Proceedings of the 12th International Scientific Conference INPROFORUM

Innovations, Enterprises, Regions and Management

Innovations, Enterprises, Regions and Management

2018

University of South Bohemia in České Budějovice

Faculty of Economics

12th International Scientific Conference INPROFORUM

Innovations, Enterprises, Regions and Management

November 1, 2018, České Budějovice

Innovations, Enterprises, Regions and Management

INPROFORUM

International

Scientific Conference

2018

2018

List of Reviewers:

CONTENT

Session   Management of Small and Medium Sized Enterprises

.

Session   Regional and Global Aspects of Sustainability, Bioeconomy

Session   Economics of Agriculture

Session   Mathematical-statistical Modelling and Optimization in Practice

Session   Market Research and Sustainable Marketing in Trade and Tourism

Session   Criminal aspects of entrepreneurship in the European context and Insolvency Proceedings

List of Sessions:

Preface

Dear readers,

The International Scientific Conference INPROFORUM is a traditional event held by the Faculty of Economics, University of South Bohemia in České Budějovice. It is focused on the research achievements in the fields of Innovations, Enterprises, Regions and Organizations. The conference offers the opportunity to discuss relevant topics among academic and practising economists.

The 12th Anniversary International Conference INPROFORUM 2018 was dedicated to the topic „Innovations, Enterprises, Regions and Management."Aim of the conference was to respond to new challenges in innovations, management and changes in enterprises and regional environment. The conference focus to exchange and discuss scientific new research results in this new context." Innovations, Enterprises, Regions and Management " has been discussed in following sections:

- Regional and Global Aspects of Sustainability, Bioeconomy,
- Microeconomic and Macroeconomic Aspects of Social and Economic Development,
- Economics of Agriculture,
- Economic Impacts of Changes and Policies in the Fields of Finance, Accounting and Taxation,
- Market Research and Sustainable Marketing in Trade and Tourism,
- Management of Small and Medium Sized Enterprises,
- Criminal aspects of entrepreneurship in the European context and Insolvency Proceedings,
- Mathematical-statistical Modelling and Optimization in Practice.

The conference was pleasured by many participants in this year and it is our pleasure to offer the INPROFORUM result in this form of reviewed contributions and hope you will find it useful and interesting for your academic development.

On behalf of organizing committee

Miloslav Lapka

SPECIAL

PLENARY SESSION PAPER

The significance of economic knowledge in the environmental sustainability discourse

Karl Bruckmeier

Abstract*: Environmental sustainability gained significance in the past three decades in science and in politics, in many countries, indicating increasing problems with environmental pollution and limited availability of natural resources. Yet, the success of sustainable development in terms of environmental improvements is limited, as the Millennium Ecosystem Assessment and further global assessments showed. This analysis of the significance of economic knowledge in the sustainability discourse is part of a discussion of potential improvements of the sustainability process. Economics is only one of many disciplines providing knowledge for the sustainability process, and it is not a paradigmatically unified science. Sustainable development depends on broader knowledge from the natural and social sciences and interdisciplinary syntheses. Interdisciplinary knowledge integration evokes questions of knowledge selection in environmental research and governance. The search for possible improvements of sustainability governance requires analyses of the main deficits: policy, market and community failures, and failures through inadequate knowledge practices, the latter rather neglected up to now.*

Key words: Economic knowledge · Environmental sustainability· Interdisciplinarity · Knowledge synthesis

JEL Classification: Q5

1 Introduction – knowledge for the environmental sustainability discourse

The significance of economic knowledge in the environmental sustainability discourse is discussed here in an interdisciplinary perspective, referring to human, social and political ecology, subjects that developed through the interdisciplinary opening of environmental and social research in the past decades. Such forms and practices of interdisciplinary research, cooperation and knowledge synthesis need to be developed further for the development and renewal of the sustainability process that includes economic knowledge as one of several components.

Sustainable development is on national and international policy agendas since more than thirty years, but the success in terms of environmental improvements and maintenance of the natural resource base of the earth is limited, as the Millennium Ecosystem Assessment from 2005 and further global assessments showed. Few and small environmental improvements happened in the past decades, in some countries, for example, through reforestation; but the main trends of deterioration of the state of the environment and of ecosystem services continue, including industrial and agricultural pollution of soils and waters and the CO2-pollution of the air, which is the main reason for global climate change.

The lacking success of sustainability policies is not easily explained; many reasons and causes can be given. Policy failures and vested interests of powerful actors and organisations are among the prominent explanations. Actors that gain from the present practices of environmental pollution are in a complicated situation; firms, for example can be confronted with demands to pay for environmental damages, as polluters that have to compensate the environmental damages according to principle "the polluter pays". But industrial firms and international corporations do not always bear the costs of pollution, they can avoid this also by relocating the production to other countries with less environmental legislation. The explanations through vested interests and policy failures are not wrong, but insufficient. The consumer behaviour, for example, evokes the question: who is more responsible for environmental damages – the producing firms or the consumers who buy the products? Other problems, rather neglected in the scientific and political discourses, include the knowledge practices in sustainability governance. Which knowledge is - or can be - used for sustainable resource management and governance, and how is it selected? Knowledge selection and interdisciplinary knowledge integration are discussed here regarding the significance of economic knowledge in different parts of the sustainability process: in research, knowledge synthesis, knowledge transfer, strategies and practices of participatory resource management and sustainability governance, review and assessment of policies and policy instruments.

---

prof. Karl Bruckmeier, Keynote speaker of the conference INPROFORUM 2018, National Research University – Higher School of Economics, Moscow, Russia, Germany, e-mail: karlbr@posteo.de

The nature of the social and economic changes required for strategies of sustainable development became clearer in recent controversies about sustainability governance. The first condition of more successful policies is the global integration of the fragmented policy processes at local, regional, national and global levels. This does not require a single, centralised and top-down approach, rather more of a networking of local and national sustainability processes in the global policy arena. The intensifying research and discourse of global environmental governance and earth system governance is seeking for such improvements in the architecture of global governance (Biermann 2007, 2014; Bruckmeier 2019). The second condition of success is to rethink sustainable development as part of a transformation of the global economic system, a social-ecological transformation as it is called in the scientific discourses of social and political ecology (Bruckmeier 2016) or a new "great transformation" of industrial society (WBGU 2011) in the sense of Polanyi (1944).

The economic problems that affect environmental sustainability and need to be discussed in the broader sustainability discourse include the scarcity and the valorisation of natural resources, economic growth, distribution and redistribution of resources, property rights and access to resources (and as ideas to solve the problems on the way to sustainability: bio-economic approaches, or other ideas of the "green economy"). Many of these problems require further knowledge, not only economic research. Scarcity of natural resources can, for example, be quantified in ecological and economic terms, as naturally or as socially caused scarcity, or as combination of both. Economic knowledge is not enough to explain environmental problems, their causes and consequences, and the restructuring of sustainability governance. Economics can say little about the functioning and the development of ecosystems, the consequences of environmental pollution for humans and nature, the environmental risks of overuse of natural resources, the coupling and the interaction of ecological and social systems, the causes and consequences of global climate change, of biodiversity loss, of land use change and urbanisation, of the limits of natural resource use or the planetary boundaries that cannot be exceeded by humans without consequences. All these themes require environmental and ecological knowledge which needs then to be combined with economic and further knowledge in the formulation of sustainability strategies and policy programmes. Furthermore, many social consequences of natural resource use in industrial and agricultural production and in consumption cannot be explained and solved with economic knowledge alone, for example, the core problem of redistribution of natural resources that is called in the sustainability discourse intra- and inter-generational solidarity. Finally, ethical considerations of environmental justice, fairness or equity are part of the sustainability discourse and governance process (Dover 2018); this requires a discussion of the social genesis of new normative orders (Forst and Günther 2011). Regarding solutions, economics is challenged through the practices of interdisciplinary and applied environmental research supported by the European Union searching for "nature based solutions", for example, in the research and innovation action "Horizon 2020".

Sustainable development depends on knowledge from the natural and social sciences and requires interdisciplinary syntheses from several disciplines. But in economics, as in many other disciplines in academic science, interdisciplinary knowledge exchange and integration is hardly practiced. The nature and forms of interdisciplinary knowledge work, and solutions in terms of combining specialisation and interdisciplinary integration of scientific knowledge, need to be discussed further in the sustainability discourse. The expertise provided through specialised research is limited with the regard to the multifaceted and complex processes that sustainability implies. When knowledge exchange, combination, integration and synthesis are not done in science, they need to be done in the policy process or in resource management – under worse conditions; this is a widespread practice. Improvements of the sustainability discourses in science and policy require, therefore, critical reviews of knowledge use and the development of interdisciplinary knowledge practices.

The environmental and economic problems that require for their solution sustainable development are interconnected in manifold ways. Three main forms of environmental degradation and functional disturbance of ecosystems need to be dealt with in global governance and sustainable development:

(1) Industrial pollution, a main cause for local, national and global environmental problems, has not stopped with all efforts of environmental policy in the past fifty years. Industrial production was relocated from the old industrial countries in Europe to newly industrialising countries as the BRICS-countries, especially China that produces now much of the industrial goods consumed in European countries, with extreme forms of pollution of air, water and soils. The pollution is where industrial production happens, and the newly industrialising countries with high numbers of population, have since the beginning of the millennium become main polluters, also regarding CO2-emissions. These countries repeat the same pollution path as the early industrialising countries in Europe. The idea of ecological modernisation of the industry, developing in the 1980s in Germany, thereafter transformed into a sociological theory in the Netherlands (Mol et al 2009), has not resulted in a systemic transformation of industry or "clean and green" production, only in piecemeal improvements in European countries that are overtaken by growth and increasing pollution in the global South.

(2) Agricultural pollution is a newer phenomenon, connected with the modernisation and industrialisation of agriculture in most countries since the 20th century, in Europe especially since the 1970s through the Common Agricultural Policy of the European Union. Modernised agriculture is an environmental polluter of soils, waters and air, which is discussed

in environmental science and policy since the beginning of environmental policies, in West European countries in the early 1970s. Simultaneously began the discussion and introduction of policy reforms and changes of agriculture in forms of more environment-friendly production methods, for example, organic farming. Also for farming the same logic applies as for industrial production: the partial improvements through environment-friendly forms are overtaken in the further modernisation and intensification of conventional agriculture in many countries.

(3) Global environmental change in forms of climate change, biodiversity reduction and land use change (agricultural, industrial and urban land use) includes the new phenomena of environmental disruption at global level that are intensively investigated and discussed in environmental science and policy in the past decades. They are closely connected with the discussion of limits of natural resources or global boundaries for the human use of natural resources. In difference to the older, single and specific pollution problems they imply more complex problems, with hitherto unknown consequences and risks for the future development of modern societies. None of these complex problems that require international cooperation and integration of environmental policies is sufficiently addressed in the sustainability process, although international environmental regimes and attempts of regulation exist for all of them. The most intensively discussed and the most advanced policies are that to mitigate climate change; but international climate policy shows simultaneously, how difficult a global policy is, moreover, threatened through setbacks.

All three forms of environmental disruption are causally connected through the spreading of industrialisation, which is the decisive process connecting global economic and environmental change. Industrialisation brought significant changes in natural resource use in modern society; it was at the beginning a limited project of social and economic trans-formation in few countries, spreading until the beginning of the 20th century only in countries in Europa and North America; during the first part of the 20th century industrialisation happened mainly in the socialist countries, and towards the end of the 20th century began a new industrialisation in the Global South, mainly in the BRICS-countries. Still many countries there are not industrialised, but the exchange and consumption of industrial products is worldwide. Future in-dustrialisation and economic growth will be more and more impeded through the ecological limits of natural resources on the earth (Meadows and Meadows 1972; Langeweg et al 2000; Dauvergne 2008).

Agriculture has become through its modernisation organisationally, technically and economically a part of the indus-trial system. In the industrialised countries of Europe, agriculture continued for long-time as a semi-autonomous form of peasant agriculture: until the second half of the 20th century, when more industry-dependent products and technologies were used in agriculture, resulting in large-scale specialised farms and high-input agriculture (fertilizer, agrochemicals, machines) which made it oil-dependent. Finally genetic modification of plants and animals makes agriculture a laboratory practice. The industrial and the agricultural sector are connected through the same institutional and economic mechanisms – they are commercialised, capital-intensive, market-dependent and profit-oriented in the production processes. Global environmental change is a consequence of the preceding transformations in industry and agriculture which resulted in increasing emissions of greenhouse gases (including CO2 and methane) that cause climate change together with the spreading of mass consumption and transport (cars, ships, airplanes). Environmental change is now a global process and can only be mitigated in globally concerted action.

The improvements of environmental quality in Western European countries that de-industrialised their national econ-omies since the collapse of East European socialism and the development of a globalised economy, are not yet of the kind of improvements of a transition to an environmentally sustainable post-industrial society. Through the re-location of industrial production and pollution to the Global South, and the import of cheap natural resources, the extraction and processing of which causes environmental damages in the Southern countries, the old industrial countries are not out of the responsibility for industrial pollution and global environmental change. This has been discussed in environmental sociology as *"the rich country illusion effect"* (Rice 2007): the rich countries of the Global North use their positional advantages in the global economy to import cheap natural resources and products from the countries of the Global South through unequal exchange; this unequal exchange implies the "export" of environmental burdens and of ecological sink capacity to the less developed countries of the South. Many European consumers are not fully aware of the global envi-ronmental consequences of their resource-intensive lifestyles (also called "imperial mode of living": Brand and Wissen 2013), as the pollution happens far away. To blame the less developed countries for not keeping their environment clean and not maintaining their natural capital is not a consequent reaction in the complicated division of labour in the globalised economy. In more general and less exact forms, the environmental sociologist Ulrich Beck has also argued critically in this sense: the price of the welfare in Western countries is the shifting of negative external effects to the environment, to the poor countries in the Global South, to the future generations (that have to bear the consequences of climate change), and to the women, who have in the genderised division of labour in most countries of the world to bear more of the burdens for environmental care and health care as consequence of environmental pollution.

The sustainability discourse is connected to other parts of the environmental discourse. The interdisciplinary learning process that resulted in the debate of sustainable development began with the debate about global environmental problems in the 1970s: in the report "Limits to Growth" of the Club of Rome from 1972 the growing scarcity of natural resources began to be discussed, also its consequences for humans and nature. Environmental problems are caused by social actors and connected with other problems in modern societies; they cannot be analysed and solved within the limits of disciplinary and specialised knowledge, but transgress the boundaries of scientific disciplines (that are only boundaries within the institution of academic science, the universities) and require interdisciplinary cooperation in search for solutions. It is not a convincing knowledge strategy, to refer to the explosion of scientific knowledge which can only be handled through specialisation, to plea for modesty and refer to the limits of our knowledge, or to ignore the complex global processes of environmental disruption and change and to focus on national, regional and local levels, looking for partial or piecemeal solutions. There are locally and regionally specific environmental problems that do not exist elsewhere and require specific solutions; but they are part of the larger processes of global pollution and overuse of natural resources. Many environmental problems are of trans-boundary nature, for example pollution of air and water, which was one of the main reasons for the first global conference on the environment, UNCHE, in Stockholm 1972: industrial air pollution and acid rain do not stop at national boundaries. The air is today polluted, in different degrees, all over the globe, also in areas where no humans live, as in the Antarctic. The oceans are polluted everywhere, with toxic material and plastic – particles of plastic are found also in the deep sea, are eaten by the fish and come again into the food chain.

Logics of interdisciplinary knowledge use and explanation that can deal with the global complexity of environmental and connected social and economic problems in the sustainability process are found in some interdisciplinary fields as complex systems analysis, earth system governance, or cultural, human, social and political ecology. In the past decades inter- and transdisciplinarity developed rapidly (Thompson-Klein 1990, Gibbons et al 1994, Nowotny et al 2001), influencing also environmental research, but in competition with conventional academic science. From this debate it can be learned how to initiate, organise and develop interdisciplinary knowledge exchange (Hirsch-Hadorn et al 2008). For sustainable development systematic knowledge exchange between the social and natural sciences is required, and the contrasting principles of disciplinary specialisation and interdisciplinary knowledge use need to be balanced. Interdisciplinary knowledge production developed with the ideas of thematically specific research, knowledge synthesis and situational generalisation. Thematic specification and problem oriented research for specific purposes are more flexible than disciplinary specialisation, as already Popper (1963) discussed, later Schäfer (1993), arguing that problems do not follow disciplinary boundaries. In thematically specified knowledge production the knowledge necessary for analysing and solving specific problems can come from different fields of specialised research, in flexible combination, according to the problem to deal with, not according to the specialized knowledge available in one discipline. Generalisations from interdisciplinary knowledge are possible as situation- and problem-specific, not always in universal forms. Interdisciplinary knowledge exchange happens to some degree in disciplinary and sub-disciplinary research, without that it is called so, or understood as interdisciplinary practice of knowledge exchange: for example in the synthetic discipline of anthropology, where continuously social and natural scientific knowledge is used.

The connections between the heterogeneous problems and processes that affect sustainable development have been recognised since long with the help of interdisciplinary knowledge practices. In an exemplary form they were described by the economist Lowe, a protagonist of interdisciplinary cooperation in the social sciences and critical analyst of economic knowledge, its validity and applicability. He became with his book "The Path of Economic Growth" (Lowe 1976) a classical author of growth-critical theory. His reflections (Lowe 1983) give a summary of the significant changes in society and economy that shape our global future and require such guiding ideas as sustainable development. According to Lowe a worldwide transformation is in progress since the 20th century that brings forth a new form of the modern economy and society. This transformation is a long process, including the changes, crises and disasters of the first half of the 20th century (with two world wars, the big global economic crisis of 1929, and the emergence of fascist and socialist systems) and the trends of change in the second half of the century, partly as reactions to the earlier ones: the end of colonialism in the Global South, the development of the welfare state and mass production and consumption in Western countries, the creation of general human rights which supported the emancipation of formerly discriminated social and ethnic groups, and the development of new technologies, especially with the microelectronic revolution. The new information technology and the media of mass communication support the further dissolution of traditional forms of knowledge and belief through the spreading of scientific knowledge. These changes seem at the first glance heterogeneous, happening casually at the same time, but Lowe identifies connections between them. He interprets the "mega-trends" in a way that reminds of the earlier hypotheses of disenchantment and rationalisation in Western modernisation formulated by the sociologist Max Weber: as creating new forms of societal development that require new forms of rationality and morality. Humans are finally free from the dark powers of the misbelief and the myths of the past where they depended from nature and the domination of religious and other authorities, priests, monarchs and bureaucrats. The way to the

future is more conscious and rational than before in human society, based on knowledge and human decisions in science, politics, and economy.

However, Lowe saw clearly the antagonistic tendencies in the complex development processes where ever more factors are effective; furthermore, one and the same cause can have contradicting consequences. Worldwide industrialisation can reduce the extreme poverty in the non-industrialised countries of the Global South, but may result in climatic catastrophes; the deregulation of markets and the globalisation of the modern economy may create new forms of mass consumption but also new disorder (anarchy in international politics and globalised markets, devastating forms of competition); the new communication technologies may result in increased private freedom of the individuals, but also in new forms of control and suppression. The last problem is discussed intensively now as a consequence of the commercialisation and misuse of the internet by global economic players and authoritarian governments. Tim Berners-Lee who invented the internet in the 1980s created a "Contract for the Web" to combat the commercial misuse and bring the net under control of the citizen who should be able to decide what happens with their data. To deal with the complex problems and dilemmas, Lowe saw the necessity of new forms of rationality, morality and responsibility that need to be institutionalised together with the development of long-term perspectives of action: responsibility for the future generations and their conditions of life that depend on action and natural resource use today. What he describes as a consequence of complex and interacting changes in late modern society *is the new ecological rationality that includes the responsibility for "our common future"*, as the Brundtland- report from 1987 calls it. This new rationality of the future is one beyond the short-term perspectives of markets, business and policy cycles; it unfolds in the sustainability process and requires new forms of knowledge use and collective learning from all actors in science, politics and the economy. More detailed analyses of the contradicting experiences and effects of globalisation are available today (in globalisation research: Held and McGrew 2007; in environmental history: McNeill 2000; in social ecology: Krausmann et al 2009, 2009a).

2 Knowledge problems in the discourse of environmental sustainability

The complicated clarification of the nature of sustainable development. This "essentially contested concept" (Collier et al 2006) is insufficiently defined in the Brundtland- report from 1987 as intra- and inter-generational solidarity of resource use. The term is continually discussed and interpreted without achieving consensus in science and politics; it exists as a bridging concept with a plurality of interpretations, including contrasting and competing ones (Bruckmeier 2009, 2013, 2016) and requires a complex, multidimensional analysis of human use of natural resources (Howitt 2001). Nevertheless it became the most influential bridging concept in environmental science and policy that was adopted by most countries as overarching policy goal, although often more rhetorically used than implemented. That sustainable development has little success so far is to a large degree a knowledge problem: less one of too little knowledge, more one of insufficiently and inadequately applied knowledge. Much knowledge is available from many disciplines, which would require interdisciplinary knowledge integration to be applied in the sustainability process.

Interpretations of the notion of sustainability in the scientific and political discourses imply difficult knowledge problems since the beginning of the sustainability process. There is no consensus in science or in practice, which interpretations are adequate to deal with the complex problems and which not. More recently came up questions whether it is too late for realising sustainable development (Worldwatch Institute 2013). Furthermore, critique of the idea of sustainability developed in the ecological discourse; it can be understood as a reaction to the lacking success in sustainability governance in the past decades, arguing that sustainability is too complex, cannot be realised practically because of insufficient knowledge and understanding of the social and ecological complexity. Therefore, it should be replaced by simpler concepts, for example, that of resilience (Benson and Craig 2014). However, resilience is as diffuse and unclear as sustainability and can be specified in different forms (Folke 2006; Bruckmeier 2013). Against the reduction of sustainability to resilience new critical voices argue for a renewal and improvement of the sustainability that has gained momentum in politics (Allen 2008; Fischer-Kowalski and Rotmans 2009; Rees 2010; Leach et al 2010; Markard et al 2012; Westley et al 2013; Asara et al 2015; for further discussion see: Bruckmeier 2016a).

In the policy and governance practices, sustainability has been dealt with in reductionist forms – either reduced to a normative goal of the governance process, or dissolved in a pluri-dimensional concept which is the mainstream variant: economic, social and ecological sustainability. Such interpretations, although not sufficient for the scientific reconstruction of sustainability, give at least the possibility to develop them further with the experiences in sustainability policies. Necessary seems at first to improve deficient policies that work with a political rhetoric of sustainability: a widespread practice in the policy processes which implies symbolic commitment to the values of sustainability, but lack of agency, implementation and regulation capacity. The examples of the definitions and descriptions of sustainble development by the European Union and the United Nations (UN 2015), two important institutional actors in the global sustainability process, show such deficits in exemplary forms: sustainable development is reduced to symbolic values and commitments, wishing lists and normative thinking, but not specified in terms of necessary institutional changes.

The difficult development of interdisciplinary research and cooperation. In large parts of environmental research and policy it is taken for granted that knowledge relevant for the practice is scientific and needs to be transferred from science to practice. Furthermore, scientific knowledge is often reduced to empirical or positive knowledge, neglecting such forms as local, practical and experience-based knowledge. With the rapid development of environmental research in the past decades, happened, however, also a revaluation and revitalisation of non-scientific, local and practical knowledge forms as discussed in the transdisciplinarity discourse.

With interdisciplinary knowledge integration come up questions of knowledge selection: which knowledge, from which disciplines should be applied and combined in the sustainability discourse and the governance processes? Which knowledge is suitable in the different phases of the sustainability process that stretches from research to governance practices? How to deal with incompatible or contradicting knowledge and information? Which social and cultural resources, beyond the natural and economic resources, are required for sustainable development in a given area or globally? These questions that guide the following analysis require implicitly an answer to the question, why economics should participate in interdisciplinary discourses when sustainable development is at stake. *Scientifically seen* economics is only a limited part of the sustainability discourse where several disciplines and interdisciplinary subjects are involved. To find out, which knowledge is important and should be used in sustainability governance requires obviously interdisciplinary knowledge integration and syntheses in both processes that constitute sustainability, research and governance. *Practically seen* economic processes are interwoven in manifold ways with other political, social, and cultural processes. Two overarching processes influence today the development of all national economies: that of globalisation and deregulation of the markets, and as countervailing process that of sustainable development; both are multi-faceted processes that interact with each other, creating a complex reality in which also the "genuine" economic processes of production, exchange and trade can no longer be understood with economic knowledge only. It can also be argued that production, exchange and trade could never be reduced to economic processes only because they include many culturally, socially, and technologically specific components and practical experience; for former societies cultural-anthropological research shows the influence of rituals and religious believes on economic processes; for modern societies the discussion about the environmental consequences of industrialisation and growth by the classical economists (refereed to below) shows, that in the 19th century interdisciplinary knowledge was used, self-evidently, to understand economic processes. Today, in the situation of global environmental change and global networking, the social, cultural, political, ecological influences and factors influencing economic processes require interdisciplinary knowledge and multi-causal explanations in more systematic ways.

Interdisciplinarity developed rapidly as a new and alternative scientific knowledge culture in the second half of the 20th century, and has become a dominant form of research and cooperation in the environmental and the technical sciences. However, interdisciplinary knowledge production is not a new phenomenon; the recent trend is only a renewal of older forms that were not discussed under this name. In the history of economics exists a long tradition of interdisciplinary thinking. As examples can be mentioned: the early interdisciplinary thinking in Physiocratic economics, for example, by Quesnay who developed a model of the circular flow of resources and money in the economy; the development of political economy from Scottish moral philosophy by Ferguson and Smith; the interdisciplinary knowledge use of the classical political economists and Marx who used social and natural-scientific knowledge in their analyses and explanations; the heterodox approach of institutional economics, influential in the 20th century, that reconnected economics with other social-scientific disciplines. What needs to be learned in the present interdisciplinary knowledge use for sustainability in economics is the integration of natural scientific and ecological knowledge from environmental research with economic knowledge. The situation can be described as follows:

(1) *Economics as an academic discipline* is similar to other social sciences with regard to its rapid specialisation in sub-disciplines and its lack of a unifying paradigm (in the sense of Kuhn 1962). There are contrasting and controversial discussions of globalisation and sustainable development also within economics, regarding the environment and natural resource use, for example, in the heterogeneous approaches of neoclassical economics, institutional economics, and ecological economics. Beyond the competing approaches, economics is differentiated in theoretical, empirical and applied forms; when economic knowledge is applied, it happens also in form of synthetic disciplines like management science which includes economic knowledge in combination with other knowledge from social and organisational research (also in the specific form of environmental management). Interdisciplinary management science and sub-disciplinary specialisation can be seen as ways of dealing with the growing complexity of modern societies, their institutions, and their interactions with nature; with that more and more interdisciplinary knowledge is taken up which can be seen as a partial correction of the principle of specialisation in disciplinary knowledge production.

(2) *The scarcity debate in economics is old and dispersed in different approaches.* The classical political economists in the early times of industrialisation, when economics was called "the dismal science" by the historian Thomas Carlyle,

discussed the future of industrial society. This dispute helps to understand the knowledge problems in the present sustainability discourse. The controversy between Malthus, Ricardo and Mill about the final limits of natural resources (Barnett and Morse 1963) happened with insufficient demographic and ecological knowledge; the global population growth could not be calculated or estimated sufficiently, and no quantitative assessments of the final resource limits on the earth were available, as they exist today. Nevertheless, the economic discourse advanced in the discussion of scarcity problems and came to realistic views.

The political economists foresaw that industrialisation ends in a plundered earth – articulated by John Stuart Mill in the question, what will be when growth has come to an end? He discussed and assessed the Malthusian and Ricardian views of resource scarcity. Malthus´ proposition of diminishing returns, summarised in his formulation of population grows geometrically (exponentially), subsistence arithmetically (in linear form), was not generally rejected by Mill, but refined and clarified (Barnett and Morse 1963: 64ff): the power of population growth has in human history never gone to such extreme forms as Malthus assumed in a foreseeable permanent state of misery. Population growth is modified through other influences; the assumption of Malthus that there is an absolute limit of available land that will be reached in the foreseeable future appeared as doubtful. The arguments of Mill can be summarised in the idea that the principle of progress works against scarcity and diminishing returns, following Ricardo´s interpretation, where scarcity appears only as a threat in the distant future. Long before Malthusian scarcity (absolute limits of natural resources) is achieved Ricardian scarcity becomes effective that is mitigated through the principle of progress; this includes progress of agricultural techniques, new knowledge, skills, inventions and innovation - all working against diminishing returns. Regarding agriculture Mill mentioned better fertilizing techniques, improvements of plant and animal breeding, cultivation of new land, reduction of agricultural waste, new machines, improved transport systems as railways and channels, improved manufacturing of food: the "progress of civilisation" and technology work against the naturalistic view of scarcity of Malthus. Mill asserted there is room on the earth for a high number of humans, supposing that the described improvements happen. Yet, Mill, as Malthus and Ricardo, believed that there is a tendency to increasing scarcity of natural resources and of diminishing returns; probably industrialisation and growth will come to an end, resulting in a "stationary state" as the consequence of a long time of economic growth. Mills reasoning with the antagonistic principles of scarcity and progress brought the debate to the point where the sustainability discourse takes it up again today. In economics this happened in the newly developing ecological economics: in the reasoning of Georgescu-Roegen (thermodynamic laws as limits to economic growth), Daly (re-adopting the idea of the "stationary state" as "steady state", and the "full earth"), and Martinez-Alier (connecting the debate of resource scarcity with the newly unfolding debate of degrowth or zero-growth).

The potential limits and the overuse of natural resources were realistically seen by the classical economists as a hypothetical state of the world in a distant future about which nothing could be concretely said with the economic and the ecological knowledge of this time. When could such a state of transgressing the global limits of the earth´s resource base be achieved? The classical economists, also Marx, could not imagine when this happens. Marx, who criticised Malthus sharply for his naturalistic reductionism in political economy, conceded that he is right in one hypothetical case: when the global population growth is so high that all resources of the earth, the land, the sea, the physical and the living resources, would not be enough to feed all humans. But he thought that this can only be in a very distant future. Also Marx could not imagine that this, what the ecological economists today call "the full earth", is approaching not much more than 100 years later.

(3) The present growth debate in ecological perspectives – exponential growth, degrowth, "prosperity without growth (Jackson 2009). Also in the 20th century the Neo-Malthusian thinking in the "Limits to growth"-debate (Meadows and Meadows 1972) initiated by the Club of Rome was at first seen as "doomsday prophecy" and "Soylent Green"-utopia of a miserable future of humankind. Simon (1981) renewed in his economic analyses of population growth and limited natural resources a cornucopian view. He rejected the Malthusian argument of scarcity through population growth and overuse of resources and foresaw the possibility of continuing, even improving resource availability in the long run. Scientific knowledge, technology and inventions can create improvements and new resources will be found to substitute scarce ones – a reasoning with which he came in conflict with ecologists, ecological economists and environmental sociologists. In Simon´s analysis and worldview only economic rationality and economic knowledge count; ecological factors are devalued in favour of economic ones and ecological diagnoses of the pollution of the environment and its long term consequences do not count much in this view. In an interdisciplinary perspective it would be possible to accept different arguments instead of a simplified "either market economics or ecology" and more complex arguments than that of population growth, economic growth and growth of natural resource use are possible also in the distant future. Under which conditions do the economic and the ecological arguments count and how can they be combined in more refined analyses? The specialisation trap seemed to block the further discussion of problems for which in classical economics already a breakthrough was achieved: to accept, that technological innovations create more elbow room in resource use *and* that ecological limits of resource exist that cannot be outwitted through "the last resource" (Simon) of the human brain. At a

time of energy and resource wars and the possibility of armed conflicts because of climate change, that can, since the Darfour-conflict in Sudan, no longer be denied (Dyer 2008; Welzer 2008), it seems necessary to find better arguments through interdisciplinary knowledge syntheses. In the further discourse and research in ecology and economics the questions of scarcity and limits to growth need to be discussed in more exact forms, with interdisciplinary knowledge syntheses. It is more and more difficult to ignore the growth critique that can show the dilemmas of present growth and of decoupling growth from resource use. For absolute decoupling of economic growth from natural resource use huge investments would be required, for example, in low carbon technologies (Jackson 2009: 83). The first significant improvement of the connected scarcity and growth debates is to dissolve the blending of different processes under the abstract term of growth, differentiating clearly between economic growth (in the whole 20th century: 2000 %; Maddison 2001) and other forms of growth – population growth (400 %), growth of global biomass extraction (360%), and growth of use of material resources (800%; Krausmann et al 2009: 2696). These are the important forms and figures to deal with: economic growth, population growth, and the "throughput growth" (use of energy and material resources, including biomass, in economic production).

Many resource-related processes show exponential growth, but how they influence economic growth is more complicated to assess. It needs to be specified what is growing when the economy grows. Daly, referring to Boulding, differentiates between growth of Gross Domestic Product (GDP, the annual marketed flow of goods and services in monetary terms, which does not measure environmental effects of growth and conflates costs and benefits for the environment), and throughput growth (which is the relevant magnitude to answer the question, how big the economy is or can become). When this flow of matter and energy from environmental sources through the economy is quantified, the ecological limits of global resource use can be calculated better.

To calculate ecological limits or "planetary boundaries" some ecological indicators and data are available: ecological footprint, MEFA – material and energy flow accounting, HANPP – human appropriation of net primary production, EROI – energy return of investment. They are not yet well connected with economic data of monetary growth. The growth of resource flows in the global economy is measured in physical terms in social ecology, for example in MEFA, which needs finally be connected with the monetary growth calculations (for that purpose the GDP growth needs to decomposed and recalculated, and the changing forms and conditions of growth need to be analysed more concretely). Daly´s view is, that throughput growth should be stopped before it creates environmental and social costs that exceed the extra production benefits (in: Jackson 2009: xii). Logically or theoretically the argument is clear, practically and concretely it is more complicated to calculate the levels of economic growth that are finally possible, and still more complicated, to imagine, how the institutionalised economic growth process can be reduced or stopped (without causing such negative consequences as the worldwide financial crash from 2007). This will be the work in the future economic and ecological sustainability discourses – so far, Jackson gives a detailed description of the problems and consequences connected with economic growth, but the question of limits to growth is only answered in physical and ecological terms, for example: 60 % of the global ecosystem services are degraded and over-used, mostly during the 20th century (Jackson 2009: 13). The final argument of Jackson, as that of the ecologists and ecological economists, is: no subsystem (as the economy) of the finite earth system can grow indefinitely in physical terms, therefore there is no alternative to question and limit economic growth (Jackson 2009: 14f). But how a transformation of the modern economy to a sustainable economy of the future (with limited growth) can be possible, is not yet known, requires further and new forms of cooperation of economic and ecological scientists. The answers by Jackson and ecologists imply: to halt economic growth and introduce more forms of sharing and (equitable) redistribution of the available natural resources on the earth, as also the idea of sustainable development requires. But how this can be achieved in practice and at global level is unclear. It requires more than presently available mechanisms in policy and governance to transform the economy. At his point the dilemma of sustainability is obvious: the next "Promethean revolution" (as Georgescu-Roegen called the great transformations in human history from hunting to agriculture and then to industry) is the building of a new economy where the natural resource use does not grow. This implies, that the process begins without sufficient knowledge, that it needs to be learned on the way how to approach reduced growth: probably in "trial and error"-procedures, through adaptive management (policy as experiments), and with new knowledge and knowledge synthese

3 Sustainable development - when scientific knowledge from different disciplines is contrasting

The greatest difficulty (and the test for economics as any other discipline of the ability to develop cooperation and interdisciplinary knowledge cultures) is, when for the multi-faceted sustainability process contrasting or contradicting knowledge is provided. What to do, when ecological research or other knowledge about the availability of natural resources or their depletion contradicts economic calculations (for example, in the bio-economic modelling in fisheries management)? What to do, when sociological or cultural-anthropological research about resource use and consumer behaviour contradicts economic research? What to do, when policy research shows that economic policy instruments such

as tradeable pollution certificates, are not efficient or counter-productive in combatting environmental damages and over-use of natural resources? What to do, when the core institutions and processes of modern economy, the markets, private property rights, the institutionalised forms of profit and economic growth, and the valorisation and pricing of natural resources are themselves criticised? All of these institutions are in environmental and social research often seen as more preventing than supporting sustainable development.

Answers to these questions, in a nutshell. In a situation where complex social and ecological systems interact, no discipline has sufficient and adequate knowledge; all have only partial knowledge that needs to be woven together in a *patchwork of explanations.* Also formal sciences as cybernetics, logic, mathematics, or general systems theory do not have privileged knowledge to understand complex processes. There is no single and universal science of complexity. The "patchwork of explanations" means, that different forms of knowledge and explanations need to be combined in prelim-inary ways, with robust methods and heuristics, to understand the multi-faceted reality of present changes that need to be dealt with in the sustainability process. The questions above articulate, directly or indirectly, situations of problems, con-flicts, crises, in which specialised knowledge and traditional forms of resource management and knowledge use show their deficits and create failures. Sustainable development is a form of new institutional and knowledge practices, a mega-innovation that covers different social, scientific, political, economic, environmental aspects which require (1) interdisci-plinary knowledge integration and (2) transdisciplinary knowledge use and -sharing. Knowledge integration, sharing and negotiation – that is, briefly said, the pluralist rationality of interdisciplinary research and knowledge use for sustainable development and participatory resource management, where not only scientists are involved in decision making as ex-perts, but also the producers and resource users as experts of other kind. Bi-directional knowledge flows, knowledge sharing and participatory resource management are today intensively discussed in ecological and resource management research. More or less at the same time as the take-off of the sustainability debate began in science and politics, especially in European countries, the search for new, less owner-controlled and managed, more decentralised, locally adapted, par-ticipatory, producer and user based forms of resource management; they had different names as stakeholder participation, local resource management, integrated management, user-based management, ecosystem-based management. From re-search on such practices Ostrom (2009) developed a general framework for interdisciplinary knowledge integration in sustainable resource management.

The European Union has supported and introduced new forms of participatory action in regional policies and fisheries policy as paradigmatic examples (Linke and Bruckmeier 2015). Participation methods in applied environmental and social research are among the better developed methodologies of transdisciplinary research and are in use already since the 1980s (Chambers 1994; Hirsch-Hadorn et al 2008). The trends towards non-hierarchical, network-based, more democratic and participation-oriented forms of policy and governance were long time discussed only as power-sharing and empow-erment of hitherto powerless groups: as problems of legitimation and democratisation of policy and governance processes. Only in the course of practical implementation and with the difficulties experienced in this process came gradually the awareness that subtle forms of interconnection between power and knowledge are at the core of the problems to deal with. Power sharing and democratisation of resource governance is sharing of different forms of knowledge, experience, and expertise, bound to different professional roles and qualifications.

The growth and security-related problems of natural resource use can be illustrated with experiences and practices of sustainability governance from the transformation of the industrial energy system, a main component of the transition to a sustainable economy.

The fossil energy resources of industrial society are approaching their limits, for reasons of natural availability or of practical applicability (the further use creates more environmental damages than benefits). In this situation the search for solutions becomes contradicting, but in the long run, there are no alternatives to phasing out the fossil sources. The "peak oil"- debate brought:

- risky technologies of deep sea drilling or fracking (originally thought as a bridging technology until new energy forms are developed, now becoming attempts of prolongation of the oil regime),

- but also the breakthrough of the development of energy from renewable sources and more sustainable energy regimes as the use of wind and solar energy.

This transformation has been initiated by environmental actors, through environmental and ecological research and critique of practices and consequences of the use of fossil energy sources. Economic corporations in the energy sector adopted the innovations when the technologies were developed (through governmental subsidies) and supported by po-litical actors and governments. Windpower is meanwhile established in many European countries, and the utopian mo-ment happened already early in 2018: for a short time in Germany so much electricity was created, mainly from windpower, less from other renewable resources, as was used in the country (Bauchmüller 2018). In the case of

windpower compromises and coexistence of different organisational solutions brought the breakthrough: large and small-scale systems, cooperative and commercial forms: company owned on- and offshore wind parks, and small, cooperatively or citizen-owned, decentral and locally adapted forms, even individual use of wind turbines on farms. The cooperative sector, less strongly dependent from market dynamics, developed rather well in the countries that adopted wind energy early, as Denmark, the leading country in developing windpower technology, and Germany. The development of solar energy did so far not run smooth; some years ago collapsed the "desertec"-project, the plan to provide energy for Europe by building a huge solar park in the Sahara desert. The plan had too many unrealistic assumptions: that the energy problems find technical fix solutions; that it is a technical and economic solution driven only by corporations, mainly relying on market forces and dynamics; that the problem can be solved quickly, and realised through cooperation of energy enterprises. The competitive situation and different interests of the enterprises were not adequately taken into account – which resulted in the opting out of the supporting enterprises that did no longer believe in their economic vision. The cooperation between political and economic actors and institutions and the development of different, more flexible and decentral systems seems a suitable option. Solar energy, already in use in smaller systems, will probably be developed in various institutional, technical and economic, private and cooperative forms, as was the case with windpower. Other problems come up with the introduction of bioenergy, where the energy products are produced on agricultural land which evokes conflicts between energy and food production.

The modern industrial energy system shows paradigmatically the problems with economic knowledge in the sustainability process. The national energy systems are variants of a global system with industrial energy technologies, the dominant energy sources being coal, gas, oil and as newer forms nuclear energy; a renewable source used is water, which has, however, caused many conflicts, also because of ecological reasons (flooding land, building huge dams, withdrawing too much water from the global cycle). The energy sources or products are not equally distributed and since long exchanged on global markets. Energy enterprises, public and private companies, are global players; and energy products or electric energy, are exported and imported. The EU imports half of its energy products, especially oil and gas that are rarely found in Europe. Electrical energy is exported especially by France and Germany, the biggest exporters of electricity in the EU. The EUs big imports of oil and gas cause continually discussions and political conflicts about the energy autonomy of the Union and its member states, for example, the controversies about the North- and South-Stream pipelines for gas-export that Russia has built or planned. But these controversies are less important when energy systems are analysed in ecological and sustainability perspectives in which the nature of the modern energy system is disputed, including its main components of fossil energy sources that developed through industrialisation: coal, oil, gas, the energy from the "subterranean forests" as it was formulated in environmental history. The further energy forms came as forms of modernisation, such as nuclear energy, or of ecological conversion of the system. It does not matter so much, whether and how the composition of energy sources varies at national levels; the industrial energy system as global system has a dynamic of its own, during the history of industrialisation shown in the transition from a mainly coal-based to an oil-based energy regime. The global energy system is until today in its main components an industrial energy system, but in transformation to a post-industrial system that is less dependent from fossil sources, directing towards a future energy system where the main source is solar energy, harvested with new technologies. This ecological conversion which is part of sustainable development is just at the beginning. In this phase the clashes of the old and the new energy regime and the conflicts and dilemmas with the development of new energy technologies by use of renewable sources are numerous: the new energy technologies are not yet environmentally sound just because the sources are renewable.

In the processes of development, innovation and transformation of the energy system come up the characteristic problems that require for solution economic and ecological knowledge. The development of new energy forms or the use of new sources and conversion technologies is usually a long process of research and development until a technology is on the energy market. The development costs are usually not taken by the firms interested in selling energy, but by the governments, the taxpayers, with the help of companies in the research and development sector. The market prices of energy do not reflect the development costs and not that for environmental pollution or environmental risks. However, the economic rationality of energy "production" (that means: technical conversion), selling and use is one of low market prices. Cheap energy made possible the mass production and consumption in the 20th century, the short period of the welfare states in Europe, dependent from the Fordist accumulation regime. The real economy, in its every day form, is working on the basis of cheap prices for energy and consumer goods, irrespective of the social costs or negative externalities: this cannot continue in the long run. Every new energy form and technology needs at first to adapt to the competitive market system, and this creates further difficulties in the transition to sustainability. As long as the whole economic system and its core mechanisms of markets, financial capital and profit are not changing, the internalisation of negative externalities in the existing globalised system is only possible to limited degrees – the system tends towards discounting the future. The environmental damages and the limited availability of natural resources on the earth make finally the transformation to another, non-industrial and less market-dependent economic system unavoidable, and this brings back the questions of the end of growth, or degrowth. With that begin the real difficulties of sustainable development. These difficulties of the

transformation of the industrial energy system became clear with the development and market-introduction of energy from renewable sources of wind, wave, solar and bioenergy.

In the transformation of the modern energy system contrasting interests and rationalities are clashing, growth-based strategies and "business as usual" are in conflict with strategies of transformation and degrowth. This is the most controversial and complicated problem that can be solved only in the longer run. That economic growth becomes more and more a problem because of overuse of natural resources became evident in the stormy debates of climate change policy and the crisis of the global financial economy during the past decade. The discussion of degrowth (Asara et al 2015) and "the folly of growth" (in the journal "Science", in 2008) are part of the discourse of sustainable development: *are there sustainable forms of growth, or is sustainable development a transformation towards a non-growing economy?* It can be foreseen that the debate is rather similar to that of the controversy in the classical political economy of the 19th century, discussed above. It will become again a controversy about economic development, modernisation and technical progress (whether and how these work together in creating welfare on the basis of renewed economic growth) or a stationary state. This time it can only be hoped that the naturalistic bias of the Malthusian "dismal science" of economics is overcome (in the words of Mill: the vulgar error of naturalising economics or reducing social differences between humans to differences in nature). With that the presently unsolved economic problem for sustainable development is described - as more dependent on knowledge, not only on power. The controversy began as one between ecological economics and conventional environmental economics, but it will become a broader one, not only between these established knowledge cultures in the discipline of economics.

The future question guiding the sustainability discourse will be: how to deal with interdisciplinary knowledge practices in science and in governance of sustainable development? Hypothetically one can answer: finding better "knowledge mixes" and compromises, integrating and synthesising knowledge from different disciplines, no technical fix solutions, but combination of knowledge about ecosystems, social systems, technologies and technical systems. The sustainability process will have to be organised as one of continuous collective learning of different actors, seeking solutions in form of adaptive governance: through "policy as experiments" (Allen et al 2012), participation and cooperation of different actors and their knowledge, giving room for different forms of knowledge, scientific, managerial, practical, normative, etc. Practically seen, this is more difficult because of the global dimensions of transitions to sustainability. Although all these components of transformative literacy, capacity and agency are already practiced locally or nationally, in some countries, the global social-ecological transformation towards sustainability is a long and difficult process.

4 Discussion and conclusions – how to renew sustainable development

A new understanding of sustainable development emerges after three decades of policies: sustainable development as a long-term process of transformation, as a new "great transformation" (Polanyi 1944) to a future sustainable society and economy. How to build a sustainable society is a learning process of several generations that cannot be planned and managed in the form of technical and economic innovation projects; it requires collective learning on the way - in science, politics, and the economy: learning from failures and experiences, from policy experiments with the goal to build a new sustainable system that can replace the industrial society and economy. The post-industrial society discussed since half a century, first in a simple form by Bell (1973) as a social and structural change from a first sector (agriculture) to a second sector (industry) to a third sector (services), is not yet achieved. In the ecological discourse the post-industrial society was called a "premature utopia" already decades ago (Bühl 1983) and it is still not approaching; the ways out of the industrial society are difficult. It is not yet known what the future sustainable society is, only how to begin the new "great transformation": (1) through the transition to less polluting and less material and energy intensive forms of economic production and consumption; (2) through innovation and transformation of the modern energy system; (3) through the development and institutionalisation of long-term perspectives and ecological rationality (as demanded by Lowe, see above). It seems unavoidable that in this process the maladaptive forms of change in the present globalised economy come more and more under critique.

The long-term project of sustainable development can be described by a paradox, as discussed by social ecologists: building a sustainable society without knowing how to do it. This can easily turn into a wrong message: that sustainable development is impossible, is an utopian idea, not made for the practice of societal development. Or it can be argued, as has been done in ecological research (see above): global environmental change and sustainability are too complex processes that cannot be understood, managed and achieved by humans. As a consequence of such reasoning, sustainability is reduced to simpler goals, for example, to forms of social-ecological resilience and disaster management. One conclusion can be drawn from this erroneous debate regarding ignorance and limits of knowledge: ignorance is too simple an argument, more blocking the seeking for further solutions, especially when it is used in the form that there are absolute limits of scientific knowledge which can never be transgressed through research. Complex systems are easily found examples to support such reasoning. Instead of such reasoning it would be required to change the thinking about ignorance and lack

of knowledge. It is not necessary to know and understand all complex processes in the social-ecological earth system to find paths towards global environmental sustainability; it is only necessary to generate knowledge for the first steps of sustainability transitions and to keep the knowledge-related processes of research, knowledge production and synthesis, innovation and learning open and continuing.

In a simple and inexact form, this has already been formulated in the debate about post-normal science (Funtowicz and Ravetz 1993): risks are high, values disputed, decisions urgently required, but knowledge is always insufficient. In the sustainability discourse and governance process, it is obviously necessary to develop better ideas for inter- and trans-disciplinary knowledge use. This includes also better ideas for dealing with ignorance in the discussion of potential development paths towards a sustainable future society that will not be achieved during this century. The first step is to understand the relations between knowledge and ignorance. The sociologist Luhmann (1995) discussed the construction of knowledge and the conventional idea that more (scientific) knowledge and research means less ignorance. His conclusion was the contrary, growing knowledge creates growing ignorance; this can be illustrated with the painful discussion about genetic modification of plants, animal and humans that is on the way and (unrealistically) seen as a possibility to solve all earlier problems of hunger, misery, health, scarcity of resources and environmental destruction. The consequences of genetically modified organisms for ecosystems and for humans are not foreseeable and the environmental as well as health and social risks are high. The new sociology of (scientific) ignorance (Gross and McGoey 2015) studies the knowledge-ignorance relations more systematically. Also the knowledge problems of sustainble development need to be discussed further in this new discourse. The preliminary discussion of knowledge problems above showed only what has been learned on the way towards sustainability and gives some hints for that what needs still to be learned in the future sustainability discourse and process.

In the past three decades since the beginning of the global sustainability discourse research has intensified and we know much more, but not only from research: learning from failures and bad experience becomes ever more important. Ideas for renewed, transformation-based sustainability strategies developed mainly during this decade, with a breakthrough in ecological research that brought a new and more realistic view of the sustainability, in the form that was unfolded above in several components: with long-term perspectives (in the terminology of Braudel 1969: the "longue durée" of the historical process); as a complex process of social-ecological transformation of the global economic and societal systems; as inter- and transdisciplinary process of knowledge integration and knowledge use, with pluralistic knowledge practices, where different disciplines, approaches, theories and methods, scientific as well as non-scientific knowledge can be applied and combined. This process ends in the distant future about which we know nothing; knowledge and creativity are required for dealing with that what cannot be planned because it is beyond the time-horizons of all planning. In the metaphorical formulation of "navigating social-ecological systems" is, in indirect form, something said about this imagining of a distant future: learning how the future which depends more and more on human decisions (Lowe, see above) can be approached successively.

At present rather simple and undeveloped concepts, tools and methodologies are used to discuss potential futures and long-term development perspectives; most prominent is the global scenario construction and movement (Raskin et al 2010) that has already significantly enhanced the debate of sustainability transformation. Possible, wanted and unwanted, future paths of development that are compared in the scenario construction show already much of the problems and dilemmas of the potential ways towards a sustainable future. This is only the beginning of a new science of the future, a science of transformation that needs to be developed and complemented with other methods, concepts and theories, and with further knowledge. The methodological challenge of such a science of the future which is to a large degree a science of sustainability is: to develop and continuously improve epistemological and methodological tools for the further sustainability process. Social ecology, the pioneering interdisciplinary science that brought since the 1990s improvements of the knowledge about sustainability, qualifying the sustainability debates in science and policy, can provide some orientation in the further search for ways to "our common future", the key metaphor of the political sustainability discourse.

The finding and defining of common interests is a further difficult part of the sustainability process: taken for granted that it is the future of humankind to be dealt with in sustainable development, it is clear: the social subject of humankind is not (yet) existing in forms that suffice the requirements of transformative agency. Humankind is splintered in many different social subjects with conflicting ideas, interests, and knowledge. How transformation subjects or transformative action groups can be developed, is one of the hardly answered (although intensively discussed) questions, and one for which economic knowledge is not very helpful with its definition and restriction of actors to economic roles. What we know so far is only that new social subjects for transformation and new agency as capacity to change society are required for sustainable development; that it is not enough to argue with "our common future" (which means "our common interests") to realize this sustainable future. The process requires the concertation and matching of many different interests and is not progressing in linear way, full of drawbacks and relapses, road blocks, violent and non-violent conflicts – not at all that, what is called "win-win-solution".

Acknowledgement

References

Acheson, J. N. (2006). Institutional Failures in Resource Management. Annual Review of Anthropology, 35, pp. 117-134.

Allen, R. E., ed. (2008). Human Ecology Economics: A new framework for global sustainability. London and New York: Routledge.

Allen, C. R., Fontaine, J. J., Pope, K. L., & Garmestani, A.S. (2012): Adaptive management for a turbulent future. Journal of Environmental Management. 92: 1339-1345.

Asara, V., Otero, I., Demaria, F., & Corbera, E. (2015). Socially sustainable degrowth as a social ecological transformation: repoliticizing sustainability. Sustainability Science (DOI 10.1007/s11625-015-0321-9).

Barnett, H. J., & Morse, C. (1963). Scarcity and Growth. The Economy of Natural Resource Availability. Baltimore: Johns Hopkins Press.

Bauchmüller, M. (2018). Saubere Premiere. Süddeutsche Zeitung, January 5-7, 2018.

Bell, D. (1973). The Coming of Post-Industrial Society: A Venture in Social Forecasting. New York: Basic Books.

Benson, M. H., & Craig, R. K. (2014). The End of Sustainability. Society and Natural Resources, 27: 777–782.

Biermann, F. (2007). Earth system governance' as a crosscutting theme of global change research. Global Environmental Change, 17, 3-4: 326-337.

Brand, U., & Wissen M., (2013). Crisis and Continuity of Capitalist Society-Nature Relationships: The Imperial Mode of Living and the Limits of Environmental Governance. Review of International Political Economy, 20, 4: 687-711.

Braudel, F. (1969). Ecrits sur l´histoire. Paris: Flammarion.

Bruckmeier, K. (2009). Sustainability between Necessity, Contingency and Impossibility. Sustainability, 2009, 1: 1388-1411 (www.mdpi.com/journal/sustainability).

- (2013). Natural Resource Use and Global Change: New Interdisciplinary Perspectives in Social Ecology. Houndmills, Basingstoke UK: Palgrave Macmillan.

- (2016). Social-Ecological Transformation: Reconnecting Society and Nature. London: Palgrave Macmillan.

- (2016a). New Ecologicl Critique and Renewal of the Sustainability Discourse. Universidade Nova de Lisboa – Faculdade de Ciencias Sociais e Humanas. E-Working Papers em Ecologia Humana No. 8/2016.

- (2019). Global Environmental Governance: Social-Ecological Perspectives. Palgrave Macmillan.

Bühl, W. (1983). Die `Postindustrielle Gesellschaft´: eine verfrühte Utopie. Kölner Zeitschrift für Soziologie und Sozialpsychologie 35, 4: 771-780.

Chambers, R. (1994). The Origins and Practice of Participatory Rural Appraisal. World Development, 22, 7: 953-969.

Collier, D., Hidalgo, F. D., & Maciucean, A. O. (2006) Essentially contested concepts: Debates and applications. Journal of Political Ideologies, 11 (3): 211-246.

Dauvergne, P. (2008). The Shadows of Consumption: Consequences for the Global Environment. Cambridge, MA: MIT Press.

Derissen, S., Quaas, M., & Baumgärtner, S. (2011): The relationship between resilience and sustainability of ecological-economic systems. Ecological Economics, 70:1121–1128.

Dover, N. (2018). The Ethics of Sustainability.Enclepedia of Life Support Systems (EOLSS): Area Studies Europe (Regional Sustainable Development Review). Paris: Eolss Publishers [http://www.eolss.net]

Dyer, G. (2008): Climate Wars. Random House Canada.

Fischer-Kowalski, M., & Rotmans, J. (2009) Conceptualizing, observing, and influencing social-ecological transitions. Ecology and Society 14 (2): 3. [online] URL: http://www.ecologyandsociety.org/vol14/iss2/art3/.

Folke, C. (2006). Resilience: The Emergence of a perspectiver for Social-Ecological Systems Analyses. Global Environmental Change, 16: 253-267.

Forst, R., & Günther, K. (ed.) (2011): Die Herausbildung normativer Ordnungen: Interdisziplinäre Perspektiven. Normative Orders Bd. 1, Frankfurt am Main: Campus

Funtowicz, S. O., & Ravetz, J. R. (1993): Science for the Post-Normal Age. Futures, 25:739–755.

Gross, M., & McGoey, L., eds. (2015). International Handbook of Ignorance Studies. Abington and New York: Routledge.

Held, D., & McGrew, A. 2007. Globalization Theories: Approaches and Controversies. Cambridge: Polity Press.

Hirsch-Hadorn, G., et al., eds. (2008). Handbook of Transdisciplinary Research. Springer.

Howitt, R. (2001). Rethinking Resource Management. Justice, Sustainability and Indigenous People. New York et al: Routledge.

Jackson, T. (2009). Prosperity Without Growth: Economics for a Finite Planet. London and Washington DC: Earthscan.

Krausmann, F., Fischer-Kowalski, M., Schandl, H., & Eisenmenger, N. (2009). The global socio-metabolic transition: past and present metabolic profiles and their future trajectories. Journal of Industrial Ecology 12, 5-6: 637-656 (doi: 10.1111/j.1530-9290.2008.00065.x).

Krausmann, F., Gingrich, S., Eisenmenger, N., Erb, K-H., Haberl, H., & Fischer-Kowalski, M. (2009a). Growth in global materials use, GDP and population during the 20th century. Ecological Economics 68 (10): 2696-2705 (doi: 10.1016/j.ecolecon.2009.05.007).

Kuhn, T. (1962). The Structure of Scientific Revolutions. Chicago: Chicago University Press.

Langeweg, F., Hilderink, H., & Maas, R. (2000). Urbanisation, Industrialisation and Sustainable Development. Bilthoven, NL: RIVM. Gobal Dynamics and Sustainable Development Programme. Globo Report Series no. 27.

Leach, M., J. Rockström, P. Raskin, I. Scoones, A. C. Stirling, A. Smith, J. Thompson, E. Millstone, A. Ely, E. Arond, C. Folke, P. Olsson (2012). Transforming innovation for sustainability. Ecology and Society 17 (2): 11 (http://dx.doi.org/10.5751/ES-04933-170211).

Linke, S., & Bruckmeier, K. (2015). Co-management in fisheries: Experiences and changing approaches in Europe. Ocean and Coastal Management 104: 170-181.

Lowe, A. (1976). The Path of Economic Growth. Cambridge et al: Cambridge University Press.

- (1983). Was Freiheit bedeuten kann. Wir brauchen eine neue Rationalität und Moralität. Die Zeit, 31 (29.07 1983): 28.

Luhmann, N. (1995). Die Soziologie des Wissens: Probleme ihrer theoretischen Konstruktion. In: N. Luhmann, Gesellschaftsstruktur und Semantik, Bd. 4, Frankfurt: Suhrkamp: 151-180.

Maddison, A. (2001). The World Economy: A Millenial Perspective. Paris: OECD, Development Centre Studies.

Markard, J., Raven, R., & Truffer, B. (2012) Sustainability transitions: An emerging field of research and its prospects. Research Policy, 41, 6: 955-967.

McNeill, J. R. (2000). Something New Under the Sun: An Environmental History of the 20th-Century World. New York: Norton.

Meadows, D., & Meadows, D. (1972). The Limits to Growth. Universe Books.

Mol, A., Sonnenfeld, D., & Spaargaren, G, eds. (2009). The Ecological Modernization Reader. London and New York: Routledge.

Nowotny, H, Scott, P., & Gibbons, M. (2001): Re-Thinking Science, Knowledge and the Public in an Age of Uncertainty. Polity Press, Cambridge.

Ostrom, E. (2009). A General Framework for Analyzing Social-Ecological Systems. Science, 325, 419 (DOI: 10.1126/science.1172133).

Polanyi, K. (1944). The Great Transformation. New York: Farrar & Rinehart.

Popper, K. R. (1963). Conjectures and Refutations. London: Routledge.

Raskin, P. D., Electris, C., & Rosen, R.A. (2010) The Century Ahead: Searching for Sustainability. Sustainability, 2: 2626-2651 (doi:10.3390/su2082626).

Rees, W. (2010) What´s blocking sustainability? Human nature, cognition, and denial. Sustainability: Science, Practice & Policy, 6, 2: 13-25.

Rice, J. (2007). Ecological Unequal Exchange: Consumption, Equity, and Unsustainable Structural Relationships within the Global Economy. International Journal of Comparative Sociology, 48,1: 43-72.

Rockström, J., Steffen, W., Noone, K., Persson, Å, Stuart Chapin III, F., Lambin, E. F., Lenton, T. M., Scheffer, M., Folke, C., Schellnhuber, H-J., Nykvist, B., de Wit, C.A., Hughes, T., van dernLeeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P. and Foley, J. (2009). A safe operating space for humanity. Nature, 461: 472-475.

Simon, J. (1981). The Ultimate Resource. Princeton: Princeton University Press.

Schäfer, L. (1993). Das Bacon-Projekt: von der Erkenntnis, Nutzung und Schonung der Natur. Frankfurt am Main: Suhrkamp.

Thompson-Klein, J. (1990). Interdisciplinarity: History, Theory and Practice. Detroit: Wayne State University Press.

UN (United Nations) (2015) Transforming Our World: The 2030 Agenda for Sustainable Development (sustainabledevelopment.un.org).

WBGU (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen) (2011). Welt im Wandel: Gesellschaftsvertrag für eine grosse Transformation. Berlin.

Welzer, H. (2008): Klimakriege: Wofür im 21. Jahrhundert getötet wird. Fischer, Frankfurt/Main

Westley, F. R., Tjornbo, O., Schultz, L., Olsson, P., Folke, C., Crona, B., & Bodin, Ö. (2013) A theory of transformative agency in linked social-ecological systems. Ecology and Society 18, 3: 27 (http://dx.doi.org/10.5751/ES-05072-180327).

Worldwatch Institute (2013) State of the World 2013: Is sustainability still possible? Washington DC et al: I

SESSION

ECONOMIC IMPACTS OF CHANGES AND POLICIES IN THE FIELDS
OF FINANCE, ACCOUNTING AND TAXATION

Fraud cases of the 21st century – a case study of Worldcom in the context of CFEBT approach

Zita Drábková, Pavel Šíma

Abstract: *The contribution aims to analyse aspects of the impact of manipulative accounting techniques on the selected case study of the worldwide known case Society of Worldcom, as subsequently identified by auditors and audit authorities after the fraud. The identified manipulations were subsequently subjected to an analysis of CFBET approach. The contribution has detected the risk of the impact of accounting errors and frauds representing one of the peaks CFEBT risk triangle accounting errors and frauds. It also calculated CFEBT M-score at three levels and identifies risks at accounting areas of provisions and overvalued own funds outside the operational area.*

The contribution presents the results of the CFEBT approach at three levels of the M-score and analyses significant discrepancies between the generation of earnings and an increase in cash flow during the observed periods. The CFEBT risk triangle was designed as a tool for detection, evaluation and management of the risk of accounting errors and frauds in circumstances of the Czech accounting standards and International Financial Reporting Standards (IFRS). The essential aim of the triangle is to reduce information asymmetry between authors and users of accounting records, or, in other words, to increase the quality of available information with respect to decision-making on the basis of available accounting information.

Key words: Worldcom · CFEBT risk triangle of accounting errors and frauds · Information asymmetry · Manipulation of financial statements

JEL Classification: G32 · G33 · M41

1 Introduction

It is essential that accounting records present a true and fair view of real facts. For most interest groups, accounting information continues to serve as the basic information source about companies. It is therefore a matter of logic that individual interest groups look for different values. A search for the most apposite expression of the evaluation of business corporations by improving the mathematical apparatus, decomposition of indicators and subsequently the use of the same on the basis of less than perfectly credible numbers may not always bring the accurate result as might be expected. In addition to a uniform set of indicators unsuitable for all business corporations, this issue concerns also a calculation procedure of financial health, bankruptcy, solvency models and other evaluation ratio indicators that are based on accounting data.

The way that accounting principles, techniques and appraisal and reporting methods are chosen may be beneficial under certain circumstances for the informative value of accounting and activities of business corporations. On the other hand, a different situation may arise when the true and fair view of accounting records is disrupted, either intentionally or due to an accounting fraud. This leads to an increase in the information asymmetry between authors and users of accounting outputs. In such a case, accounting records do not provide users with quality information to enable them to make a decision. It is rather difficult to foresee the critical consequences of such decisions, for example, decisions made by an investor purchasing an interest in the accounting unit concerned, or by a bank providing the accounting unit with a loan, or an owner who - in the legislative context - bears all risks, including criminal-law risks (Drábková, 2017).

First and foremost, accounting frauds include embezzlement of property, manipulation of accounting data and forgery of documents, corruption and computer criminality. Accounting frauds cannot be entirely suppressed and toughening of prison sentences may not always be the right answer, as attested by the American approach (Wells, 2017). The fight

Ing. Zita Drábková, Ph.D., MBA, University of South Bohemia, Faculty of Economics, Department of accounting and finance, Studentská 13, 370 05 České Budějovice, e-mail: drabkova@ef.jcu.cz.

Bc. Pavel Šíma, University of South Bohemia, Faculty of Economics, student of a master's degree, Studentská 13, 370 05 České Budějovice, e-mail:pavel.sima94@seznam.cz

against creative accounting surpassing the bounds of the true and fair view of accounting has gained in importance especially as a consequence of scandals of a number of renowned European and American companies (Enron, WorldCom, Tyco, Lehman Brothers) and scandals that came to light in the Czech Republic. Results of studies performed by leading audit companies have presented the importance of these problems at the level of consequences and costs of solutions for business corporations in the Czech Republic, Europe and other countries.

In addition to the above research carried out by leading audit companies (Pricewaterhouse Cooper; 2016), other research studies show that the management of risks and consequences of accounting and tax frauds has gained in significant importance. This fact is highlighted by the currently established level of criminal liability (Act No. 40/2009 Coll.) and its interconnection with the development of tax legislation. As regards the value added tax, the tax legislation presently works with the following concepts: unreliable payer concept, control reports and measures to eliminate refunds of excessive deductions, digitalization of receipts, a duty to prove in the area of transaction prices also for income tax, and last but not least, sanctions imposed on unjustifiable offshore companies. The years 2016 and 2017 were fruitful also in respect of the development of another follow-up restrictive legislative measures - primarily an amendment to Act No. 253/2008 Coll., on Selected Measures against Legitimisation of Proceeds of Crime and Financing of Terrorism (the Money Laundering Act), or an automatic exchange of information.

Companies now face a task of the implementation of information technologies into forensic activities, and improvement of internal information systems by introducing effective internal controls based on interconnections in financial and management accounting. A rise in effectiveness of internal control systems should proceed from complex relations between accounting and the management of companies in order to enable companies to reduce information asymmetry between authors and users of accounting records by establishing suitable "anti-fraud"[3] systems, which, based on data analyses, detect and measure adequately the risk of accounting frauds, whereupon companies may subsequently respond to any detected risks by introducing measures placed in the "right" direction.

Within accounting units or their surrounding environment, the avenue leading from creative accounting (permissible under the existing rules) to frauds is dotted with certain **risk factors**, agents, intermediaries or **warning signals**, present in transmitted data about the condition and organizational arrangement of the entity, the result of which may be frauds or accounts manipulation.

The following examples illustrate specific cases of risk situations, aggressive accounting procedures, which imply the perpetrator's intentional conduct, i.e. the third level of creative accounting presented, see EY (2016):

- Early reporting of revenues or postponement of costs, or ambiguous contracts.

- The pressure exerted on organizational components, including plans, an inadequate structure of management, management is controlled by one person only or a small group of persons unsupervised by a supervisory body.

- High fluctuation of advisors and top management employees and dominant top management, in a prodigal style.

- Employees, customers or suppliers are not checked, e.g. references are not taken into consideration.

- Bank accounts, subsidiaries or branch offices are established in tax haven countries without any justifiable reasons.

- The given company's financial stability or profitability is endangered by economic conditions, conditions prevailing in the industry concerned or by operating conditions in the accounting unit itself.

- Strong competition in the industry is accompanied by a considerable drop in demand.

- The business corporation is unable to generate cash flow from operating activities and, at the same time, report growing revenues.

- Operating loss, with an ensuing risk of bankruptcy or takeover of the given accounting unit by a competitive company.

- High sensitivity to technological changes or changes in interest rates.

- The excessively high pressure exerted on the company's management in connection with the performance of requirements or expectations of third parties in relation to profitability or future development.

---

[3] Based on the base word "fraud", "anti-fraud" systems are systems that detect (uncover) accounting frauds, evaluate them and therefore make it possible for accounting frauds to be penalized and prevented.

- The excessively high pressure exerted on operating personnel, who are required to fulfill financial objectives set by persons in charge of management, including motivation targets in the area of revenues or profits, too optimistic press releases or information in annual reports.

- It is necessary to gain further capital or debt financing for maintaining competitiveness, including the financing of large-scale research and development projects or investment costs.

- The personal financial standing of management or persons in charge of the management of the company is endangered by financial results of the company (interests in the company, remuneration, liability for the company's obligations).

- Assets, liabilities, revenues or costs proceed from estimates that are in turn based on subjective evaluation or uncertain information difficult to prove.

- Complex or unstable organizational structure of the given accounting unit - high fluctuation of top management members, counsels, persons in charge of management, personnel engaged in accounting, internal audit or information technology, hiring persons with inadequate qualifications.

- The standard of living of any of the company's employees does not correspond to his or her income.

- Excessive number of overtime work, tasks are not delegated to other employees.

- Management ignores internal controls.

- Performance of unusual or intricate transactions with a significant influence on revenues or too complex for a layman to understand.

- Unusually high profit or loss in comparison with other companies in the same industry.

Specific recommendations for the management to introduce internal auditing and set up different organizational internal controls for preventing frauds of financial statements were published in the form of results of a case study carried out in a construction company operating in the construction industry (Horvat & Lipicnik, 2016).

A proposal of methodology for distinguishing probability of truthfulness of accounting reports as a tool for differentiating between fraudulent and truthful reports was published by authors Purda and Skillicorn (Purda & Skillicorn, 2015). These considerations are followed by finding measures that take different forms. It seems advisable to look for the simplest methods of identification of signs of misstatements and possible fraud in accounting, see also (Stárová, 2014).

According to most opinions or knowledge gained in practice, the axiom that creative accounting solutions are always bad does not hold the absolute truth. In these cases, the given accounting unit's intent and scope of application of creative accounting methods is rather an adequate response to the complex and diverse nature of business transactions (Kouřilová, Drábková & Sedláček, 2017).

2 Methods

The purpose of the contribution is to evaluate the risk of manipulation of the financial statements on the example fraud case of Worldcom. Then an analysis of the rigged values will be performed through CFEBT M-scores i.e. peak CFEBT triangle risk of the effects of accounting errors and fraud.

The CFEBT score will include the effects of the rigged data in the financial statements for the period 1995–2002, i.e. For the period when the company with the data manipulated until the year when the Worldcom entered into liquidation.

The analysis employed the CFEBT model, designed for the individual levels of the analysis delving into detailed relations between financial statements:

The first M-score level of the CFEBT model is defined as follows:

$$CFEBT = \frac{\sum_{t=1}^{n} CF_t - \sum_{t=1}^{n} EBT_t}{\sum_{t=1}^{n} EBT_t} * 100 \qquad (1)$$

Where:

CF: total increase or decrease in cash before tax during the analysed period t

EBT: earnings before taxes generated for the analysed period

If $CFEBT \geq materiality$, detailed tests of relations of impacts in the second and third levels follow. We consider the materiality between 5 and 10% (Drábková, 2015).

The second M-score level of the CFEBT model (modified CFEBT score) complies with the established hypothesis as to the relation between the generation of cash flow and earnings. Monetary means and monetary equivalents for the analysed accounting period are modified by changes in assets and liabilities, which represent a possible inflow and outflow of monetary means. The sum of EBT gained in the analysed period is modified by expenses reported as non-monetary expenses, (Drábková, 2017):

$$CFEBTm = \frac{\sum_{t=1}^{n} CFm_t - \sum_{t=1}^{n} EBTm_t}{\sum_{t=1}^{n} EBTm_t} * 100 \qquad (2)$$

Where:

CFm: increase in cash flow before taxes in the analysed period, modified by reported future cash-in and outflows

EBTm: earnings before taxes gained for the analysed period modified by non-monetary expenses

The third M-score level of the CFEBT model expresses a ratio of operative cash flow generated in the analysed period and modified earnings in the analysed accounting period. Where expressed in percentage, this value presents a ratio of generated cash flow from operating activities to generate earnings which include only those expenses and revenues that are directly transformed in cash flow in the current or future accounting periods, (Drábková, 2017):

$$CFEBTom = \frac{\sum_{t=1}^{n} CFom_t - \sum_{t=1}^{n} EBTm_t}{\sum_{t=1}^{n} EBTm_t} * 100 \qquad (3)$$

Where:

CFom: increase in operative cash flow before taxes in the analysed period

EBTm: earnings before taxes gained for the analysed period modified by non-monetary expenses

3 Research results

A representative of Fraud Cases of the 21st century is one US company named Worldcom. Worldcom was once the second-largest long-distance company in the United States and the largest Internet service provider. Between 1995 and 2000, Worldcom acquired more than 60 other telecom companies, valued at close to $70 billion. With the purchase of MCI, Worldcom moved into the Internet and data communications business. Worldcom owned almost one-third of all data cables in the United States and had a presence in more than 65 countries.

The scandal started with Worldcom CEO Bernie Ebbers´s business strategy of achieving growth through acquisitions. Ebbers used Worldcom stock to pay for these acquisitions. After acquiring MCI, Ebbers proposed a merger with Sprint. When Ebbers was forced to abandon the proposed Sprint merger in 2000, he needed to continue showing an increase in revenue, despite the slow-down in acquisitions. Even though Ebbers was determined to show positive revenues, there was a decline in the telecommunications market.

Instead of taking the time necessary to adjust to Worldcom acquisitions and mergers, Ebbers manipulated the books to satisfy Wall Street´s expectations. To show an increase in reported income, Bernie Ebbers had his senior staff fraudulently release almost $3 billion in provisions to offset the company´s operating expenses. Provisions are profits that have been set aside for a particular purpose, such as to pay a legal settlement, pay off debt, or pay for specific future repair and maintenance. They should not be used to reduce the reported amount of ongoing operating costs.

To further boost earnings, Ebbers then had his senior staff members classify operating expenses as long-term capital investments. But, operating expenses are recorded in the accounting period in which they were incurred. They should not be treated as long-term investments or assets. Worldcom was stuck in an agreement to lease the cables for two to five years. The company had to pay for these cable leases even though it was not generating any income from them. The cost associated with the leases caused Worldcom´s expenses to increase as revenue decreased. Moving these lease expenses fraudulently from the income statement and onto the balance sheet as assets caused an overstatement in assets and income.

Additionally, a journal entry for 500 million in computer expenses was recorded as a capital. These adjustments to the financial statements turned Worldcom´s losses into profits, thus making its assets appear more valuable than really were. Another major factor in the Worldcom accounting fraud scheme was Ebbers´s personal loans. Ebbers had generous stock options and, when the stock price rose, he used his stock as collateral for personal loans. It was for almost 360 million for personal loans, which was one of the largest ever granted to a CEO of a publicly traded company.

Worldcom´s company culture was a major reason the accounting fraud continued for so long. Ebbers encouraged a culture in which loyalty to him - rather than loyalty to the company - was rewarded. This created an environment in which employees were afraid to speak up for fear of retaliation.

The scheme was detected when a capital costs audit revealed suspicious journal entries. As a part of the review, Worldcom´s internal audit department found a series of accounting manipulation intended to bury almost 4 billion dollars in misallocated expenses and false accounting entries. In 2002, Worldcom publicly announced that that it had recognized 3 billion profit instead of reporting a half billion dollars loss. In July 2002, Worldcom filed for bankruptcy. With close to 107 billion in assets, the company´s filing was the largest in U.S. history.

3.1 The Impact and Fallout

The Worldcom scandal led to a class-action lawsuit by individuals and entities that had purchased Worldcom securities between April 1999 and June 2002 and experienced losses due to fraud. Additionally, Arthur Andersen LLP, the accounting firm that acted ad Worldcom's auditors during the scandal, was also cited in the class action lawsuit. Arthur Andersen was later replaced by an independent accounting firm, KPMG. After Worldcom emerged from bankruptcy in 2003, it changed its name to MCI.

The Worldcom accounting scandal was a situation in which corporate governance failed and the board of directors was caught unaware. The board also approved multimillion-dollar personal loans to Ebbers and failed to disclose them. Many of Worldcom´s strategic decisions to grow the company relied on a continuous supply of acquisitions, but the company lacked strategic planning to merge its operations once companies were acquired.

External auditors could have uncovered the fraud before 2002 had they done sufficient testing of account balances. Additionally, the external auditors should have informed the audit committee that they did not have all the financial information needed to make a reasonable assessment of the control environment. At the time of the Worldcom scandal, there was no employee hotline or ethics officer. A hotline would have made it easy for the internal auditors or anyone else who had suspicions about the treatment of accounting entries to alert the proper authorities to investigate the potentially fraudulent activity.

3.2 CFEBT Score – risk of impact of accounting errors and fraud

From Detected Values Handling in financial statements. The company Worldcom in the period 1999–2002 was calculated in three levels of M-score with the other values of the financial statements being taken into account at zero values. The aim was to identify the possibilities of detecting manipulative techniques used by Worldcom in the reference period on the basis of the CFEBT risk triangle approach, namely the peak risk of the impact of accounting errors and fraud.

Table 1 CFEBT Score – Handling of financial statements of Worldcom in the period 1995-2002

Tax entity	Basic	Modified	M-Operating
CFEBT Score	-110	-100	0
CF change in mil. $	-0,36	0,5	6 500
EBT sum in mil. $	3,5	6 500	6 500

Source: Own processing

CFEBT M-score of the first level was found in table and presents significantly exceeding the value of materiality. It was detected of 110% value. Based on detailed analysis handling of financial statements, which the company reported in the period 1995–2002 a discrepancy was detected between the production of the profit and cash flow in the value of 100% of the second modified CFEBT M-score. Calculation of the third level of CFEBT M-score detected risk outside the operational area of cash flow formation. The resulting discrepancy between the operating CF and EBT were detected at a rate of 0%. This means that the effects of the manipulative techniques that the company has exploited fully into the financial and investment area.

Table 2 Modified CFEBT Score- Selected significant accounting items in the period 1995-2002

Item name (modifier, informational)	N (mil. $)	N/EBT (%)
* Receivables from partners	0,36	10
** Provisions	-3 000	-85 714
***Equity	4 0000	114 286

Source: Own processing

* PTEs for CFm modification
* * PTEs for modification of EBTm
*** informative PTEs

Table 2 presents significant values that were used for the modification of CF and EBT in the calculation of modified score of the second and third CFEBT M-score. The modification items confirm the detected manipulations, which were presented by the forensic audit of Worldcom. The effects of the most important manipulations are artificially-designed dissolution of accounting provisions and overappraisal of own capital over economic substance Subject of the activity selected accounting units.

4 Conclusions

The contribution presented the causes and consequences of the worldwide known accounting scandálu Company Worldcom in the years 1995–2002. In addition, an analysis of the risk impact of manipulated data in the risk assessment of accounting fraud was carried out on the example of the worldwide known cases of Worldcom. The analysis was carried out at the level of one of the highlights of the CFEBT risk triangle, from the perspective of the user's financial statements, which, based on reportovaných data, makes its decisions.

CFEBT Risk triangle detected a significant risk of manipulation at the level of discrepancy on the basis of economic substance between production of the result and cash flow in reported periods 1995–2002. Calculation of modified score 2. and 3. level of CFEBT evaluated the manipulation in the field of investment and finance.

From the point of view of the company's management from cases some recommendations to prevent occurrences like those at Worldcom. In particular, hiring hones people and train them on fraud awareness create and positive work environment. Additionally, ensure that auditors apply skepticism when performing audits and observe pressures and opportunities that can lead to fraud. Last not at least implement a company helpline so that employees can report concerns.

Acknowledgement

References

Dawson, S. (2015). *Internal control/anti-fraud program design for the small business: a guide for companies not subject to the Sarbanes-Oxley Act.* UK: Wiley.

Drábková, Z. (2015). Analysis of possibilities of detecting the manipulation of financial statements in terms of the IFRS and Czech accounting standards. *Acta universitatis agriculturae et silviculturae Mendelianae Brunensis.* 2015, Volume 63, č. 6, s. 200.

Drábková, Z. (2017). *Fraud Risk Management – an Effective Anti-Fraud system and a Decision-Making Tool for Users of Financial Statements.* Brno: Tribun EU.

EY (2016). *Global Fraud Survey 2016.* Retrieved May 1, 2018, from: http://www.ey.com/gl/en/services/assurance/fraud-investigation---dispute-services/ey-global-fraud-survey-2016.

Horvat, T., & Lipicnik, M. (2016). Internal Audits of Frauds in Accounting Statements of a Construction Company. *Strategic Management*, 21(4), 29-36.

PWC (2016). *Celosvětový průzkum hospodářské kriminality 2016.* Retrieved May 1, 2018, from: http://www.pwc.com/cz/cs/hospodarska-kriminalita/assets/pdf/global-economic-crime-survey-2016-cz.pdf

Kouřilová, J., Drábková, Z., & Sedláček, J. (2017). *Q-DMFCA and CFEBT methods as possibilities of incorrectness identification and fraud in accounting of a firm.* ČB, Česko: ČB, JU EF.

Purda, L., & Skillicorn, D. (2015). Accounting Variables, Deception, and a Bag of Words: Assessing the Tools of Fraud Detection. *Contemporary Accounting Research*, 32(3), 1193-1223. doi: 10.1111/1911-3846.12089.

Stárová, M. at al. (2014). *Asymmetries in Accounting information*, Česko, Praha: PowerPrint, 174 p.

Wells, J. T./2017). *Fraud Casebook. Lessons from the Bad Side of Business.* New Jersey: John Wiley&Sons.

Tax Mix Development in the Member States of the European Union

Jarmila Rybová, Hana Hlaváčková

Abstract: *The aim of the article is to identify changes in the share of revenues of taxes in total tax revenue in the European Union countries, and to identify groups of similar states in the years 1995 and 2016. The analysis of the tax mix of the member states uses cluster analysis and analysis of the variation coefficient. The cluster analysis confirms differences between Nordic, western and new members. The coefficient of variation shows a higher similarity of indirect taxes than in the case of direct taxes. The tax mixes of the member states do not significantly converge despite the efforts of the European Union to harmonize member states' tax systems. However, there is a difference among the first 15 member states of the European Union and a group of other states that joined the European Union later. The new member states prefer indirect taxes, which make up a large share of tax revenue. These tax mixes in the European Union did not change significantly between the years 1995 and 2016.*

Key words: Tax mix · European Union · Cluster analysis · Variation coefficient · Convergence

JEL Classification: H20

1 Introduction

We can identify changes in the field of taxation with several indicators. (Rybová & Beránková, 2017) for example argue that the composite tax quota and the simple tax quota show a modest trend of tax convergence in the European Union. In other words, European countries are slightly closer to the share of absolute tax revenues in GDP. This is vital information in terms of total tax burden. The tax mix expresses the share of income from individual taxes in the total tax revenue of the state. The study confirms that the historical development of the state and its tradition greatly influence the composition of the tax mix. This is true both within and outside the European Union. Harmonization of taxes can also significantly affect tax mixes. This is particularly true in the case of indirect taxes.

2 Methods

The article examines differences among the member states in the tax mixes in the period 1995-2016. The subject of the survey is convergence or divergence among 28 member states in cases of selected taxes. Croatia is not included in the analysis in 1995. The necessary data are missing from this country. Similarities among the states are investigated by cluster analysis and convergence in the period 1995-2016 are detected by the sigma convergence method.

The breakdown of taxes corresponds to the tax groups according to the ESA 2010. Data for all member states are available for the first time at Eurostat Database in the year 1995. Eurostat is the statistical office of the European Union, which provides statistical data at a European level. Taxes are divided into the tax mix according to the European System of National and Regional Accounts (ESA 2010). These selected taxes are expressed as a percentage of total tax revenue (Eurostat, 2018). The tax mix consists of the following five groups of taxes, which are identified by a letter and a number according to the methodology of the European Statistical Office as follows:

- Taxes on products correspond to D21 in the ESA 2010.

- Other taxes on production and imports correspond to D29 in the ESA 2010.

- Current taxes on income correspond to D51 in the ESA 2010.

- Other current taxes + Capital taxes belong to the groups D59 and D91 in the ESA 2010.

Ing. Jarmila Rybová, Ph. D., University of South Bohemia in České Budějovíce, Faculty of Economics, Department of Accounting and Finance, Studentská 13, 370 05 České Budějovice e-mail: jrybova@ef.jcu.cz

Ing. Hana Hlaváčková, University of South Bohemia in České Budějovíce, Faculty of Economics, Department of Accounting and Finance, Studentská 13, 370 05 České Budějovice, e-mail: hlavacko@ef.jcu.cz

- Net social contributions correspond to D61 in the ESA 2010.

2.1 Cluster analysis

The tax mix data for the years 1995 and 2016 are subjected to a cluster analysis. The objects are clustered hierarchically using the Ward method. The principle of Ward's method is to minimize heterogeneity of clusters according to the criterion of the minimum increase of intragroup sum of squares of object deviations from the center of gravity of clusters. The cluster creates objects whose value of increment of the sum of squares of deviations has a minimum value. If the cluster is made up of a number of objects k that are characterized by n characters, then the data set creates array kxn with elements x_{ij} (the value of the j-character for the k-object).

Intra-cluster Variability (ICV) is given by:

$$\text{ICV} = \sum_{j=1}^{nk} \sum_{i=1}^{} (x_{ij} - \bar{x}_j)^2, \text{ where for } \bar{x}_j : \bar{x}_j = 1/k \sum_{i=1}^{k} x_{ij} \tag{1}$$

This procedure tends to combine clusters with a small number of objects. The disadvantage of Ward's method is the tendency to form equally small clumps.

The merging rule for objects is the Euclid distance. The proportions of individual taxes in the tax mix are monitored statistical features. Member states are clustering objects. Tracking signs are tax rates in the tax mix. All 27 countries are included in the analysis, regardless of their membership in the year 1995.

2.2 Sigma convergence

Convergence of the member states is examined by the sigma convergence method, which is based on changes in the values of the variation coefficients. The variability of the tax mix is examined using a variation coefficient. Variability is the fluctuation of the values of the studied quantity. It states how many percent the average values deviate from the arithmetic mean (Souček, 2006).

Variation coefficients are established for each year in the period 1995-2016. Changes in values serve to identify countries' convergence or divergence. The decrease of the coefficient of variation over time means the homogeneity of the countries and vice versa.

The formula for calculating the coefficient of variation is as follows (Souček, 2006):

$$V_x = \frac{s_x}{\bar{x}} \tag{2}$$

Where:

V_x	Coefficient of variation
s_x	Standard deviation of the values
$\bar{x}$	Arithmetic mean of the values

The data are obtained from the Eurostat Statistical Office of the European Union. Data are in percent. These are the shares of tax revenue on total tax revenue (Eurostat, 2018). Both of these methods were used in a study on excise taxes (Rybová, 2017).

3 Research results

The cluster analysis resulted in clusters of similar states in the years 1995 and 2016. The Nordic states are the most different from other EU members in both cluster processes. Differences are also found between the countries of the original EU-15 and the new members.

3.1 Clustering in the year 1995

Six clusters are formed at a distance of 30 points between the joints. The first two clusters (Cluster 1/1995 and Cluster 2/1995) are closest to each other. On the other hand, clusters 5/1995 and 6/1995 are most distant to other countries.

These groups of similar states are formed by clustering:

Cluster 1/1995: Belgium, Italy, Luxembourg, Romania, Finland
Cluster 2/1995: Czech Republic, Slovakia, Spain, Austria, Germany, Netherlands, France
Cluster 3/1995: Bulgaria, Portugal, Estonia, Poland, Cyprus, Lithuania, Malta
Cluster 4/1995: Greece, Hungary, Latvia, Slovenia
Cluster 5/1995: Denmark
Cluster 6/1995: Ireland, United Kingdom, Sweden

Figure 1 Clustering in the year 1995
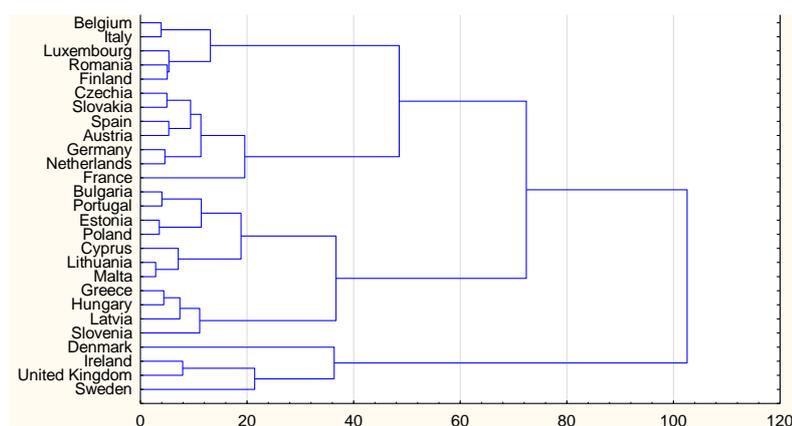
Source: Own processing in the software Statistica 12, Eurostat, 2018

The northern member states (cluster 5/1995 and 6/1995) are the top income tax revenue. Social security earnings are the lowest among all countries. The states of Western Europe with Finland and Romania in cluster 1/1995 prefer higher revenue from taxes on income and social security. Taxation of production is the lowest of all clusters. The countries of Western and Central Europe have the highest income from social security, income, and capital taxes.

Table 1 Arithmetic means of individual clusters in the year 1995

	Taxes on production (1)	Other taxes on production (2)	Indirect taxes (1) + (2)	Taxes on income (3)	Net social contributions (4)	Other current taxes + Capital taxes (5)	Direct taxes and social security (3) + (4) + (5)
Cluster 1/1995	27.8	2.6	30.4	35.8	32.1	1.7	69.6
Cluster 2/1995	28.1	4.2	32.3	25.2	**40.9**	2.0	68.1
Cluster 3/1995	38.7	2.3	41.0	28.5	29.4	1.1	59.0
Cluster 4/1995	**39.2**	2.5	41.7	19.7	37.6	1.2	58.5
Cluster 5/1995	31.1	3.2	34.3	**61.3**	3.6	1.4	66.3
Cluster 6/1995	32.7	**9.5**	42.2	37.9	17.0	**2.8**	57.7

Source: Own processing

The highest average tax rates of clusters are shown in bold. The share of direct and indirect taxes is the most balanced in the northern states of the European Union in the cluster 6/1995. Denmark and western countries of the European Union prefer direct taxes the most.

3.2 Clustering in the year 2016

The northern member states had a specific tax system in the year 2016 too. The basic feature is high taxation and high social benefits often provided by the state. The composition of the tax mix did not change significantly in the years under review.

These groups of similar states are formed by clustering:

Cluster 1/2016: Belgium, Italy, Luxembourg, Germany, Netherlands, Spain, Austria, France
Cluster 2/2016: Bulgaria, Croatia, Estonia, Romania, Hungary, Greece, Portugal, Cyprus, Latvia
Cluster 3/2016: Czech Republic, Slovakia, Lithuania, Slovenia, Poland
Cluster 4/2016: Denmark, Sweden
Cluster 5/2016: Ireland, Malta, Finland, United Kingdom

Figure 2 Clustering in the year 2016
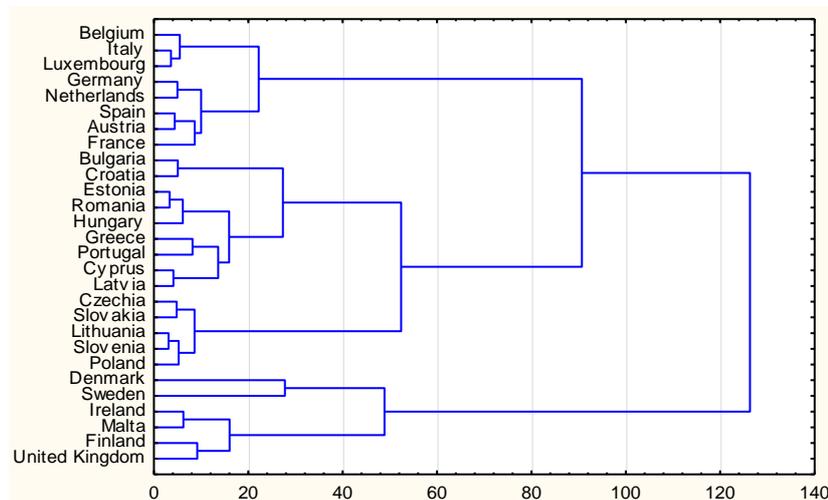
Source: Own processing in the software Statistica 12, Eurostat, 2018

The highest average tax rates of clusters are shown in bold. The share of direct and indirect taxes is the most balanced in the southern and eastern member states. Direct taxation is most preferred in the western part of the European Union. Some of the new member states increased indirect tax rates in the tax mix in the period 1995 - 2016. These states joined the EU in the year 2004 or later. The differences between the states of the original EU-15 grouping and the new member states were greater in the year 2016 than in the year 1995.

Table 2 Arithmetic means of individual clusters in the year 2016

	Taxes on production (1)	Other taxes on produc- tion (2)	Indirect taxes (1) + (2)	Taxes on income (3)	Net social contribu- tions (4)	Other cur- rent taxes + Capital taxes (5)	Direct taxes and social se- curity (3) + (4) + (5)
Cluster 1/2016	26.1	5.7	31.8	30.0	35.9	2.7	68.6
Cluster 2/2016	**41.5**	4.5	46.0	22.0	30.6	1.4	54.0
Cluster 3/2016	34.5	3.1	37.6	19.9	**41.6**	1.0	62.5
Cluster 4/2016	28.6	**14.2**	42.8	**51.1**	4.7	1.9	57.7
Cluster 5/2016	33.6	2.8	36.4	37.8	22.2	**3.6**	63.6

Source: Own processing

3.3 Sigma convergence in the period 1995-2016

There are only minor changes in the member states' tax mixes. This factor can be assessed positively from the standpoint of stability of the member states and the European Union. The reasons are similar to the tax quota. The fiscal role of taxes and stability of the political and economic environment are crucial in each country.

It should be noted that data in the year 2017 are not complete. The similarity of states is higher for indirect taxes in the period 1995-2016. This is mainly due to the harmonization of indirect taxes. Differences are increased with capital taxes.

Beranová (2018) describes the convergence of the original and new member states of the European Union in the period 2000-2015 in more detail. She concludes that for the top 15 member states there is only little convergence for most taxes. The new member states do not mutually adjust by their tax mixes.

Figure 3 Variation coefficients of the shares of individual taxes in the tax mix
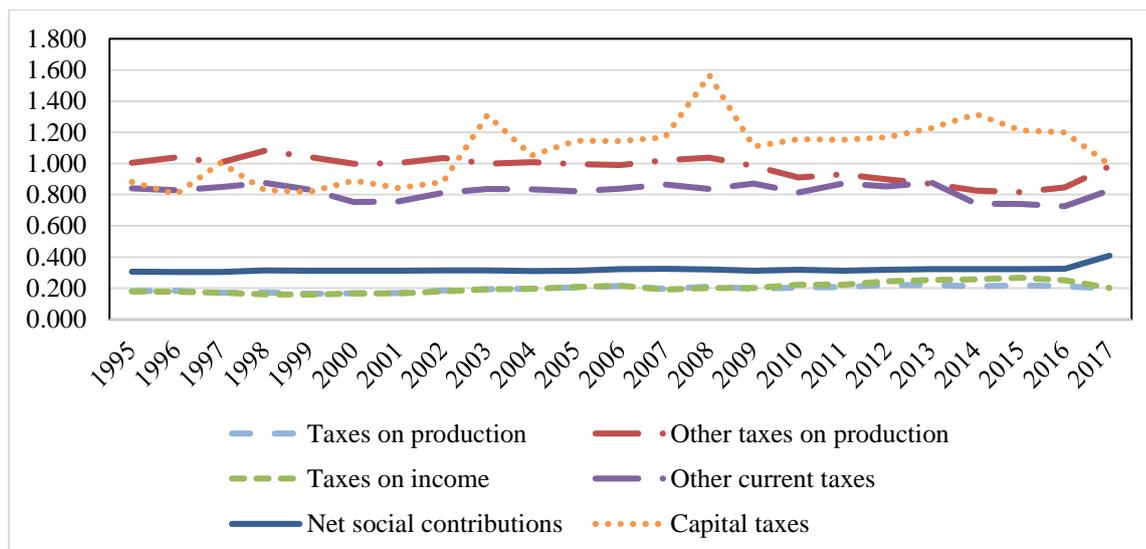
4 Conclusions

Generally speaking, the preferences of selected tax revenues do not change much in individual countries. The tradition, the historical and political customs of a given society are decisive factors in this case. Income from direct taxes is still very significant. Most member states received high social security income. Differences among countries are rather steady. Harmonization steps have supported a decline in the differences among the member states in indirect taxes.

The share of indirect taxes has increased. This is especially true for the new member states. They had to raise rates more than the original EU-15 members. State revenues diverged only on capital taxes. Nevertheless, member state tax mixes can be considered stable. And that's positive.

References

Beranová, M. (2018). *Changes in the Tax Mix in the Countries of the European Union* (Original: Změny daňového mixu ve státech Evropské unie). Thesis. Faculty of Economics. České Budějovice: University of South Bohemia in České Budějovice

Eurostat database (2018). (on line). Available: http://appsso.eurostat.ec.europa.eu/nui/show.do

Rybová, J. (2017). *Changes in Excise Duties in Connection with Harmonization Processes in the Member States of the European Union* (Original: Změny spotřebních daní v souvislosti s harmonizačními procesy v členských státech Evropské unie). Dissertation. Prague: University of Economics in Prague.

Rybová, J., & Beránková, M. (November 2017). Partial versus composite tax quota in the Member States of the European union. *Economic impacts of changes and policies in finance, accounting and taxation, 4 vol*, pages 73-78.

Souček, E. (2006). *Statistics for economists for Economists* (Original: Statistika pro ekonomy). Prague: University of Economics and Management, [on line]. Available: https://books.google.cz/books?id=wP3USSFP8sEC&pg=PA22&dq=varia%C4%8Dn%C3%AD+koeficient+vzorec&hl=cs&sa=X&ved=0ahUKEwiE5t_k76DaAhWHYVAKHcfoA58Q6AEIL-DAB#v=onepage&q=varia%C4%8Dn%C3%AD%20koeficient%20vzorec&f=false

The risk and the cost of quality: The quality management case study

Jaroslava Pražáková, Dagmar Bednářová

Abstract: *The article deals with the issue of quality risks and costs in the area of quality management. The presented case study demonstrates the practical application of the risk register and the use of the PAF model to quantify the cost of quality. At present, enterprises are faced with the recertification necessary for the transition from ČSN ISO 9001: 2008 to ISO 9001: 2015 as ČSN ISO 9001: 2016. Audits that are part of the preparatory phase of recertification identify problems and set recommendations to address these problems. The most frequently mentioned recommendations include the need to set up the risk register and the associated risk assessment. The implementation of quality management also results in need for monitoring and managing the cost of quality.*

Key words: Quality management · Cost of quality · PAF model · Case study

JEL Classification: G32 · M11 · L60

1 Introduction

The main aim of quality management is satisfying customer with a product that meets his expectation. For manufacturers or service providers, it is also important that quality management results in cost savings. Costs of quality are considerably lower than the cost associated with mitigation of poor production quality (Bednářová, 2013). Costs of quality must be taken into account in state-to-the-art quality management systems. Practically, it is the only financial instrument we can use to plan, prove and improve quality. All engineering and organizational measures related to quality management system can be easily justified to all employees groups (Nenadál, Noskievičová, Petříková & Plura, 2008). Vyleťal & kol. (2008) and Spejchalová (2012) claim that the introduction of quality management system is resulting in cost reduction. That means securing business goals at minimal cost and leads to optimization of business activities.

Producer's costs of quality play a significant role (Nenadál, Noskievičová, Petříková & Plura, 2008). Several models for managing these costs are currently available such as PAF model (Prevention, Appraisal, Failure costs), new PAF model (enhanced variant incorporating environmental costs), COPQ model, model of process costs (Nenadál, 2016), ABC model. The PAF model represents a classic method of recording and evaluating the cost of quality, based on the division of cost items in the enterprise into four expense groups: internal failure costs, external failure costs, evaluation costs and prevention costs (Shubhangan & Darshak, 2016). While the first two expense groups are net losses from an economic point of view directly affecting economic performance of organizations, the expense associated with evaluation and prevention are considered as operating costs in nature. Investment should be focused mainly on preventive activities. This allows minimizing internal and external defects, as well as optimizing the overall structure of expenses related to quality.

In order to mitigate quality costs, it is important to monitor and analyse risks. When planning a quality management system, the organization must analyse the risks, i.e. assess the external and internal environmental factors, the requirements and expectations of stakeholders and identify the risks and opportunities to be treated. Reasons for performing risk analysis are as:

- the quality management system has achieved the expected results;
- avoiding unwanted consequences, or at least minimizing their occurrence;
- making improvements (Makýš & Šluch, 2015).

Supplier failure is considered to be a risk. This can be avoided through proper communication with vendors. Communication takes place on the one hand before starting a partnership project with suppliers. This is primarily in the direction

Ing. Jaroslava Pražáková, Ph.D., University of South Bohemia, Faculty of economics, Department of accounting and finances, Studentská 13, České Budějovice, e-mail: smoloj@ef.jcu.cz

Ing. Dagmar Bednářová, CSc., University of South Bohemia, Faculty of economics, Department of management, Studentská 13, České Budějovice, e-mail: bednar@ef.jcu.cz

of senior management. Furthermore, it is communication after the start of cooperation, which takes place between managers and experts of cooperating organizations (Bednářová, 2013).

Another problem or risk that damages the organization is non-conforming products. Managing non-conforming products is an important part of the functional quality assurance system in each organization. The process of managing mismatched products consists of the following steps:

- finding a non-compliant product;

- identifying non-conforming products by the identifying mark and their separation;

- a record of disagreement;

- reconsideration (assessment) of disagreement;

- settlement of disagreement;

- cost and loss calculations;

- solution of damages;

- analyses of disagreements;

- implementation of corrective measures and checking their effectiveness (Nenadál, Noskievičová, Petříková, & Plura, 2008).

No matter which costs of quality model is used, the main idea behind this analysis is the linking of improvement activities with associated costs and customer expectations, thus allowing targeted action for reducing quality costs and increasing quality improvement benefits (Psomas, et al., 2018). Therefore, a realistic estimation of costs of quality that is the appropriate trade-off between the levels of conformance and non-conformance costs, should be considered an essential element of any quality initiative and a crucial issue for any manager (Schiffauerova, & Thomson, 2006). A number of small and medium sized organizations are now still seeking both theoretical advice and practical evidence about quality related costs and the implementation of quality costing systems.

2 Methods

The presented case study deals with ČSN ISO 9001: 2008 to ISO 9001: 2015 recertification. It illustrates some actual problems of this long term process and defines one of the possible solutions. Many small and medium sized engineering companies are forced to this process by their customers and trade partners. Therefore the case study was made for medium-size engineering company (Company B) that is residing in Southern Bohemia. The company has established and certified quality system complying with ČSN EN ISO 9001: 2009. Currently, the final phase of recertification is completed in the company. The real situation that is demonstrated in case study is from the very beginning of the recertification process from the preliminary audit. The mentioned audit brought inter alia these recommendations: it is necessary to create list of risks, to update the list of interested parties and organization structure and improve tracking and reporting of quality costs.

Paper presents the brief example of the list of risks. The main risks associated with the costs of quality as well as the influenced process, risk evaluation and mitigations are mentioned (see Table 1).

Due to the nature of the company and its previous experience, the PAF model was recommended as a useful method for recording and evaluating the cost of the quality. This paper introduces the practical application of the model and shows the actual costs of quality management in the enterprise. The total costs of quality in years 2016 and 2017 are shown in Table 2 – PAF model in Company B.

3 Research results

Company B has been operating on the market for more than 25 years. At a very beginning engineering company engaged in custom machining mostly on automatic lathes. After 2 years of its existence, it had expanded the firm's mechanical assembly work to mass production. The company B employs almost 130 persons in two divisions (machining division and assembly division) nowadays. The main activity of Company B is custom manufacturing of rotating parts in larger batches by turning on turret and CNC long-turning machines. As a manufacturer of precision engineering, company B cooperates with more than 180 customers from various branches (e.g. health industry, automotive, precise engineering). In cooperation with the customers company prefers long-term partnerships in which they have achieved the role of a strategic supplier of machined rotating components.

The application of quality management measures brings not only the costs of quality calculation but also the profit of quality. This concept is connected with TQM (Total Quality Management) very closely. It is possible to find parts of kaizen and innovations methods in one place. The profit associated with quality is possible to determine by many specific measures. The considered company uses inter alia these measures: rate of complaint solution, external customer satisfaction level, the level of external customer loyalty, internal productivity measures (improvement rate, noncompliant product rate). The increasing level of external customer satisfaction brings tight relationship with customer and together with the increasing level of external customer loyalty decrease the risk of customer loosing. The quality management goal the measure of individual customer satisfaction is 1.2 or better (Jandova, 2018). Nowadays the company use the 5 point scale when 1 is the best and 5 the worst. The managers make visits to key customers to review customer satisfaction and to find out the real situation once in every six month at least.

The considered company periodically audits all their first tier suppliers (the quality goal for this measure has minimum level 92 % of all audited suppliers evaluated as an A – the best trustworthy).

The internal productivity measures (non-compliant product rate etc.) are connected with specific external needs of customers expressed by PPM measure. According to individual needs of customers the PPM is stated as follows: health care – PPM 0, automotive industry - PPM 5, general engineering - PPM 10, etc. A lower product defect level can be obtained by increasing the prevention and appraisal costs that subsequently lowers the external failure costs.

3.1 The list of risks

The created list of risks contains almost 100 reported risks in all processes of the company, given the extent and the focus of the paper, Table 1 presents only some selected risks relate directly to costs of quality. The brief list of risks presents five most important risks from three main company processes. The evaluation of the risks is made with respect to the frequency of the risk occurrence and its importance. The importance of risk is evaluated on the basis of company's management and external expert opinions. The risks are grouped into three main sections: high risks, low risks and medium risks. The list of risks is life document where the number of risks and its evaluation is changing over time. The facts presented in Table 1 correspond to the real conditions from the end of the year 2017.

Table 1 The list of risks – selected parts

Process	Risk identification	Risk evaluation			Mitigation
		Importance	Frequency	Risk	
Purchase	Supplier failure	5	3	High	Select more than one supplier for every item
	Minimum stock default	3	1	Low	Use ERP system for stock system management
	Complaint not solved on time	5	1	Medium	Qualified employee determining the terms for complaint process; periodical employers training
Project management	Project milestone not on time	5	3	High	Evaluation of the project according to the control plan
CRM *	Loosing customer	5	1	Medium	On time delivery in accurate quality. Customer satisfaction evaluation

*Customer relationship management

Source: own processing

The Supplier failure and Project milestone not on time reach the same marks and both are considered as a high risky. This may seem unjustified, because loosing customer is often regard as the most serious risk, especially in some literature (i.e. Buttle & Burton, 2002). The significance of this risk also reaches the higher mark, but its frequency is far lower, so the risk is classified as a medium. Regardless, the Loosing customer is one of the crucial risks for the Company C.

One problem can cause several risks at one point or as a sequence of events. One such event occurred in the middle of the year 2016, when the serious Supplier failure caused the Complaint made by external customer that was not solved on time. Total failure costs exceeded 500 000 CZK.

The Minimum stock default is labelled as a low risk that is caused especially by its low frequency. In spite of this evaluation, minimum stock default non-compliance can lead to problems at assembly lines and it can ends by the general stop of the production. Company B has not yet been forced to quantify the exact cost of stopping production because such

a situation has never occurred. If the production has to be interrupted for more than few hours, estimated total cost will exceed the amount mentioned in previous case more than 10 times (depending on the downtime duration).

3.2 The costs of Quality

Most cost of quality models are based on P-A-F classification. This model classified cost of quality into three categories: prevention costs, appraisal costs and failure costs. Failure costs consist of two subcategories: internal failure costs and external failure costs. Prevention costs include activities specifically designed to prevent poor quality of products or services, for example the cost of new product review and quality planning, improvement and quality training, supplier evaluation costs, general management costs, information system costs (Farooq at al, 2017). Second category - appraisal costs are associated with evaluating, measuring or auditing products to make sure everything is in conformance to standard and performance requirement. These costs include the costs of measuring and testing equipment accuracy and the cost of associated materials. Internal failure costs are costs that occur before delivering the product to the customer.

The prevention and appraisal costs are considered as a controllable quality costs while the internal and external failure costs are uncontrollable. At some point the cost of prevention and appraisal defects exceeds the cost of correcting for product failure. A lower product defect level can be obtained by increasing the prevention and appraisal costs, which subsequently lowers the external failure costs.

The costs occurring after delivering the product to the customer are defined as external failure costs, for example, product recalls, warranty claims, customer's returns.

Table 2 PAF model in Company B

Costs		Annually (in CZK)	
		2016	2017
P - Prevention	Training Costs	65 000	68 750
	General management costs	84 976	88 353
	Supplier evaluation, Customer relationship management		
	Certification	33 125	66 250
	Information system	158 750	218 750
Total prevention costs		341 851	442 103
A - Appraisal	Auditing	25 000	25 000
	Inspection, Testing, equipment accuracy	301 500	301 500
Total appraisal costs		326 500	326 500
F - Failure	Internal failure costs – scrap, rework, retest, yield losses	508 288	542 113
	External failure costs – warranty, liability, returns,	952 390	125 603
Total Failure costs		1 460 678	667 715
The total costs of quality		**2 129 029**	**1 436 318**

Source: own processing

Total costs of quality exceed the amount of 2.1 million CZK in 2016 and 1.4 million CZK in 2017. The considerable difference between these values is mainly caused by external failure costs expansion in 2016. This cost expansion was caused by supplier failure mentioned above. The prevention costs are annually increasing; it corresponds to the basic principal of PAF model. The constant growth of this group of costs is supposed to reduce total cost of quality. Almost all mentioned subcategories of prevention costs are growing due to recertification audit and informational system changes.

Appraisal costs are same in both years. Inspection, testing and equipment accuracy costs are concentrated to this category. The technology used for the measurement is considered to be fully satisfactory and therefore the cost has not changed.

Failure costs are crucial for the company hence the company has the quality goal for them too (Psomas, & Kafetzopoulos, 2014). External failure costs are measured for example on the level – non-compliant external product. Costs for non-compliant external products will not exceed 0.10 % of sales revenue and costs for non-conforming products will not exceed 0.35 % of sales revenue. The development of these measures for the period from 2010 to 2017 is shown in Figure 1. Achieved rates of sales are plotted on x-axis. Individual annual results are in line with the set quality goal, excluding few values caused by extreme situation.

Figure 1 Internal and external failure
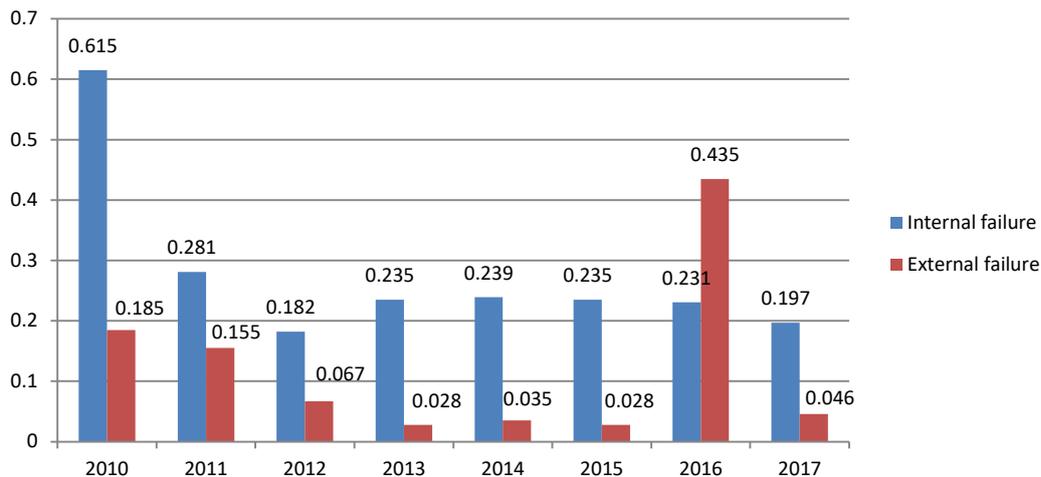
Source: Zemanová (2018)

4 Conclusions

Presented illustrative case study is focused on quality management system in middle size company. Considered Company B has a long-standing experience with application of some quality management methods. Nevertheless, the recertification to the new ČSN ISO standard was very demanding in terms of both time and money. On the other hand, the quality management system methods i.e. PAF model will allow quality cost monitoring clear and at one place. In addition, this is a very <u>common</u> concept so the application methodology is available.

Far more challenging is the certification process for an enterprise that has not used the quality management system yet. In some production areas, quality management is common issue and its certification is directly required by customers. Consequently, new firms in such industries must necessarily be certified to meet the demanding requirements of their customers. And then they will also face with setting up a list of the risks and detailed quality cost monitoring, as well as Company B.

Acknowledgement

References

Bednářová, D. (2013). *Řízení kvality.* České Budějovice: Jihočeská univerzita, Ekonomická fakulta. ISBN 978-80-7394-404-9.

Buttle, F. A., & Burton, J. (2002). Does service failure influence customer loyalty? *Journal of Consumer Behaviour,* 1(3): 217-227. doi: 10.1002/cb.67

Farooq, A.M., Kirchain, R., Novoab, H., & Araujob, A. (2017). Cost of quality: Evaluating cost-quality trade-offs for inspection strategies of manufacturing processes. *International Journal of Production Economics*, 188 (June 2017), 156-166, doi: 10.1016/j.ijpe.2017.03.019.

Jandova, L. (2018). Příprava podniku na recertifikaci podle normy ISO 9001:2015. České Budějovice. The University of South Bohemia in České Budějovice. *Diplomová práce.*

Makýš, P., & Šlúch, M. (2016). *Systém manažérstva kvality podľa ISO 9001:2015 a jeho interné audity.* M Kreo: Žilina. ISBN 978-80-971299-1-0.

Nenadál, J. (2016). *Systémy managementu kvality: co, proč a jak měřit.* Management Press: Praha. ISBN 978-807261-426-4.

Nenadál, J., Noskievičová, D., Petříková, R., Plura, J., & Tošenovský, J. (2008). Moderní management jakosti - principy, postupy, metody. Praha: Management Press. ISBN 978-80-7261-186-7.

Psomas, E., & Kafetzopoulos, D. (2014). Performance measures of ISO 9001 certified and non-certified manufacturing companies. Benchmarking: An International Journal, 21(5), 756-774, doi: 10.1108/BIJ-04-2012-0028

Psomas, E., Dimitrantzou, Ch., Vouzas, F., & Bouranta N., (2018). Cost of quality measurement in food manufacturing companies: the Greek case. *International Journal of Productivity and Performance Management*, 67 (9), 1882-1900, doi: 10.1108/IJPPM-12-2017-0325

Schiffauerova, A., & Thomson, V., (2006). Managing cost of quality: Insight into industry practice, *The TQM Magazine.* 18(5), 542-550, doi: 10.1108/09544780610685502

Shubhangan, M., & Darshak, D. (2016). Review on Cost of Quality Methodology and Hidden Costs in Manufacturing Industries. *REST Journal on Emerging trends in Modelling and Manufacturing,* 2(4), 87-94

Spejchalová, D. (2012). *Management kvality, bezpečnosti a environmentu.* Praha: VSEM. ISBN 978-808673-087-5.

Vyleťal, P., & al. (2008). *Ekonomické nástroje a metody řízení jakosti v akvizičním procesu.* Ministerstvo obrany České republiky: Praha.

Zemanova, M. (2018). Systém řízení kvality ve vybraném podniku. České Budějovice. The University of South Bohemia in České Budějovice. *Diplomová práce.*

The Impact of a new way to lease reporting in a retail sector

Alžběta Veverková, Patrik Svoboda, Hana Bohušová

Abstract: *Studies on the use of lease carried out have shown that operational leases are utilized in some sectors more than in others. In these sectors, operating leases represent an alternative to massive capital investment. One of these sectors was chosen to assess the expected impacts of IFRS 16. This is the retail sector. Retail is identified as the sector that should be most affected by the new lease reporting methodology. The most common leased asset is a real estate in this sector. It is either a store with equipment or a retail space. Majority of lease contracts take the form of a medium-term operating leases (3-9 years) with options to extend the lease term. Retail space rental is a fundamental part of the business model of these entities. The ratio of operating and finance leases for selected companies in the retail sector is 96%, the median is 95%. For this reason, significant impacts of the new IFRS 16 can be expected in this sector. An important factor influencing the magnitude of the changes is not only the percentage of the operating lease to the total lease, but also the volume of unrecognized assets and leasing liabilities. The financial statements of the twenty largest retail companies operating within the EU listed in the EU stock-exchange market, reporting according to IFRS were subject of the research. The study revealed that the amount of assets (rights to use) and unrecognized lease liabilities that corresponds to the operating lease is closely related to the type of leased asset and its carrying amount. The average increase in total assets is 37% and debts 55%. The decrease in equity of 4.5 % is due to the fact that the carrying amount of the leased asset usually decreases faster than the carrying amount of the lease liability.*

Key words: IAS17 · IFRS16 · Operating lease · Financial lease · Capitalization

JEL Classification: M41

1 Introduction

According to the World Leasing Yearbook (2018), the top 50 countries in 2016 are reporting growth in new business volume of 9.40% rising from US$ 1,005.30bn in 2015 to US$ 1,099.77bn in 2016. The leasing industry has experienced significant growth and has introduced new and innovative ways to finance equipment for companies worldwide. Due to this fact, lease can be considered as a significant source of financing of long term assets. Also in Europe, leasing can be considered important external source of financing. The value of newly entered leasing contracts is amounted to EUR 333.7 billion (Leaseurope, 2017). The significance of leasing for companies is estimated by Deutsche Bundesbank (2011), it estimates that, in about fifty percent of companies have used leasing of long-term assets as a source of their financing. This fact shows that especially for companies that can't afford to finance their investments with internal sources, leasing is an important alternative to a bank loan. The study thus shows that one fifth of fixed investment is financed by leasing. According to the current treatments, leases could be treated in two different ways as an operating or financial. Lease is classified as financial if it transfers substantial risks and rewards incidental to ownership of an asset to the lessee. It is irrelevant whether after the end of the lease there will be a transfer of ownership to the lessee for classification of lease as a financial lease. Otherwise a lease is recorded as an operating lease. The subject of the financial lease is reported as a long-term asset and the appropriate liability while the operating lease is not subject of financial position statement presentation. Regardless the form of lease, a lessee obtains an asset or right to use an asset and a liability arise when company enters into a lease contract. Contrary to that view, according to the current treatments for lease reporting (IAS 17, Topic 840), most of leases are not reported on a lessee's balance sheet and this is the reason why the current lease accounting principles do not provide comparable, high-quality and comprehensive information for external and internal users of the financial statements.

Ing. Alžběta Veverková, Mendel University, Faculty of Business and Economics, Department of Accounting and Taxes, Zemědělská 1, 613 00 Brno, e-mail: xsrnova1@node.mendelu.cz

doc. Ing. Patrik Svoboda, Ph. D., Mendel University, Faculty of Business and Economics, Department of Accounting and Taxes, Zemědělská 1, 613 00 Brno, e-mail: patrik.svoboda@mendelu.cz

doc. Ing. Hana Bohušová, Ph.D., Mendel University, Faculty of Business and Economics, Department of Accounting and Taxes, Zemědělská 1, 613 00 Brno, e-mail: uchana@mendelu.cz

However, for many lessees, the effect on reported leverage can be substantial. According to El-Gazzar, Lilien, Pastena (1986) and Imhoff, Thomas (1988) firms are structuring leases as operating leases to avoid increasing of debt-equity ratio. It forced analysts to make their own assessments about the assets and liabilities arising from lease agreements. The possible way of incorporation of off-balance lease for financial decision purposes is simulation of effects of operating lease capitalization on balance sheet items and related items of income statement. There are many ways for incorporation of operational lease to financial statements: Standard and Poor´s Present value method (2005), Moody´s Factor method (2006), Fitch Hybrid model (2006), constructive capitalization method used by Imhoff, Lipe, Wright (1991, 1993, 1997)), Srnová, Bohušová, Blašková(2014), Svoboda, Bohušová (2014) etc. The purpose of lease capitalization techniques is to adjust the financial statements to show what would have resulted if operating leases had been accounted for as financial lease. There are significant differences among the above-mentioned models. The choice of model could influence financial decision making of users of financial information.

According to Damodaran (2009) many firms prefer operating leases since they hide the potential liability to the firm and understate its effective financial leverage. Currently the line between operating and financial leases remains fine and companies can modify lease agreements to cross the line in the demanded way. Also Duke, Hsieh a Su (2009) stress that many companies use operating lease to hide their current liabilities and assets and increase operating profit to external users in the post Enron era. They present the possibility of financial analysis ratios improvement (ROA, D/E, current ratio) by reporting leases as operating.

Based on above mentioned studies it is apparent that the current treatments for lease reporting provide a space for structuring of lease in the way to serve demanded data for external users.

The way out of this situation was a development of new treatments for the lease with the term over one year reporting regardless of the lease classification. Since 2006, the IASB and FASB had been working on a joint project with the aim to develop a common standard for lease reporting. The final standard IFRS 16 – Leases was released in 2016, effective date is January1st, 2019.

2 Aim and Methods

The aim of the paper is to identify and quantify the impacts of the new IFRS 16 Lease in sector where the operating lease is the material way of financing economic resources for doing business. Previous studies carried out by EFRAG (2017), IASB (2016), Moussaly, Wang (2014), De Villiers a Middelberg (2013), Goodacre (2003), Gosman a Hanson (2000)) have shown that some sectors use operating leases more than others. In these sectors, operating leases represent an alternative to massive capital investment. One of these industries has been selected to assess the expected impacts of IFRS 16.

The retail sector (NACE G. 47) was chosen for the research. Retail is identified as the sector with the very high level of operating lease that should be most affected by the new lease reporting methodology (EY (2016), Fitó et al (2013), Altamuro et al (2012), Durocher (2008), Fülbier et al.(2008), Mulford & Gram (2007)). The PwC Global Lease Capitalization study of 2016, which identified a 98% increase in long-term assets in the retail sector and a 41% increase in EBITDA (measured as a median), also resulted in the same conclusions.

Selection of researched companies

The selection of companies operating in retail, preparing financial statements according to the IFRS and fulfilling the following criteria: annual turnover over EUR 2 billion, use of operating leases as an external source of financing, headquarters of the company in the territory of a Member State of the European Union (or Iceland, Norway, Liechtenstein and Switzerland) was carried out. The turnover criterion is based on a 2011 European Commission study that concluded that more than fifty per cent companies with a turnover of more than € 2 billion EUR use lease as an external source of financing. The starting point for company identification was the Amadeus (Bureau van Dijk) database, which enables to identify the industry on the basis of defined NACE code, to meet the predetermined turnover, and identify headquarters and ownership of the company. Other assumptions were tested on the basis of an individual assessment - IFRS reporting and the volume of operating leases, the quality of the information in the notes to the financial statements. Failing to meet any of the set criteria, companies were discarded. The following companies, which met the previously mentioned conditions, were identified Ahold, Auchan, Carrefour, COOP, Dixons, Douglas, Groupe Casino, Groupe Fnac Darty, HM, Inditex, J Sainsburys plc., KESKO, Kingfischer plc., Mark Spencer, METRO AG, Migros Group, REWE Group, SPAR, TESCO plc.

The financial statements for the year 2016 of these companies were subject of the research. The share of operating lease (operating lease/ total lease liability) in the researched sample was from 72.5% to 100%, median was 96,95%.

Selection of indicators

Quantification of the impacts of the lease reporting according to the new IFRS 16 Leases on the selected indicators is made by comparison of these indicators for financial statements prepared according to the current IAS 17 – Leases and financial statement transformed using the IFRS 16 for operating lease reporting. The information concerning the operating lease presented in the notes are utilized for transformation. The financial statements items were selected as the significant indicators.

1.   Financial Position Statement (Long-term assets, B/S total, Equity, Liability)

2.   Income Statement (EBIT, EBITDA, Depreciation, Interest Cost)

Method of transformation

All researched companies use leasing services and currently present data on operating leases in accordance with IAS 17. IAS 17 (paragraph 35) specifies which information is disclosed for operating leases in the notes to financial statements (the summary of future minimum lease payments for non-repayable operating leases separately for a period of one year and a period of up to five and over five years). This information is used for transformation of financial statements prepared according to IAS 17 to IFRS 16. The methods of Fito, Moya and Orgaz (2011) and Fülbier, Silva a Pferdehirt (2008) were used for the interest rate estimation. These methods are based on the median disclosed by researched companies´ interest rates (4.2 %).

Significance testing

It is necessary to determine statistical significance of the results of the research. Using Shapir-Wilk's test, the normality of previously defined items of financial statements was verified. On the basis of the results obtained, which do not confirmed normal variability of the observed variables, the Wilcoxon Pair Test was used.

3 Theoretical background

The main objective of the development of the IFRS 16 was to serve a true and fair view of financial situation and performance of companies for users of financial statements, and to increase the comparability of financial statements of companies and to provide more transparency about financial liabilities and the use of external capital by the company. The recognition of a leased asset and the lease liability of all types of leases on financial statement using the same rules can be considered a means of achieving these objectives.

IFRS 16 does not distinguish between reporting of financial and operating leases on the side of lessee any more. All types of leases with a lease term longer than twelve months are required to be reported on the lessee's financial statements, similar to the financial lease under IAS 17. The lease is capitalized on lessee´s financial statements. At the same time, the different nature of these two transactions should be evident. According to the IASB (2016), if the lease is economically close to the loan for the purchase of the asset, it is a situation where the lease term corresponds approximately to the life of the leased asset and the value of the reported asset and the liability on the financial statements should be very similar. In an opposite situation where the lease term will be significantly shorter than the economic life of the asset, the value of this asset is significantly higher than the value of the lease liability. IFRS 16 imposes to recognize this asset in a value corresponding to the right to use of this asset. The lessee is reporting an assets right-to-use during the lease term and on the other hand the lessee is reporting a liability representing obligation to pay the lease payments over the lease term on its balance sheet. This liability is recognized at the discounted value of the lease payments using the implicit or incremental interest rate at the inception of the lease contract. This obligation is subsequently gradually amortized using an effective interest rate. The asset is amortized on a rational and systematic basis. The lessee is required to report interest and amortization cost separately. The costs of all types of leasing are divided into both, in the operating income and in the financial income. The part of the leasing costs corresponding to the depreciation cost is a part of operating costs in the case of operating leases. The remaining portion of interest costs increases the company's total financial costs. These changes will be reflected in other items in the income statement.

4 Results

Impact on Balance Sheet Items

An important factor influencing the volume of the changes is not only the percentage of operating leases to total lease, but also the volume of non-recognized lease liabilities to the total liabilities of the company. The information concerning the volume of unrecognized lease liabilities (liabilities of operating lease over the lease term is recognized according to the IAS 17). The volume of non-recognized as a percentage of recognized lease liabilities is a subject of following table

1. The volume is in the range from 9.25 % to 445.53 %. The median is 47.08 %. It means that all recognized lease liabilities would increase 1.47 times due to incorporation of operating lease liability to financial statements off retailing companies. The B/S total would increase in the range from 0.65 % to 133.98 %. The median is 37.88 %. The total liabilities would increase in the range from 1. 2 % to 148.38 %, with the median 54.99 %. Contrary to the increase of the previous items, the equity would decrease, due to a faster decrease in value of the long-term lease assets in comparison to the decrease of the lease liability, The lease instalment is split into interests and an amortization of the lease liability. The decrease in equity is significantly lower in comparison to increase of long-term assets.

The results of similar studies focusing on the impacts of a lease capitalization and of IFRS 16 in a retail sector differ. According to the study carried out by Mulford and Gram (2007) which capitalized operating leases concluded that the total assets increased by 14.6% and total liabilities increased by 24.4%. The PwC study (2016) concerned only the increase of the debt; it concluded the increase by 98%. The study did not mentioned the change in assets. The IASB (2016) conducted an extensive study on the impact of IFRS 16 in several sectors of the economy. In the case of retail, there were researched 204 companies. After capitalization of long-term operating leases, these companies showed an increase in debt by 214%. Also the Turkish study conducted by Sari, Altintas, Tas (2016) researched seven retail companies listed on Turkish stock Exchange, they concerned financial statements for the period 2010-2014. The results of 2010 and 2011 are quite surprising as there has been a decline in both total assets and liabilities. However, the authors do not explain this fact in any way. In the other years there was an average increase of 4.8%, 23.7 and 30.9% for assets and 13.7%, 37.3% and 45.1% respectively. The obtained results show only a slight decrease in the value of equity - 4.48%, with no significant differences between individual companies. Only Sari, Altintas, and Tas (2016) have studied in their study the impact of IFRS 16 on equity, similar to our study. The authors achieved an average decrease of 12.5%.

Table 1 Changes on B/S

Company	Non-recognized lease liability	Change in Total Assets	Change in total Liabilities	Change in Equity
1	10,18%	8,53%	11,08%	-2,40%
2	38,28%	36,06%	43,73%	-10,29%
3	47,06%	44,68%	62,12%	-7,37%
4	96,28%	75,66%	109,87%	-8,55%
5	70,87%	42,38%	55,92%	-4,60%
6	62,29%	44,30%	71,48%	-3,82%
7	13,18%	11,08%	15,20%	-2,24%
8	9,29%	6,40%	10,20%	-0,77%
9	124,84%	79,62%	148,38%	-4,35%
10	43,87%	39,70%	51,98%	-2,21%
11	47,10%	34,13%	54,06%	-5,12%
12	16,19%	0,65%	1,20%	-0,06%
13	124,06%	65,21%	141,57%	-6,73%
14	22,41%	16,15%	25,83%	-2,68%
15	117,72%	58,11%	138,06%	-2,78%
16	455,53%	133,98%	419,70%	-10,10%
17	24,61%	21,68%	26,89%	-4,81%
18	102,33%	105,63%	117,45%	-6,70%
19	79,28%	29,70%	93,98%	-2,70%
20	29,25%	22,27%	2,03%	-4,67%
Median	**47,08%**	**37,88%**	**54,99%**	**-4,48%**

Source: Own calculation using financial statements

Impact on Comprehensive Income Items

IFRS 16 requires recognition and reporting of assets connected with the lease contracts, regardless of the form of the lease (financial, operating). In the case of costs, there is a change in the cost structure. Operating lease costs were reported as service cost according to the IAS 17 – Leases. Newly, according to the IFRS 16, the costs associated with operating leases include depreciation of the asset associated with the lease in the form of the right of use and interest costs related to the

value of the outstanding lease liability. The increase of total interest costs (financial costs) is obvious and the increase of depreciation is obvious as well. The following table 2 describes changes in examined items of costs.

The increase in depreciation costs is between 0.07% and 113.47% for the researched sample, the median is 27.43%. The rise in interest costs is in the range of 0.23% to 94.96%, median is 16.36%. The difference between the increase in depreciation costs and interest costs is associated with a decreasing lease liability during the lease, and a straight-line depreciation of the leasing assets during the lease term. Compared to the conclusion of the Baastad, Aslaksen study (2017), which shows the expected increase in depreciation costs between 80% and 89%, conclusions of our research estimate a lower impact.

However, Baastad, Aslaksen (2017) did not investigate the change in interest costs separately from other financial costs. The results of this study concluded the higher increase in financial costs (89%) compared to the conclusions of this work + 16.36%. Significantly higher interest costs are mainly due to the assumption of significantly higher increase in liabilities.

As a result of the application of IFRS 16, there is a year-on-year decrease in leasing costs over the lease terms as compared to previous the straight-line lease costs of operating leases. In the context of the new methodology for operating leases reporting, there is an increase in EBIT, as EBIT is affected only by depreciation costs, interest costs are a part of finance costs. The impact on the researched sample is quantified in Table 2. In the case of EBITDA, the increase is higher as all costs associated with the operating lease are excluded from the EBITDA. Median increase is 14.57%.

Compared to the results of similar studies, only Baastad, Aslaksen (2017) focused their research on the change in EBIT. EBIT increased by 15%. The increase is higher than those obtained in this study + 2.5%. As concerns the change in EBITDA after the IFRS 16 application, the result is + 14.57% i tis lower than conclusions of other studies. Mulford and Gram (2007) concluded increase by 22.5%. Study of Singh (2012) researched 234 restaurants and retail companies during the period from 2006 to 2008. It estimates increase by 61.3%. Similarly, higher increase 43% also estimates the IASB study (2016) and PwC (2016) 41 %.

Table 2 Changes in Comprehensive Income Statement

Company	Change in Amortization and Depreciation Costs	Change in interest Costs	Changes in EBIT	Changes in EBITDA
1	13,15%	8,74%	2,15%	6,63%
2	41,83%	10,65%	3,82%	20,92%
3	85,41%	16,99%	2,26%	26,61%
4	41,58%	74,39%	13,29%	31,34%
5	79,01%	74,31%	1,57%	8,12%
6	19,35%	12,82%	2,45%	10,04%
7	26,89%	39,15%	2,96%	15,97%
8	8,00%	9,47%	1,64%	4,00%
9	44,92%	15,72%	2,49%	18,80%
10	25,04%	10,29%	3,44%	16,10%
11	27,96%	8,60%	1,54%	12,66%
12	0,07%	0,23%	0,09%	0,08%
13	106,20%	94,96%	7,14%	39,46%
14	18,07%	9,99%	2,30%	11,90%
15	3,06%	84,90%	2,80%	3,11%
16	113,47%	71,04%	2,51%	20,21%
17	14,59%	15,72%	10,03%	13,18%
18	61,69%	37,48%	9,14%	27,28%
19	23,89%	87,58%	1,49%	6,58%
20	37,58%	30,08%	7,03%	20,24%
Median	**27,43%**	**16,36%**	**2,50%**	**14,57%**

Source: Own calculation using financial statements

Using the Normality Test (Shapir-Wilk test) it was shown that all the variables monitored do not have a normal distribution, so it is necessary to use a non-parametric test (Wilcoxon test) to verify the impact on individual indicators.

IFRS 16 has a significant impact on total assets, total liabilities, depreciation and interest expense. The results in details are subject of the table 3

Table 3 Statistical significance of IFRS 16 impacts

Zero hypothesis	p-value
Σ **Assets**	2,34**
Σ **Liabilities**	3,57***
Σ **Equity**	-0,48
EBIT	0,38
EBITDA	1,15
Depreciation	2,74***
Interest cost	2,11**

Source: Authors calculations according to financial statements (*** p-value< 0,01; ** p-value< 0,05; *p-value<0,1)

5 Conclusions

The retail sector is characterized by the high volume of unrecognized lease liabilities due to the high book value of the assets leased for this sector (retail space, plant and equipment). The obligation to disclose the subject of the lease and the lease liability in the lessee's balance sheet was reflected in a one-third increase in the balance sheet total and in almost half the total liabilities. From the newly recognized subject of the lease and the lease liability, the depreciation and interest costs increase to the previously reported depreciation and financial costs. For these reasons, it is clear that the increase in these items must be higher for sectors (companies) showing a greater change in assets and liabilities. In the case of retail companies, there was an increase of about twenty percent. Due to the new structure of the profit, there was not only an increase in EBIT but also a significant increase in EBITDA.

Acknowledgments

References

Altamuro, J. et al. (2012). Operating Leases and Credit Assessments. Contemporary Accounting Research. 31(2). [online]. Available at: https://doi.org/10.2139/ssrn.1115924

Baastad, M. S., & Aslaksen, A.B. (2017). IFRS 16 Leases and its Effects on Management Compensation Systems in the Norwegian Retail Industry. Master Thesis. Oslo: BI Norwegian Business School.

Damodaran, A. (2009). Equity risk premiums (erp): determinants, estimation and implications - a post-crisis update. SSRN [online] Available at: http://ssrn.com/abstract=1492717 or http://dx.doi.org/10.2139/ssrn.1492717 [accessed 2015, June 1].

De Villis, R., & Middelberg, S. (2013). Determining the impact of capitalising long-term operating lease on the financial ratios of the top 40 JSE –listed companies. International Business & Economics Research Journal. 12 (6), 655-669.

Duke, J., & Hsieh, S.J. (2006). Capturing the benefits of operating and synthetic leases. Journal of Corporate Accounting & Finance. (18), 45-52.

El-Gazzar, S., Lilien, S. & Pastena, V. (1986). Accounting for leases by lessees Journal of accounting and economics, 1986, Vol. 8, issue 3, 217-237

ERNST and YOUNG (2016). Leases: A summary of IFRS 16 and its effects. [online]. [vid. 2017-02-16]. available at https://www.ey.com/Publication/vwLUAssets/ey-leases-a-summary-of-ifrs-16/$FILE/ey-leases-a-summary-of-ifrs-16.pdf

EFRAG (2017). EX ante Impact Assessment of IFRS 16. EFRAG [online]. London. [vid. 2018-05-24]. available at: https://www.ef-rag.org/Assets/Download?assetUrl=%2Fsites%2Fwebpublishing%2FSiteAssets%2FIFRS%252016%2520-%2520Eu-rope%2520Economics%2520-%2520Ex%2520ante%2520Impact%2520Assessment%2520%2822%2520Febru-ary%25202017%29.pdf&AspxAutoDetectCookieSupport=1

EUROPEAN COMMISSION (2010). International Accounting Standard 17 – Leases. [online]. available at: http://ec.europa.eu/inter-nal_market/accounting/docs/consolidated/ias17_en.pdf

Fito, M. A., Moya, S., & Orgaz, N. (2011). Impact assessment of recognition versus note disclosure in operating leases. [online]. [vid. 2016-03-14]. Available at: https://www.researchgate.net/profile/M_Fito/publication/266210932_Impact_assessment_of_recogni-tion_versus_note_disclosure_in_operating_leases/links/552be2d40cf29b22c9c232cc/impact-assessment-of-recognition-versus-note-disclosure-in-operating-leases.pdf

Fülbier, R. U., Jorge L.S., & Pferdehirt, M.H. (2008). Impact of lease capitalization on Financial ratios of Listed German Companies. Schmalenbach Business Review. [online]. 60, 122-144. https://doi.org/10.1007/BF03396762.

Goodacre, A. (2003). Operating lease finance in the UK retail sector. International Review of Retail, Distribution and Consumer Re-search. 13 (1), 99-125.

Gosman, M. L., & Hanson, E.I. (2000). The impact of leasing on lenders' evaluations of firms 'debt levels. Commercial Lending Review. 15, 53-60.

IASB (2016). IFRS 16 Leases. [online]. [vid. 2018-02-16]. Available at: https://www.ifrs.org/-/media/project/leases/ifrs/published-documents/ifrs16-effects-analysis.pdf

Imhoff E. A., Lipe, R.C., & Wright, D. W. (1991). Operating Leases: Impact of Constructive Capitalization. Accounting Horizons**.** (5), 51–63.

Imhoff E. A., Lipe, R.C., & Wright, D. W. (1993). The effects of recognition versus disclosure on shareholder risk and executive compensation. Journal of Accounting, Auditing and Finance. (8), 51–63.

Imhoff E. A., Lipe, R. C., & Wright, D. W. (1997). Operating Leases: Income Effects of Constructive Capitalization. Accounting Horizons. (11), 12–32.

Imhoff E.A., & Thomas, J. K. (1988). Economic consequences of accounting standards: The lease disclosure rule change. Journal of Accounting and Economics. (10), 277-310.

LEASEUROPE (2018). Leasing &Rental. [online]. available at: z http://www.leaseurope.org/index.php?page=rental-leasing-introduction

Moussaly, K., & Wang, W. (2014). The Impact of Leased and Rented Assets on Industry Productivity Measurement [online]. [vid. 2018-07-24]. available at: https://www150.statcan.gc.ca/n1/pub/15-206-x/15-206-x2014036-eng.htm.

Mulford, Charles W., & Gram, M. (2007). The Effects of Lease Capitalization on Various Financial Measures: An Analysis of the Retail Industry. Journal of Applied Research in Accounting and Finance. 2(2), 3–13.

PRICEWATERHOUSECOOPERS (2016b). A study on the impact of lease capitalisation IFRS 16: The new leases standard. [online]. [vid. 2018-07-28]. available at: https://www.pwc.com/gx/en/audit-services/publications/assets/a-study-on-the-impact-of-lease-capitalisation.pdf

Sari, E. S., (2016). The effect of the IFRS 16: Constructive capitalization of operating leases in the Turkish retailing sector. Journal of Business, Economics and Finance (JBEF), ISSN: 2146-7943. [online]. available at: https://ssrn.com/abstract=2888364

Singh, A. (2012). Proposed Lease Accounting Changes: Implications for the Restaurant and Retail Industries. Journal of Hospitality & Tourism Research. 36(3), 335–365. [online]. available at: https://doi.org/10.1177/1096348010388659.

Srnová, A., Bohušová, H., & Blašková, V. (2014). Lease Type B and Possible Duplicate Recognition of Assets. In European Financial Systems 2014. 1. vyd. Brno: Masaryk University, 2014, s. 557-564. ISBN 978-80-210-7153-7.

Svoboda, P., & Bohušová, H. (2014). The uncertainty associated with the estimated lease term and its impact on the financial analysis ratios. In European Financial Systems. 1. vyd. Brno: Masaryk University, 2014, s. 621-628. ISBN 978-80-210-7153-7.

World leasing Yearbook (2018). [online] available at: http://www.world-leasing-yearbook.com/.

Professional Traits of Experts as the Basic Determinants of Quality of Business Valuation Reports: Preliminary Research Results

Martin Červený

Abstract: *The quality of business valuation reports in the Czech Republic has been criticized by numerous scholars and professionals. Some believe that the discrepancies in quality are caused primarily by differences in skillfulness of the experts. The goal of this paper is to identify and describe the relationship between selected professional traits of the experts and the quality of their valuation reports. Namely, this paper will investigate whether expert institutions generally produce more quality reports than individuals, and whether there is a relationship between the years of practice of the expert, the length of the report, and its respective quality.*

The empirical study is based on a sample of 122 business valuation reports published during the year 2017 and uses a set of predetermined binary criteria to assess the valuations. Based on the results, we cannot confirm that institutions produce more quality valuations than individuals, or vice versa. Surprisingly enough, there seems to be a negative relationship between the number of years experts are active and the score of the work they produce. Finally, longer and more elaborated reports tend to imply a better quality overall.

Key words: Business Valuation · Expert Witness · Valuation Assessment · Quality of Valuation

JEL Classification: G30

1 Introduction

The quality of business valuation reports in the Czech Republic has been criticized by some scholars and professionals (e.g. Mařík & Maříková, 2011). The aim of our ongoing project is to investigate the quality of business valuation reports thoroughly and possibly suggest solutions specific to our domestic conditions.

The initial struggle, however, was caused by the realization that generally accepted evaluation criteria for valuation reports are factually non-existent in both domestic and global literature. In addition, many agree that each valuation report is a highly individualized material and so must be the process of assessment (Rýdlová, 2015). Still, we are convinced that the valuation principles are sufficiently embodied in the International Valuation Standards (or similar standards) as well as in the reputable literature dealing with business valuation (Damodaran, 2012; Mařík, 2018). Thus, we believe that the assessment of valuation reports is not only possible, but also necessary. As we will show, the byproduct of our efforts is a set of generally applicable evaluation criteria for assessing business valuation reports.

Previous studies dealing with the quality of valuation reports have used diverse methodologies and various samples. All of the authors, however, agree that the quality of valuation reports is generally rather poor (Doležalová, 2011; Havlíková, 2017). Some studies even suggested that certain types of experts might consistently produce reports of better quality (Švecová, 2017). The latter implication was supported with anecdotal evidence by the author, but we still found the idea inspiring. Could it be that the professional traits of the experts such as their legal form or their track of record determine the quality of the work they produce? If so, what implications can we derive if we want to strive for the best quality available? Thus, the goal of this paper is to identify and describe the relationship between selected professional traits of the experts and the quality of their valuation reports. In order to fulfill the goal, we are going to investigate three research questions:

1. Who produces more quality business valuation reports - individual or institutional experts?

2. Is there a relationship between the years of practice of the experts and the quality of their reports?

3. Are longer valuation reports better?

Ing. Martin Červený, MBA, University of Economics, Prague, Faculty of Finance and Accounting, Department of Corporate Finance, W. Churchill Sq 1938/4, Prague 3 – Žižkov, Czech Republic, e-mail: martin.cerveny@vse.cz

2 Methods

The study is based on a sample of publicly disclosed business valuation reports from the Czech Commercial Register that were published during the year 2017. For our purpose, we have created a script that ensured we would obtain a complete set of valuation reports related to the respective period. Out of the 1724 documents in total, we excluded all samples that were dealing with property valuation, valuation of intangibles, and we also removed all duplicities. This left us with 254 business valuation reports for further investigation. The presented preliminary results are based on those 122 reports we have managed to assess to this date.

All the reports were assessed with the use of a complete list of criteria, which was published in our previous article (see Červený, 2018 for further details). These criteria are based on widely accepted valuation principles and consist of 44 binary (yes/no) questions divided into sections that follow the standard structure of a business valuation report. The use of binary questions allowed for a quantitative assessment based on a single score, which would reflect the overall quality of the report. Solely for the purpose of our study, we have calculated the final score as an average score for all sections. The reasoning behind our decision is that we view each section of the valuation report equally important.

For each report, we also observed several descriptive characteristics related to the professional qualification or the character of the expert: a) her legal form, b) the number of years active (for individuals only), and c) the length of the report. We did omitted the years active in the case of institutions, because this tells very little about the valuation analysts actually responsible for the report. The length of the report was included in this research, because the expert herself is responsible for the justification of all the steps and we consider the writing style to be one of the professional traits.

Once we obtained all the data necessary, we ran fundamental statistical tests such as the equality tests as well as correlation and OLS regression analyses suitable for the respective research questions. Our findings shall be presented in the subsequent section.

3 Research results

3.1 Individuals vs. Institutions

The sample of 122 valuation reports consisted of 57 samples by individuals and 65 samples by institutions. The distribution of the former sample did have the characteristics of the normal distribution, but this could not be confirmed for the latter sample (both Lillefors and Cramer-von Mises test statistically significant on a 95 % confidence level), even though this might only be due to a relatively smaller sample size. Arguably, the distribution of scores for larger samples would converge to the normal distribution. Nevertheless, in addition to the standard parametric t-test, we ran selected non-parametric tests as well.

Figure 1 Distributions of Scores for Individuals (FO) and Institutions (PO)
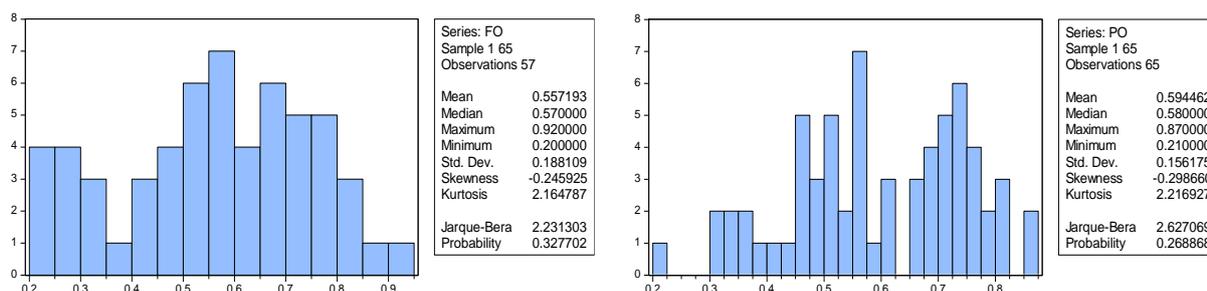
Source: Own processing

The results of the tests are presented in the table below:

Table 1 Parametric and Non-parametric Tests of Equality

Method	df	Value	Probability
t-test	120	-1.195333	0.2343
Mann-Whitney	-	1.173588	0.2406
Kruskal-Wallis	1	1.382834	0.2396

Source: Own processing

Based on all the results, we could not reject the hypothesis the means/medians of the groups are equal. Thus, we found little statistical evidence that one of the groups systematically produces more quality reports.

3.2 Do Years of Active Practice Matter?

As previously mentioned, the following analysis was performed on the sample of 57 reports by individuals only, as the active years have limited explanatory power regarding the persons actually responsible. The Pearson coefficient between the active years and the respective scores showed a statistically significant value of -0.33. Similar implications were acquired with a linear regression analysis where the number of years active served as an explanatory variable. The coefficient for the years active was -0.008283, which confirms the negative impact on the score of the respective report.

Quite interestingly, the R-squared of the model is rather low at 0.11, which implies that additional factors might have a significant impact on the quality of the report. This, however, does not change anything about the fact that both regression coefficients were statistically significant in this model.

Table 2 Years of Active Practice – Linear Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
c	0.687835	0.055248	12.44990	0.0000
Years Active	-0.008283	0.003164	-2.617907	0.0114
Regression parameters				
R-squared	0.110802	Mean dependent var.		0.557193
Adjusted R-squared	0.094634	S.D. dependent var.		0.188109
S.E. of regression	0.178987	Akaike info criterion		-0.568553
Sum squared resid	1.761993	Schwarz criterion		-0.496867
Log likelihood	18.20377	Hannan-Quinn criterion		-0.540695
F-statistic	6.853436	Durbin-Watson stat.		1.698278
Probability	0.011405			

Source: Own processing

3.3 Does Length Imply Quality?

Similar tests were performed using the length of the report as an explanatory variable, this time on the whole sample of 122 valuation reports. The Pearson coefficient of 0.41 was, again, statistically significant and implied a positive relationship between the number of pages and the quality of the report. The OLS regression results confirmed this, as the coefficient for length was 0.0019 for every single page, again, statistically significant. The R-squared at 0.16 implies rather low explanatory power of the model, which once again implies there might be other significant factors.

Table 3 Length of the Report – Linear Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
c	0.439247	0.031748	13.83535	0.0000
Length	0.001938	0.000399	4.861763	0.000
Regression parameters				
R-squared	0.164559	Mean dependent var.		0.577049
Adjusted R-squared	0.157597	S.D. dependent var.		0.172122
S.E. of regression	0.157978	Akaike info criterion		-0.836488
Sum squared resid	2.994836	Schwarz criterion		-0.790500
Log likelihood	53.02452	Hannan-Quinn criterion		-0.817797
F-statistic	23.63674	Durbin-Watson stat.		1.575711
Probability	0.000004			

Source: Own processing

4 Conclusions

Based on the results, we could not confirm the hypothesis that there is a difference in quality between the business valuation reports produced by individuals and institutions. This is contrary to the popular belief that the institutions have the

advantage of sharing knowledge and skills, which should, at least in theory, lead to more quality reports overall. Based on our findings, it seems that the legal form should be irrelevant when one seeks a quality valuation.

More surprisingly, there seems to be a negative correlation between the years of active practice and quality of the reports. This finding, in fact, undermines the current conception of requirements for the experts enforced by the regulatory authorities since the experts are obliged to prove a certain experience before they can even be appointed. Our explanation of this finding is that the experts with a lesser amount of years of active practice are generally younger, which means that they have been impacted by the contemporary research and development in the field of valuation during their studies, or their training.

Finally, we have shown that longer and more elaborated reports seem to have better quality overall. With several caveats, of course. First, the business valuation reports clearly need to have a certain minimum length to ensure all the required analyses are performed in a proper depth. Still, a long report serves no good should it consist of mostly irrelevant and redundant information. Second, there are other reasons why valuation reports might be shorter. An example could be a report where the expert was unable to fulfill the goal due to missing data, but he justified his procedures properly. This should still be rated as a quality work taking all the circumstances into consideration.

Once we have stated the implications, we should not fail to discuss the limitations of this research. Most importantly, one can never quantify every aspect of the valuation report. The scores presented in this research only assess whether the valuation report includes all the steps, procedures, and methods required by the valuation standards and the generally accepted valuation principles. Specifically, they reflect whether the expert performed all the standard analyses and described them in the report properly, or whether he or she properly justified why certain steps were omitted. It does not imply anything about the correctness of the results or the values of businesses determined by the experts. In addition, the outputs of the regression models presented in this study suggest there might be additional at least equally important determinants of valuation reports' quality.

Moreover, published valuation reports are not a complete representation of the population. Valuation reports are often assembled for other purposes such as court processes or investment decisions. These reports are, however, not available to the general public as they are strictly confidential.

And finally, we realize that averaging the scores is only one way to assess these reports. In our interpretation, we only assume that every section of the report is equally important. Also, using one score that describes the overall quality of the report is a practical approach to the quantitative research, yet it causes that one loses the whole story behind the report.

Still, we believe that our analyses bear important implications as they challenge paradigms that may no longer apply. We hope that more attention will be paid to the professional and personal traits of the experts, because sometimes, the product might not be as good as initially expected.

Acknowledgement

References

Červený, M. (2018). Návrh kritérií pro hodnocení znaleckých posudků na ocenění podniku: výnosové ocenění. Prague: *Oceňování: čtvrtletník,* 11(1), 3–17. ISSN 1803-0785.

Damodaran, A. (2012). *Investment valuation: Tools and techniques for determining the value of any asset.* 3rd ed. New Jersey: John Wiley & Sons. ISBN 978-1-118-13073-5.

Doležalová, L. (2011): Nedostatky ve znaleckých posudcích s doporučením na jejich odstranění. Master Thesis. Prague: University of Economics, Prague. Supervisor M. Mařík.

Havlíková, Z. (2017). Analýza úrovně znaleckých posudků pro výnosové ocenění podniku. Master Thesis. Prague: University of Economics, Prague. Supervisor M. Mařík.

Mařík, M. (2018). Metody oceňování podniku – proces ocenění, základní metody a postupy. 4.ed. Prague: Ekopress. ISBN: 978-80-87865-38-5

Mařík, M., & Maříková, P. (2011): Slabší místa v ocenění českých podniků - 1. část. *Odhadce a oceňování podniku*, XVII(2), 21-31. ISSN 1213-8223.

Rýdlová, B. (2015): Zpracování revizních posudků. Prague: *Oceňování: čtvrtletník, 8(2),* 74–85. ISSN 1803-0785.

Švecová, E. (2017): Analýza vybraných znaleckých posudků pro ocenění podniků v ČR. Master Thesis. Prague: University of Economics, Prague. Supervisor M. Mařík.

Hybrid Mismatches, CFC Rules and Interest Deduction Rules as stated in the OECD and EU standards and their Reflection in the Czech and Slovak Law – a Comparative Study

Kristýna Bělušová

Abstract: *The aim of this paper is to compare the way the rules for Hybrid mismatches, CFCs and the Interest Deduction rules are/will be reflected in the Slovak law and the way the rules should be reflected in the Czech law. Following aim is to compare these rules as stated in the OECD Action Plan on Base Erosion and Profit Shifting, specifically Actions 2, 3 and 4, and in ATAD Directive. The paper is based on a qualitative research, specifically on a multiple case study. The subject of the research was the above-mentioned OECD and EU standards, texts of legal regulations, document of the Chamber and technical texts dealing with implementation these standards in the national legislations.*

On the basis of research made, one can conclude that the BEPS and the ATAD Directive lay down very similar rules in relation to the categories in question. According to the document of the Chamber the Czech Republic intends to define CFC revenues exhaustively, while the Slovak Republic defines them in a general manner. None of these States will impose any exemptions in relation to the CFC. Compared to the Czech Republic, the Slovak Republic has already established and introduced rules on Hybrid mismatches. As for the interest deduction rules, the Czech Republic intends to adopt the upper limit for the deductibility of interest and the de minimis threshold exemption with a lower threshold than it is stipulated in the ATAD Directive. The Slovak Republic, however, will take advantage of the Article 11 and retains the current rules on the limitation of the deduction of interest, the so-called low capitalization rules.

Key words: ATAD Directive · BEPS · CFC rules · Interest Deduction · Hybrid Mismatches

JEL Classification: H25 · H26 · H34

1 Introduction

"*The current international tax framework incentivises the location of expenses in higher-tax jurisdictions and income in low- or no-tax jurisdictions as it can result in significant tax minimisation*" (Kayis-Kumar, 2016). Tax minimization is precisely the outcome of tax planning which can be defined as the company' activities carried out in order to minimize the tax burden through any available contributions, deductions or exemptions (Januleviciene, Rackeviciene, 2016). "*Tax planning opportunities are not same for all taxpayers*" i. e. especially for small and medium-sized enterprises (Gazzola et al., 2018) and moreover, tax planning leads to inefficiency of the economy (Knuutinen, 2013). The notion of tax planning is undoubtedly associated with the notion of aggressive tax planning. According to Carrerro and Seara (2016), aggressive tax planning is deemed to mean a type of tax planning which can be defined as "*the behaviour adopted by multinationals to explore the existing opportunities to decrease the tax burden granted by globalization and the interaction of tax rules in different jurisdictions*" (Dourado, 2015). Precisely payments for royalties and interest and dividend flows which can be classified as passive income (Sojka, 2017) are often used by multinational enterprises as a tool of aggressive tax planning.

Aggressive tax planning generates substantial losses for national economies in terms of revenue to the state budget (according to OECD, this amounts to $100 - $240 billion per year (OECD, 2015a in Avi-Yonah, 2017))), which is why in 2008, OECD started to take steps to restrict it (Juruss, Kuma, 2016). As a result of these measures or steps was the creation of OECD BEPS Action Plan (Base Erosion and Profit Shifting) (Juruss, Kuma, 2016, OECD, 2015a), that includes 15 actions with the aim to ensure "*that profits are taxed where economic activities generating the profits areperfomed and where value is created*" (OECD, 2015a) (hereinafter referred to as BEPS*). BEPS stipulated "*three tiers of*

Ing. et Ing. Kristýna Bělušová, Brno University of Technology, Faculty of Business and Management, Department of Finance, Kolejní 2906/4, 612 00 Brno, e-mail: Kristyna.Belusova@vutbr.cz

norms in the form of "minimum standards," "recommendations," and "best practices" to be operationalized in both OECD and non-OECD member states via multiple soft and hard law mechanisms" (Christians, 2016).

Following to the above, the Council of the European Union adopted the *Council Directive (EU) 2016/1164 of 12 July 2016 laying down rules against tax avoidance practice that directly affect the functioning of the internal market* (hereinafter referred to as ATAD Directive (Eur-lex, 2018a), with the aim to through adopting methods, against aggressive tax planning, which are in accordance with the conclusions stemming from BEPS, i.e., to increase the effective taxation of the internal market. The implementation of this directive into individual legal regulations of EU member states will result in the creation of a minimum level of protection of tax systems in the area of corporate income tax. (Eur-lex, 2018a in Ginevra, 2017). As regards action 2 Hybrid mismatches, this involves *Council Directive (EU) 2017/952 of 29 May 2017 amending Directive (EU) 2016/1164 as regards hybrid mismatches with third countries* (hereinafter referred as ATAD 2 Directive) (Eur-lex, 2018b).

This contribution targets rules for payments concerning passive income in BEPS, namely action 2 – Hybrids, 3 – Controlled foreign company Rules and 4 – Interest deduction, and the relevant articles ATAD and ATAD 2 Directive (4 – Interest limitation Rule, 6 a 7 – Controlled Foreign Company Rules (hereinafter referred to as CFC rules) a 9 – Hybrid mismatches).

2 Methods

The aim of this paper is to describe and compare rules for hybrid mismatches, CFC and Interest Limitation Rule in the form they are/will be reflected in legal regulations of the Slovak Republic, and in the form they are to be provided for in the legislation of the Czech Republic. Following aim is to compare such rules, or recommendations, stipulated in BEPS and ATAD Directives.

The contribution is based on qualitative research. Given the scope of the contribution, the purpose of the study is to describe and compare the relevant rules on at a general level using four criteria – *Basic definition of the notion, entities concerned, relevant rule and exceptions.* Hybrid Mismatches Action 2 focuses solely on financial instruments in connection with the passive income category.

The paper is based on content analysis of the text. Selected texts published by OECD (OECD, 2015b, 2015c, 2015d), ATAD and ATAD 2 Directives (Eur-lex, 2018a, 2018b), as well as the document for public consultation regarding the implementation of EU directive on tax avoidance in the Czech law, published by the Ministry of Finance (MFCR, 2017), Parliamentary Doc. 206, approved in the first reading in the legislative process (PSP, 2018), Act No. 595/2003 Coll., on Income Tax, in force and effect as of January 1, 2019, Information on Amendment to Act No. 595/2003 Coll., on Income Tax, as amended, in the area of cross-border tax relations (MFSR, 2017a), and Statement of Basis and Purpose of the Ministry of Finance of the Slovak Republic, approved by the government on August 16, 2017 (MFSR, 2017b) were object of the research.

The structure of the paper is as follows. The following part of the contribution defines rules which will most likely be implemented in the legal regulations of the Czech and Slovak Republics. The final summary is preceded by a comparison of individual standards with rules defined by domestic legal regulations.

3 Research Results – Reflection BEPS a ATAD Directive standards in the Czech and Slovak law

CFC Rules and Interest limitation Rule have to be implemented in the national legal regulations by December 31, 2018, effective on the date of January 1, 2019 (Eur-lex, 2018a). Rules concerning hybrid mismatches have to be reflected in the relevant legal regulations by December 31, 2019, effective on the date of January 1, 2020. (Eur-lex, 2018b). From the perspective of Czech legal regulations, the relevant rules will be reflected in Act No. 586/1992 Coll., on Income Tax (hereinafter referred to as ZDP-CZE). In the process of implementation of these rules, the Ministry of Finance created a document for discussion, which served as a basis for public consultation (for more detail, see MFCR, 2017). The draft amendment to the income tax act containing the relevant rules is a part of the tax package for 2019 (Parliamentary Doc. 206/0 part 1/12, which amends certain tax laws - EU), with the relevant legislative process still pending (PSP, 2018). As regards Slovak legal regulations, the relevant rules are/will be implemented in the Act No. 595/2003 Coll., on Income Tax (hereinafter referred to as ZDP-SR). Rules concerning hybrid mismatches were reflected in this law as of January 1, 2018. As regards CFC Rules, they will enter into force as of January 1, 2019. According to the statement of basis and purpose of the Ministry of Finance of the Slovak Republic, approved by the government on August 16, 2017 (for more detail, see MFSR 2017b), the current *low capitalization rule* will be left in place in connection with rules for limitation of interest deductibility. The Slovak Republic thus applies Article 11 which makes it possible to leave national rules

limiting interest deductibility in national legal regulations (MFSR, 2017b), provided they are as effective as those in BEPS action 4.

3.1 Hybrid Mismatches

Hybrid mismatches or rules arising from different legal classification will be defined in Section 23h of the ZDP-CZE. These rules are to become valid as of January 1, 2020. According to these rules, where a multiple reduction of the tax base of associated entities occurs in expenses due to different legal classification, the results of operations of the associated entity - recipient - will be increased by such amount. Where a reduction of the tax base of one associated entity occurs in the payment between associates, and such payment is not included in the tax base of the associated entity to whom it arises, such payment shall be included, to the adequate extent, in the tax base of the payee. Associated entities are deemed to be entities in which an entity holds at least a 50% share in the registered capital, profit or voting rights. (PSP, 2018)

These rules were added in Section 21 (2)(o) in relation to ZDP-SR as follows: expenses or costs of dependent persons (i.e., an economically connected entity in which another entity holds a direct or indirect share in voting rights, registered capital or profit of at least 25%) do not constitute a tax expense, i.e., will be included in the tax base to the extent such dependant persons apply such tax cost more than once (deduction on the part of the payer and on the part of the payee). Where the relevant payment is deducted from the tax base on the part of the payer and classified as income not included in the tax base on the part of the payee, such income does not constitute taxable income, i.e., will be included in the tax base of the relevant payee. (ZDP-SR) Table 1 below provides a comparison of rules in terms of the relevant standards and legal regulations under examination.

Table 1 Comparison of rules for Hybrid mismatches

Crite-rium	BEPS	ATAD Directive	ZDP-CZE	ZDP-SR
Basic definition of the notion	Cross-border payments leading, due to different legal regulations, to double non-taxation, double deduction or long-term deferral of the payment	Payments leading, due to different legal classification, to deduction without inclusion or double deduction	Expenses/ Payments leading, due to different legal classification, to multiple reduction of tax base or deduction/non-inclusion in the tax base	Expenses leading, due to different legal regulations, to multiple deduction or deduction/non-inclusion in the tax base
Entities concerned	Related person (minimum share of 25 %)	Associated enterprise (minimum share of 50 %)	Associated enterprise (minimum share of 50 %)	Dependent persons (minimum share of 25 %)
Basic Rule	Deny payer/payee deduction Deny payer deduction / Include as ordinary income for the payee	Deny payer/payee deduction Deny payer deduction / Include as ordinary income for the payee	Deny payee deduction Include as ordinary income for the payee	Deny payee deduction Include as ordinary income for the payee
Exceptions	Yes, to payments of investment means which are subject to *lege speciales*	Yes, defined exhaustively in relation to financial institution, and further, payments representing return on assigned financial tool or payment where the resultant mismatch arises from differences in payment allocation or non-recognition of payment/permanent establishment	No	No

Source: Own elaboration with using OECD (2015b), Eur-lex (2018b), PSP (2018), ZDP-SR.

3.2 CFC Rules

According to Parliamentary doc. 206, if approved without modifications, the rules for CFC would be defined in Section 38fa of the ZDP-CZE, nevertheless, the draft amendment to this act is yet to be fully discussed and approved. The definition of CFC ought to remain as defined by ATAD Directive. Income to which such rules will apply, and which will thus be included in the controlling company's tax base, ought to be defined exhaustively, i.e., pursuant to Article 7 (2)(a) of the ATAD Directive, if the entity in question does not pursue significant economic activity using staff, equipment, property and premises. No exemptions from these rules set forth by the directive will be implemented into the ZDP-CZE. Income included in the tax base will be calculated in accordance with regulations on corporate income tax *pro rata* to the tax payer's participation in the relevant entity. In the event of a loss, the tax base of the controlling company cannot be reduced by such loss, however, in the following three taxation periods, the loss may be applied only up to the positive

balance of the controlled company's results of operations, by which the tax base of the controlling company is to be increased. If CFC income leads to double taxation, CFC tax will be deducted by way of set-off in accordance with Czech tax law. (PSP, 2018).

CFC Rules will be stipulated in the ZDP-SR in Section 17h (the draft amendment has already passed through all the legislative processes and was promulgated in the collection of laws). The definition of CFC is identical with the definition set out in the ATAD Directive. Nevertheless, income to which such rules apply is generally defined as income which is not real and was effected to obtain a tax benefit (i.e., pursuant to Article 7 (2)(b) of the ATAD Directive). Such income is included in the tax base of the parent company - resident of the Slovak Republic - to the extent such income is attributable to property and risks related to the discharge of important functions by the payer; the amount of such income is calculated on an arm's length basis. No exemptions will be reflected in this legal regulation in relation to CFC. If the inclusion of CFC income in the parent company's tax base leads to double taxation, such double taxation will be prevented by way of set-off of the tax paid. (MFSR, 2017a, ZDP-SR) Table 2 contains a comparison of individual rules set forth in the standards under observation, and their comparison to domestic legal regulations.

Table 2 CFC rules comparison

Criterium	BEPS	ATAD Directive	ZDP-CZE	ZDP-SR
Relevant income	Undivided dividends, interest, insurance proceeds, etc. (income to which CFC does not apply is defined)	Exhaustively defined undivided income (e.g., interest on financial assets, royalties, dividends, etc.), if the entity does not pursue significant economic activity, or generally defined as undivided income from artificial transactions	Exhaustive list of individual types of income pursuant to ATAD Directive	Generally defined as undivided income from artificial transactions pursuant to ATAD Directive
Entities concerned	Company or permanent establishment in which the controlling company holds at least 50%, if located in a jurisdiction with a significantly lower tax rate than in the domestic jurisdiction	Company or permanent establishment in which the controlling company holds at least 50%, if located in a jurisdiction where the tax rate is lower than 50% of the rate applicable in the domestic jurisdiction	Same as the definition in ATAD	Same as the definition in ATAD
Basic Rule	Inclusion of CFC income into the parent company's tax base	Inclusion of CFC income in the parent company's tax base	Same as the definition in ATAD	Same as the definition in ATAD
Exception	De minimis threshold /identical effective tax rate	Income defined exhaustively: de minimis threshold/expanded to include EEA states in case of significant economic activity. Income defined on a general basis: de minimis threshold	No	No

Source: Own elaboration with using OECD (2015c), Eur-lex (2018a), PSP (2018), ZDP-SR.

3.3 Interest Limitation Rule

In the event of limitation of deductibility of excessive borrowing expenses, the basic rule will be implemented through Section 23e and Section 23f, which stipulates that to the extent of positive difference between excessive borrowing expenses and the limits for their deductibility, i.e., the higher of two amounts (30% EBITDA or CZK 80 million (*de minimis threshold*), interest will not be deductible. The definition of excessive borrowing expenses is identical with the definition set forth in the directive. As regards payers whose tax base will be increased by excessive borrowing expenses in the ordinary taxation period according to this rule, they will be able to carry such excessive borrowing expenses forward, in order to apply them in the following taxation periods, always up to the amount of the positive difference between excessive borrowing expenses and their deductibility limit. Exemptions from the regime governing deductibility of excessive borrowing expenses are provided for certain types of financial institutions defined exhaustively, as well as entities without an associated entity defined for the purposes of CFC (25% interest in the capital, voting rights or profit of the entity), a permanent establishment or the duty to compile consolidated financial statements (*entities outside the group). (PSP, 2018)*

According to the statement of basis and purpose of the Ministry of Finance of the Slovak Republic, approved by the government on August 16, 2017 (MFSR 2017b), the rule pertaining to the limitation of deductibility of excessive borrowing expenses will not be transposed in the ZDP-SR at present. According to the currently applicable low capitalization rules, the dependent person thus cannot deduct from its tax base more than 25% of interest paid on loans and credits, including related costs, from the results of operations before tax, which include depreciation, including interest costs (ZDP-SR). Table 3 compares the standards and their reflection in national legislation.

Table 3 Comparison of rules for the limitation of deductibility of interest

Criterium	BEPS	ATAD Directive	ZDP-CZE	ZDP-SR*
Basic definition of the notion	Interest on debt in all forms, payments economically equivalent to interest, etc.	Interest on debt in all forms, payments economically equivalent to interest, etc.	Same as the definition in ATAD	Interest on loans and credits, including related costs
Entities concerned	All legal entities	All entities	Group entities (does not apply to entities outside the group)	Dependent person (25% share)
Basic rules	Deduction up to 10 – 30% of EBITDA	Deduction up to 30% of EBITDA	Deduction up to 30% of tax profit before depreciation, interest and tax	Deduction up to 25% of results of operations before tax, including interest costs and depreciation
Excetions	De minimis threshold	De minimis threshold / deduction in full	De minimis threshold	No

Source: Own elaboration with using OECD (2015d), Eur-lex (2018a), PSP (2018), MFSR (2017b), ZDP-SR.

* Definition of the low capitalization rule

3.4 Summarization of the comparison of individual rules

In the rules applicable to hybrid mismatches, BEPS and ATAD Directive set forth a nearly identical definition, save for the long-deferral of this payment, provided for in BEPS. According to BEPS, entities affected by this rule are affiliates which own a direct or indirect 25% in registered capital. Nonetheless, ATAD 2 Directive raises this threshold to 50%. The 25% threshold which is based on BEPS was implemented into the ZDP-SR. As regards the ZDP-CZE, the 50% threshold will most likely be implemented. The basic rules regarding double application of the payment or the application/non-inclusion of the payment are/will be defined in the same way in the standards under examination, as well as the relevant provisions of law. As regards exemptions, BEPS sets forth certain exemptions from the rules for payments of investment funds which are subject to *lege speciales*. Unlike BEPS, ATAD 2 Directive makes it possible to implement exemptions in several areas. Nevertheless, none of the states under observations intends to transpose such exemptions into its laws.

Unlike the standard of the ATAD Directive, BEPS also defines income to which the rules do not apply. ATAD Directive gives member states discretion to decide whether they would implement the relevant income in their national laws using a category-based approach which, according to MFCR (2017), gives the states greater legal certainty - both to tax payers and tax administrators, or using a general definition which might lead to a more objective outcome but which requires assessment of the individual transactions on a case by case basis. For the sake of greater legal certainty, the Ministry of Finance of the Czech Republic thus opted for the category-based, or exhaustive, list for the reflection of the rules. ZDP-SR implements the general definition approach for a change. The entities to which the rules apply, as well as basic rules, are defined both in the standards and in the legal regulations of the states observed in the same way. As in the case of hybrid mismatches, ATAD Directive gives member states the possibility of applying a higher number of exemptions than BEPS, and in case of a general definition of income, the exemption may be applied to income from artificial transactions. Nevertheless, none of the states under observation will transpose the exemptions in question into their national laws.

As for rules limiting deductibility of interest, it can be said that the definition of payments to which the rules will apply after implementation into ZDP-CZE is the same as the definition provided in the ATAD Directive. Nonetheless, the rules do not apply to entities who do not have any affiliates (25% of the entity in the capital, profit or voting rights of another entity), a permanent establishment or the duty to compile consolidated financial statements. The basic rules implement the upper limit defined by the directive. The de minimis threshold rule is ultimately implemented by the Czech Republic in the way defined by the directive, although in the document for debate, the Ministry of Finance originally wanted to implement a lower threshold. The reason why the threshold was left as defined in the ATAD Directive is to preserve the low capitalization rules as defined in Section 25 of the ZDP-CZE. As regards the low capitalization rule

within the ZDP-SR, it can be said that it sets forth rules which are very similar to those set forth in the ATAD Directive. The entities concerned to whom the rule applies are dependent persons (25% share in registered capital, profit or voting rights). The relevant entities can thus deduct interest up to 25% of results of operations before interest costs and depreciation. The provision does not provide for any exemptions.

4 Discussion and Conclusions

This contribution compares basic rules regarding hybrid mismatches, CFC and limitation of interest deductibility. Since the contribution focused on payments of passive nature, the rules for hybrid mismatches only addressed to financial instruments. The rules defined in Czech legislation, as described and then compared herein, may not be final as the legislative process is still pending; however, their final form and the possibility of expanding the comparison of such rules to laws of other member states provides room for further research. However, it is important to say that due to aggressive tax planning, *"the estimated net tax revenue loss ranges from 4 % to 10 % of global corporate tax revenues"* (Johansson, et al., 2016). This income tax loss, as well as the fact that according to a study carried out by Hardeck and Wittenstein (2018), hybrid mismatches represent material and continuous means for effective reduction of tax obligations of payers, it is necessary to implement rules set forth in BEPS in the laws of both member and non-member OECD states. Nevertheless, both BEPS which only provides recommendations, and the ATAD Directive give national legislators a fairly broad discretion. According to the comparison performed, the member states did avail themselves of this option. However, the question remains whether different implementation of rules arising from the directive, or rather, standards under observation, will not enable large multinational enterprises to use mechanisms, or means, for transferring profits to jurisdictions with low or no tax anyway.

Tax avoidance on the part of multinational enterprises in the form of transfer of profits from countries with relatively high corporate income tax rates to tax havens with low or no tax, can be viewed as a very common phenomenon in today's global world (Hybka, 2014). The profit transfer problem arose as a result of rules created by states in order to protect their domestic tax bases. And it is precisely the relationship between very different national tax rules that created the opportunities for tax benefits for multinational enterprises (Smith, 2014). To prevent tax avoidance on the part of multinational enterprises, the individual tax systems need to be coordinated in a certain way, by means of BEPS, or the ATAD Directive. The purpose of this contribution was to describe and compare rules pertaining to Hybrid Mismatches, CFC and limitation of interest deductibility in the form in which they are/will be set forth in Slovak legislation, and in the form in which they are to be set forth in Czech laws. An individual objective of this contribution was to compare, in the context of the relevant rules, the recommendations set forth in BEPS and ATAD Directives. The contribution was based on qualitative research, where analysis of content of texts of legal regulations was carried out using the data collection technique, followed by their comparison. The resultant finding is that neither the Czech Republic nor the Slovak Republic will implement any exemptions in their laws in the context of CFC rules. The Czech Republic will define income falling under CFC using a category-based approach, or rather, by providing an exhaustive overview, while the Slovak Republic opted for a general definition. The Czech Republic will implement rules on hybrid mismatches as of January 1, 2020, while the Slovak Republic implemented the rule as of January 1, 2018. As regards the rule for limitation of interest deductions, the Slovak Republic will make use of Article 11 of the ATAD Directive, i.e., will retain the low capitalization rules for the time being. The Czech Republic will then implement these rules with an upper deduction limit of 30% of EBITDA, save for the *de minimis threshold.*

References

Avi-Yonah, R. (2017). International Tax Avoidance – Introduction. *Accounting, Economics and Law*, 7(1), 1367-1372. doi: 10.1515/ael-2016-0071

Carrero, J. M. C., & Seara, A. Q. (2016). The concept of 'Aggressive tax planning' launched by the OECD and the EU commission in the BEPS era: Redefining the border between legitimate and illegitimate tax planning. *Intertax,* 44(3), 206-226.

Christian, A. BEPS and the New International Tax Order. *Brigham Tax University Law Review*, 6, 1603-1646.

Janulevičienė, V., & Rackevičienė, S. (2016). Public Sector Fraud: Comparative Analysis of Terminology and Concepts. *Public Policy and Administration,* 15(4), 673-686. doi 10.13165/VPA-16-15-4-11

Dourado, A. P. (2015). Aggressive tax planning in EU law and in the light of BEPS: The EC recommendation on aggressive tax planning and BEPS actions 2 and 6.*Intertax*, 43(1), 42-57.

Eur-lex. (2018a). *Council Directive (EU) 2016/1164 of 12 July 2016 laying down rules against tax avoidance practice that directly affect the functioning of the internal market.* Eur-lex.eu [online]. Available at: https://eur-lex.europa.eu/legal-content/CS/TXT/?uri=CELEX%3A32016L1164 [cit.-2018-10-13].

Eur-lex. (2018b). *Council Directive (EU) 2017/952 of 29 May 2017 amending Directive (EU) 2016/1164 as regards hybrid mismatches with third countries.* Eur-lex.eu [online]. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2017.144.01.0001.01.ENG [cit.-2018-10-13].

Gazzola, P. Slavata, D., & Panova, O. (2018). Small and medium-sized enteprise development the Europe'context. In: the Proceedings of IVth International scientific and practical Internet-conference "Business administration in terms of turbulent economy. (in print)

Ginevra, G. (2017). The EU anti-tax avoidance directive and the base erosion and profit shifting (BEPS) action plan: Necessity and adequacy of the measures at EU level. *Intertax,* 45(2), 120-137.

Hardeck I., & Wittenstein, P. U. (2018). Assessing the tax benefits of hybrid arrangements - evidence from the Luxembourg leaks. *National Tax Journal*, 71(2), 295-334. doi: 10.17310/ntj.2018.2.04

Hybka, M. M. (2014). Legislative proposal for a controlled foreign companies régime in Poland from an international perspective. *Financial Theory and Practice*, 38(4), 465-487. doi: 10.3326/fintp.38.4.4

Johansson A. et al. (2016). Tax planning by multinational firms: From level evidence from a cross-country database. In: *Economic Departments of Working Papers No. 1355*, 1-63.

Juruss, M., & Kuma, E. (2016). BEPS: Impact of international tax measures on business environment in Latvia. *International Scientific Conference: Turiba University,* 104-112.

Kayis-Kumar, A. (2016). What's BEPS got to do with it? Exploring the effectiveness of thin capitalisation rules. *eJournal of Tax Research,* 14(2), 359-386.

Knuutinen, R. (2013). International Tax Planning, Tax Avoidance and Corporate Social Responsibility. *Interdisciplinary Studies Journal,* 3(1), 73-84.

MFCR. (2017). *Implementace směrnice EU proti vyhýbání se daňovým povinnostem do českého právního řádu: podklad pro veřejnou konzultaci.* Mfcr.cz [online]. Available at: https://www.mfcr.cz/cs/o-ministerstvu/verejne-diskuze/2017/verejna-konzultace-implementace-smernice-28011 [cit. 2018-10-13]. [The implementation of EU directive on tax avoidance in the Czech law: Basis for public discussion]

MFSR. (2017a). *Informácia o novele zákona č. 595/2003 Z. z. o dani z príjmov v znení neskorších predpisov v oblasti cezhraničných daňových vzťahov.* Financnasprava.sk [online]. Available at: https://www.financnasprava.sk/_img/pfsedit/Dokumenty_PFS/Zverejnovanie_dok/Dane/Novinky_leg/Medzinarodne_zdanovanie/2018.01.03_novele_ZDP_za_MZ.pdf [cit. 2018-10-15].

MFSR. (2017b). *Důvodová zprává Ministerstva Financí Slovenské republiky schválené vládou dne 16. srpna 2017.* Nrsr.sk [online]. Available at: https://www.nrsr.sk/web/Dynamic/Download.aspx?DocID=442074 [cit. 2018-10-15]. [Statement of Basis and Purpose of the Ministry of Finance of the Slovak Republic, approved by the government on August 16, 2017]

OECD. (2015a). *OECD: BEPS Actions.* OECD.org. [online]. Available at: http://www.oecd.org/ctp/beps-actions.htm [cit. 2018-10-15].

OECD. (2015b). *Neutralising the Effects of Hybrid Mismatch Arrangements, Action 2 - 2015 Final Report*: *OECD/G20 Base Erosion and Profit Shifting Project.* Paris: OECD Publishing, doi: 10.1787/9789264241138-en

OECD. (2015c).*Designing Effective Controlled Foreign Company Rules, Action 3 - 2015 Final Report*: *OECD/G20 Base Erosion and Profit Shifting Project.* Paris: OECD Publishing, Paris, doi: 10.1787/9789264241152-en

OECD. (2015d). *Limiting Base Erosion Involving Interest Deductions and Other Financial Payments, Action 4 - 2015 Final Report*: *OECD/G20 Base Erosion and Profit Shifting Project.* Paris: OECD Publishing, Paris. doi: 10.1787/9789264241176-en

PSP. (2018). *Sněmovní tisk 206/0, část č. 1/12Vl. n. z. kterým se mění některé zákony v oblasti daní – EU.* Psp.cz [online]. Available at: http://public.psp.cz/en/sqw/text/tiskt.sqw?O=8&CT=206&CT1=0 [cit. 2018-10-22]. [Document of the Chamber 206/0, Part No. 1/12, Governmental Proposal of the Act amending certain tax laws – the EU]

Smith, F. (2014). Asset protection in multinational enterprises – where to now? Implications for asset protection planning in multinational enterprises from the OECD's work on BEPS. *Multinational Business Review,* 22(4), 351-371. doi: 10.1108/MBR-04-2014-0014

Sojka, V. (2017*). Mezinárodní zdanění příjmů: Smlouvy o zamezení dvojího zdanění a zákon o daních z příjmů.* 4. ed. Prague: Wolters Kluewer. ISBN: 978-80-7552-688-5. [International taxation of incomes. Double tax treaties and Income Tax Act].

Zákon č. 595/2003 Z. z. o dani z príjmov v znení platném k 1. 1. 2019. [Income Tax Act].

The Reserve Fund - Creation and Use in Contributory Organizations set up by Local Government Units

Marie Vejsadová Dryjová

Abstract*: The reserve fund of the contributory organizations combines a source fund (generated from an economic result) and a monetary fund (generated from received gifts and unused balances of operating subsidies granted from the budget of the European union). If an entity wants to ensure a full financial coverage of the reserve fund, the entity should not allocate the profit to the fund, for which there is no certainty of the financial coverage. However, as stated in Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended, in § 30, the reserve fund is formed from the profit of the contributory organization on the basis of an approval of its amount by a founder of the organization after the end of the year, reduced by possibly transfers to the reward fund.*

The unused balances of the operating subsidies as the source of the reserve fund give rise to further accounting problems. These unused balances are clearly a liability of the contributory organization to the grant provider, however, accounting rules consider them to be the own source. Czech Accounting Standard No. 704 – Funds clearly defines the accounting rules for the creation of the reserve fund on the basis of the unused balances of the operating subsidies, however, these accounting procedures are difficult to apply in practice. This problem is not closer methodically regulated by the Ministry of Finance. In the Czech Republic, therefore, accounting practices are differentiated.

Key words: Reserve fund · Contributory organization · Economic result · Equity

JEL Classification: H71 · M41

1 Introduction

Contributory organizations are a type of public non-profit organizations that are established for the purpose of performing publicly beneficial activities. Contributory organizations, in the performance of their activities, are governed by Act No. 563/1992 Coll., On Accounting, as amended, where these organizations are designated together with the organizational units of the state, territorial self-governing units, voluntary associations of municipalities, state funds and regional councils of cohesion regions as so-called selected accounting entities. Act No. 583/1992 Coll., On Income Taxes, as amended, marks the contributory organizations as a publicly beneficial taxpayer. The contributory organizations have legal personality and are the entity. They are also subject to other normative regulations governing the accounting – i.e. Implementing Decree No. 410/2009 Coll., as amended, and Czech Accounting Standards No. 701 to No. 710. The management of the contributory organizations established by the territorial self-governing units is regulated by Act no. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended.

Since 2010, the public sector has undergone a number of changes in the accounting. This reform consists mainly of legislative changes. As a result of this reform is changing the practices and principles of the accounting in the public finances. Evidence of the ongoing reform of the public finances is, among other things, the latest amendment of Czech Accounting Standard No. 704 – Funds valid from the 1st January 2016.

The contributory organizations established by the territorial self-governing units in their activity create monetary funds – i.e. the reward fund, the cultural and social fund, the reserve fund and the investment fund. The conditions for the creation and the use of the individual funds are stated in Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended. However, the founder may impose stricter conditions for the creation and the use of the funds but these conditions must not be in conflict with that law. In practice, there may be a differentiation of the conditions of the creation and the use of the funds among contributory organizations and may lead to artificially disturbing the economy of the contributory organizations.

Ing. Marie Vejsadová Dryjová, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Accounting and Finance, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mal: vejsadova@ef.jcu.cz

2 Methods

In accordance with § 30 of Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended, the reserve fund is formed from the improved economic result of the contributory organization based on its approval by the founder after the end of the year, less any transfers to the reward fund. The improved economic result of the contributory organization is created when the actual operating revenues of the contributory organization together with the received operating contribution are higher than its operating costs. The distribution of the improved economic result to the reserve fund and the reward fund is approved by the founder. Maderová Voltnerová and Tégl (2011) state that the improved economic result must be completely divided between the reserve fund and the reward fund. At the same time, the law states that other sources of the reserve fund may be cash gifts and the unused balances of the operating subsidies provided from the EU budget. In § 28 of Act No. 250/2000 Coll., as amended, it is also stated that these unused balances must be monitored separately in the reserve fund and must be used only in stated purposes in the following years. In § 32 of Act No. 250/2000 Coll., as amended, there is also stated that the reward fund is made up of the improved economic result of the contributory organization up to 80 % but not more than 80 % of the amount of the salaries set by the founder.

Basic accounting procedures for the funds of the selected entities are governed by Czech Accounting Standard No. 704 - Funds. The reserve fund consisting of the improved economic result is recognized in the account 413 - Reserve fund from the improved economic result. The decrease of the improved economic result is recorded in the account 431 - Economic result in the approval procedure. The reserve fund consisting of the cash gifts and the unused balances of the operating subsidies provided from the EU budget is recorded in the account 414 – Rezerve fund from other titles. The receipt of the cash gifts is recorded in the account 241 – Current bank account. The unused balances of the operating subsidies are recorded on debit side in the group of the accounts 67 – Transfer revenues. Accounting procedures of the creation of the reserve fund which are given by Czech accounting standard No. 704 – Funds are summarized in Table 1.

Table 1 Creation of the reserve fund

Text	Debit side of the account	Credit side of the account
Creation of the reserve fund from the improved economic result	431	413
Creation of the reserve fund from the cash gifts	241	414
Creation of the reserve fund from the unused balances of the operating subsidies provided from the EU budget	67x	414

Source: Czech Accounting Standard No. 704 - Funds

In accordance with § 30 of Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended, the contributory organization uses the reserve fund for the purposes of (with the exception of special-purpose gifts and unspent balances of the operating subsidies from the EU):

- a further development of the activity,

- a time bridge of a temporary mismatch between revenues and costs,

- a payment of any penalties imposed for breach of budgetary discipline,

- a payment of loss for the previous period.

The use of the reserve fund for the purposes of the further development, the time bridge of a temporary mismatch and payment of penalties is recorded in the account 648 – Using of funds. The founder may also allow the contributing organization to use part of its reserve fund, with the exception of special-purpose gifts and the unused balances of the operating subsidies from the EU, to reinforce its investment fund, i.e. account 416 – Investment fund. The payment of the loss for the previous period from the reserve fund is recorded in the account 432 – Economic result for previous period. Březinová (2017) adds that account 432 includes unpaid losses of the past periods. Accounting procedures of the use of the reserve fund which are given by Czech accounting standard No. 704 – Funds are summarized in Table 2.

Table 2 Use of the reserve fund

Text	Debit side of the account	Credit side of the account
Further development of the activity	413, 414	648
Time bridge of the temporary mismatch between revenues and costs	413, 414	648
Payment of any penalties imposed for breach of budgetary discipline	413, 414	648

| Payment of loss for the previous period | 413, 414 | 431, 432 |
| Strengthening of the investment fund | 413, 414 | 416 |

Source: Czech Accounting Standard No. 704 - Funds

3 Research results and discussion

There are a number of uncertainties surrounding the application of the valid legal regulation of the funds of contributory organizations. Chapter Results and discussion highlights the most problematic areas of accounting for the creation and the use of the reserve fund in contributory organizations and at the same time presents the accounting solutions.

The primary problem of the reserve fund is that it has not yet been possible to clarify whether the funds are money or the financial sources. The funds are described as own sources in the accounting and the accounting system is designed in connection with this. In Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended, the funds are described as the finances (money) that are intended for a particular purpose.

3.1 Creation of the reserve fund – proposals for accounting solutions

The reserve fund of the contributory organizations combines the source fund (generated from the economic result) and the monetary fund (generated from received gifts and the unused balances of the operating subsidies granted from the budget of the European union). The reserve fund is formed from the improved economic result less any transfers to the reward fund. It follows that the reward fund is purely voluntary. If the founder decides, the entire improved economic result can be transferred to the reserve fund. But it does not have to mean that the improved economic result is automatically fully financially covered. Maderová Voltnerová and Tégl (2011) state that financially uncovered portion of the improved economic result may be, for example, of the fact that customers do not honor their obligations. In addition, Maderová Voltnerová and Tégl (2011) further describe that if the entire improved economic result, including its possible financially uncovered portion, will be allocated to the reserve fund it is the question of what money will be allocated to the bank account of the reserve fund. The only solution that can be recommended to the contributory organizations is the analytical breakdown of the account 413 (where the financially uncovered portion of the improved economic result is monitored separately). Unfortunately, however, the reserve fund cannot serve as the real financial source.

However, the most problematic part of the creation of the reserve fund is the creation of the fund in the amount of the unused balances of the operating subsidies provided from the EU budget. The situation will be illustrated in a following simplified example. Let us assume some contributory organization that received the subsidy (advance payment) from the EU budget of 500,000 CZK in April. In the second quarter, the organization spent costs of 450,000 CZK. The time resulution of the operating subsidies is carried out by the contributory organization quarterly. Individual variants of the proposals for the accounting solutions are shown in Tables 3 and 4.

Table 3 Variant 1

	Text	Amount in CZK	Debit side of the account	Credit side of the account
1	Advance payment – April	500,000	241	374
2	Creation of an estimated item in the amount of the costs	450,000	388	672
3	Creation of the reserve fund in the amount of the unused balances	**50,000**	**401**	**414**

Source: Own processing

The contributory organization captures the received finances to the bank account (account 241) and at the same time accounts about the short-term received advance payment from the subsidy in the account 374 – Short-term received advance payment from the subsidies. Consequently, the entity creates the account 388 – Estimated assets account in the amount of the actual incurred costs. The unused balance of the operating subsidy (i.e. the difference between accounts 374 and 388) is recorded in the acount 401 – Entity´s equity at the end of the quartal. In this variant, the account 414 captures the unused balance but not as a reduction in the revenues in the group of the accounts 67 but in the account 401. The accounting requirement for the creation of the reserve fund in accordance with Czech Accounting Standard no. 704 –Funds is met in variant 1. At the beginning of the next year, the entity accounts the amount of the unused balances on the debit side of the account 414 and on the credit side of the account 401. The technical transfer between the accounts of the fourth accounting class is captured in the area of own sources. At the time of the settlement, the account 388 is re-accounted in the account 348 – Receivables from local government institutions. Then the account 348 is cleared with the account 374. Another advantage of this variant 1 is that there is no distortion of the volume of reported own sources. As

Juráňová and Juhászová (2017) state, the contributory organizations report the final balances of the accounts 374 and 388 compatible with other subsidies for settlement in according to Czech Accounting Standard no. 703 – Subsidies. The disadvantage of this method is that the unused balance (which can be returned to the provider) is captured in its own sources but from the accounting point of view it is a liability of the contributory organization.

Table 4 Variant 2

	Text	Amount in CZK	Debit side of the account	Credit side of the account
1	Advance payment - April	500,000	241	374
2	Creation of the estimated item in the amount of the received advance payment	500,000	388	672
3	Creation of the reserve fund in the amount of the unused balances	**50,000**	**672**	**414**

Source: Own processing

The advantage of the second variant is full compatibility in according to the requirements of Czech Accounting Standard No. 704 - Funds. The requirement of Czech Accounting Standard No. 704 – Funds is met only if the entire amount of the received advance payment from the subsidy is charged in the account 388. The disadvantage of this method is duplicate reporting on the account 374 and on the account 414.

3.2 Use of the reserve fund – proposals for accounting solutions

In Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended, it does not require the prior consent of the founder to use the reserve fund. As a result, there is differentiated charging among contributing organizations.

Maderová Voltnerová and Tégl (2011) states that one of the other problematic areas of the use the reserve fund is **the further development of the organization** because the Ministry of Finance has never more specified what is meant by further development. The organizations may artificially distort the economic result. The contributory organizations are fully aware of this possibility and use the general dukes of the law to compensate the loss. The result is the achievement of the improved economic result that is reallocated to the reserve fund. However, it is a shadowing of the real state of the economy when the financial problems have not been resolved the reserve fund has been used (charged to revenues in the account 648) and the result is duplicate reporting of revenues. At present, accounting regulations provide the using of the reserve fund is accounted into revenues although the revenues characteristic is not fulfilled (it is the consumption of the own created reserves).

The use of the reserve fund to **the time bridge of the temporary mismatch between revenues and costs** as well as the above-mentioned further development of the organization is not regulated by law. The length of temporality is not stated. Similarly, it is not established whether the finances must be returned to the reserve fund after the temporary mismatch has passed. The variant of the accounting solution states how the contributory organization should revert the finances to the fund after an ending the temporary mismatch between revenues and costs, see Table 5.

Table 5 Ending of the temporary mismatch – repayment of the finances to the reserve fund

Text	Debit side of an account	Credit side of an account
Repayment of the finances to the reserve fund after the ending of the temporary mismatch between the revenues and the costs	648	413, 414

Source: Own processing

The use of the reserve fund to cover the loss for previous years seems to be a seamless area at first glance. However, the contributory organizations have learned to exploit the possibilities of diverging interpretations of the notion of the further development of activity and the temporary mismatch between therevenues and costs. Therefore, the organizations have accounted the reserve fund into the revenues as the result of these offered opportunities. This will cover the loss during the accounting period. Schneiderová and Nejezchleb (2012) confirm that contributory organizations use the reserve fund to cover any economic loss.

4 Conclusions

The category of the funds is currently considered to be the most important factor in the poor bookkeeping of the contributory organizations. If the funds of the contributory organizations were to be reported as monetary, the profit should not be allocated to the funds but only the part of the profit that realistically corresponds to the generated free cash.

The unused balances of the operating subsidies provided from the EU budget are the problem area of the creation of the reserve fund which are captured by other accounting methods than those subsidies applied by Czech Accounting Standard 703 – Subsidies. The applying of the different methods for the same or similar accounting transactions may lead to the difficult interpretion of the balance sheet and profit and loss statements for the users of the accounting informations. In this case, it would be best to include subsidies from the EU budget into the standard subsidy regime. Also because the unused part of the operating subsidies which can be potentially return is understood as the obligation of the organization from the accounting point of view, not as the own source which is accounted according to Czech Accounting Standard No. 704 - Funds.

The legal regulation of the use of the reserve fund is relatively brief. At the same time, it does not define the further development of the activity and the temporary mismatch between revenues and costs. This inconsistency in terms of interpretations may cause the budget discipline breaches by the contributory organizations. The contributory organizations report the artificial economic results by dissolving the reserve fund into the returns and then the organizations create with this artificial profit the reserve fund again. However, the charging of the reserve fund into the revenues does not represent any profit in the organizations but only the re-charging of the part of the equity into the revenues.

References

Act No. 250/2000 Coll., On Budgetary Rules of Territorial Budgets, as amended
Act No. 563/1992 Sb., On Accounting, as amended
Act No. 586/1992 Sb., On Income Tax, as amended
Březinová, H. (2017). Účetní předpisy pro vybrané účetní jednotky. 1. vyd. Praha: Wolters Kluwer. ISBN 978-80-7552-581-9.
Czech Accounting Standards No. 701 to No. 710
Implementing Decree No. 410/2009 Coll., as amended
Juráňová, H., & Juhászová, K. (2017). Účetnictví pro veřejnou správu v příkladech. 1. vyd. Olomouc: Anag. ISBN 978-80-7554-085-0.
Maderová Voltnerová, K., & Tégl P. (2011). Vztahy mezi zřizovatelem a příspěvkovou organizací. 2. vyd. Olomouc: Anag. ISBN 978-80-7263-664-8.
Schneiderová, I., & Nejezchleb, Z. (2012). Účetní reforma 2012 pro ÚSC a jimi zřizované PO. 1. vyd. Praha: Acha obec účtuje. ISBN 978-80-260-2780-5.

Application of detection methods on controlled transactions of concerns „Transfer pricing"

Marcela Hradecká

Abstract: *Controlled transactions of concerns and multi-national groups of business corporations transfer pricing are conducted intentionally. The primary purpose of concern transactions is to use the capital power of the concern for the backup of the concern transactions that lead to increased profits and the economic value of the concern. Due to imperfect and unsatisfactory regulatory legislation of the accounting concerns and multi-national corporations use the loopholes in legislation for the transfer of profits to areas with lower tax legislation for optimize their net profit which is the basis for the payment of dividends and for the pecuniary transfer flow between the mother company and its daughter companies. The mother company should choose such methods for setting the transfer pricing that lead to higher profits of the concern group of corporations and to the maximization of the value of the owners.Methodology of the transfer pricing of concerns must be controlled not only from the tax perspective to prevent tax avoidance by moving money to countries with lower tax burden but also from the accounting perspective so that the controlled transactions were not overprized by fictitious service costs that distort the economic result and decrease the value for the owners.*

This paper deals with the practical application of detection methods aimed at revealing fictitious services included into transfer prices of concerns and suggests possible solution through accounting based on value forming activities and modification of the profit and loss account.

Key words: Transfer pricing · Fictitious service · Reporting · Detection methods ·Value-creating activities · Shareholder value

JEL Classification: M2 · M41 · M42

Research hypothesis

Are transfer prices value-creating activity from the accounting point of view or are they just fictitious transfer services aimed at tax optimization?

1 Introduction

Business relations realized between corporations that do not form a concern and are not connected through capital or persons behave in accordance with the market principle governed by supply and demand for goods and services. When business relations are realized between related parties they should follow the same principles as independent corporations. Organization for Economic Cooperation and Development (OECD) set guidelines (The Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations) for the transfer pricing and methods for pricing dependent transactions for creating a unified procedure for taxation of dependent transactions both from the side of multinational corporations and the tax authority. However, the accounting perspective of the transfer prices remains a rather neglected question. Transfer prices influence the net profit which is the basis for the payment of dividends, net operating result and the added value of orders and projects.

2 Methodology

The methods for pricing dependent transactions according to the guidelines of the OECD for taxation purposes can be classified into transaction methods (method CUP, COST+, RPM) and methods on the basis of profit division (TNNM, PSM). By comparing the methods of transfer pricing according to the OECD guidelines the least reliable method is the comparable price method CUP, as it only compares data from reporting from publically available registers and databases. Individual reported entries of business corporations can contain differing values of costs and earnings even if they refer

Ing. Marcela Hradecká, University of South Bohemia in České Budějovice, Faculty of Economics, Ph.D. student, Department of Accounting and Finance, Studentská 13, 370 05 České Budějovice, Czech Republic, hradecka@mh-dane.cz

to a comparable product. According to the author of this paper the methods on the basis of profit division PSM belong to the most reliable. The methodology of transfer prices based on distribution of profit should be set by firmly fixed calculation of concern or group transaction and profit or earning from that transaction. Consequently the share of the profit or earnings of the individual corporation of the concern is set on the basis of previously agreed scheme. The result effect of the conducted transfer should lead to increased economic value of the concern or multi-national group (shareholder value). This means the growth of ROE (Return on Equity), and EVA (Economic Value Added) measures. The most controversial area of reporting from the accounting point of view is the consumption performances reported in the profit and loss account and its influence on the added value and economic result. The issue of accounting and reporting of transferring prices falls into consumption performances section. This paper analyzes the accepted controlled transactions (services), their nature for the given economic activity. Service can have the nature of value creating activity, operation service or just fictitious service performed with the aim to optimize taxation and cash flow within the concern or the multinational group.

3 Procedure

Among the most common methods of detection of fictitious services, belong the comparison of values between independent bodies with values from dependent transactions. These methods are rather inaccurate as they are based on data from publicly available databases that can be distorted. Other methods include models exposing manipulation with accounting values, for example CFEBT model, Beneish model, M SCORE, and others. These methods analyze data and values from statements, reports and final accounts of corporations related to branch and kind of their economic activity. These methods are also inaccurate for the detection of fictitious services in the area of transfer services as the values in reports can be intentionally manipulated, over or undervalued. Another example is the method of adjusted value added which detects selected data and measures from the profit and loss accounts of selected corporations of a concern or multinational group. It specifically means the indicator of the ratio of services to adjusted added value including personnel costs. All methods based on analysis of accounting reporting suffer the risk that all corporations and particularly the multinationals are interested to improve certain covenants in their reporting with the aim to increase their credit quality or conversely to distort their economic result by controlled flow of their financial means into corporation that have a domicile in lower tax burden jurisdictions. A system of calculations can be used to detect fictitious services. The method of Value Chain Analysis was chosen from the group of methods preventing fraud in accounting and detecting fictitious service. According to Porter (1985) is value chain a sequence of activities, which the corporation sets as primary, that is those that lead to increase of the corporation´s value and secondary, supportive among those the use of information technology could be included.. Value chain method concentrates on competitive advantage which relies on providing activities at lower costs.

Table 1 Formula for Value Chain

Value creating activities +
Margin +
Total price of project

Source: Author´s elaboration

Management of the corporation analyzes and divides and denominates separate activities within the corporation or within a project. Separate activities are assigned the related costs and allocated with real sources that bring increase of the economic value of the group of corporations and increased profits. Each activity is assigned a calculation unit. In the case of provided services the measured unit will be time unit of one hour. All related costs of an activity represent value-creating consumption of performances. This namely represents depreciation of assets, rent and related services, operation costs, advertising, transfer costs of a concern etc. Related costs are recalculated on a measured unit of time i.e. hour and consequently the calculations are made of costs hour. This costs hour is composed of time unit of value-creating activity (consumption performances) expressed in measured unit of time and time unit of average wages cost hour.

Table 2 Entry date for planned calculation for project

Planned calculation	Entry data
Number of hours for project	1 700 hours
Average wages hour incl. insurance	320 CZK
Number of employees	5 employees

Average costs hour	1 000 CZK
Margin	10%

Source: Author´s elaboration

4 Detection processes

On the basis of robotic internal audit the overvaluation of reported fictitious cause related costs can be detected which means fictitious services within the concern that aim at lowering the profit of the transaction and distort the economic result of separate corporations within the group.

Table 3 Detection processes

Creation of reporting	Setting the items of the report necessary for the controlling system
Analysis of deviations	Periodical analysis of deviations of costs from financial accounting in respect to planned calculations
Comparison of wages hour	Comparison of reported work hours on projects with the wages recapitulation for the given period
Comparison of subcontracts	Comparison of reported costs of subcontracts with costs reported in financial accounting
Comparison of operation result	Comparison of achieved operation result with the planned calculated profit from projects
Analysis of other costs	Comparison of total costs in operation result with those in the calculation system
Analysis of partial invoicing	Comparison of earning reported in financial accounting and invoicing prescribed according to calculation system
Stock-taking of unfinished production	Comparison of value-creating activities in calculations and stocktaking reported in financial accounting

Source: Author´s elaboration

Application of detection processes of robotic internal audit

Reporting: On the basis of delivered reporting the following costs were determined from the accounting of the corporation in the main book of accounts (ledger). Accounts from accounting classes 5 and 6 grouped according to projects (orders).

Analysis of deviations: On the basis of the analysis of deviations the following differences from planned calculation were encountered:

Table 4 Results of the detection processes

Name item	Calculation	Ledger	Deviations
Performances output +	1,870,000	1,684,000	-186,000
Consumption performances-	1,156,000	1,369,000	+213,000
Personnel costs -	544,000	581,120	+37,120
Total	170 ,000	-266,120	----

Source: Author´s elaboration

Comparison of wages hours: The comparison of wages hours on the basis of reporting and the wages recapitulation of hours of work structured according to projects of employees showed that for a given project 1816 hours were reported which is 116 hours more than in the planned calculation. The wages costs due to this rose by 37,120 CZK.

Analysis of operating costs: The analysis of operating costs detected that in the financial accounting is accounted service provided by the mother company for advertising campaign to a given project which required higher costs than planned and influenced the value of the average costs hour and the total consumption performances. The costs are higher by 213,000 CZK.

Analysis of earning: The analysis of earnings detected that the final invoicing in the value of 186,000 CZK was conducted according to the planned.

Comparison of operating economic result: the conducted comparison showed that the planned profit in the amount of 170,000 CZK will not be reached with this project. On the contrary loss will be reported. This is caused by higher operating costs of 213,000 CZK and higher personnel costs (wages) of employees 37,120 CZK.

On the basis of conducted detection processes it is necessary to summon managers as responsible person for the given project to give reasons for surpassing the planned amount of hours of work on the project and also to explain why the costs of services are higher y 213,000 CZK. It could be considered a fault of the managers as they should have reported the increase extent of work in an earlier stage of the project or it could be viewed as intentional distortion with the aim of higher wages. As the higher costs of service are concerned it again can be a fault of the responsible employee of the mother corporation when negotiating with the advertising agency or it may be the intentional draining of financial resource from the corporation into the multinational concern. The fourth phase of the project in the amount 186,000 CZK of which was not invoiced can be detected as a fault of the responsible employee. Value Chain Analysis model can be suitably supplemented by ratio indicators aimed at utilization of long term assets. Return on investment and return on capital. In case the management of the corporation does not conduct detection to prevent accounting fraud it can lead to distortion of economic result, which have a direct impact on tax obligation, loss of available cash flow and it can mean financial loss for the share holders because of unpaid dividends or reduction of shareholder value.

5 Modification of reporting leading to detection of fictitious services

External users, the investors and tax authorities in particular primarily get acquainted with accounting reports and final accounts of the corporation. The biggest obstacle for the detection of fraudulent accounting and fictitious services is the content limitation of the items of the profit and loss account according to the Decree 500/2002 Coll., which refers to and puts into practice some parts of the Act No. 563/1991 Coll. on accounting in its valid form for enterprising entities. This decree ordinance) regulates the extent and the way the final accounts is set. The corresponding profit and loss account can be set either according to Attachment No.2 in division into kinds (nature of expense specific classification) or according to Attachment 3 in division into purposes (function of expense, product classification) Accounting units (enterprising entities) defined by the Act on Accounting have therefore liberty as to which method they use for the forming of the profit and loss account. The report formed in the division into kinds is not appropriate for the detection of the detection of fraudulent accounting and fictitious services. It does not reflect and does not show related revenues and costs of the main economic activities that are value-creating in contrast to subordinate revenues and cost of operational character.

Table 5 Profit and loss account statement with specific classification

Marking of the lines	Item of the profit and loss statement
I.	Revenue / Sales from services
II.	Revenue / Sales from goods
A.	Consumption performance
1.	Cost of sales
2.	Consumption of material and energy
3.	Services
D.	Personnel costs
E.	Adjustments of values in the operation area
III.	Other operation revenues

F.	Other operation costs
*	Economic result of operation +/-

Source: Author´s elaboration

From the Table 5 it is evident that consumption performance is the most controversial part of the statement. It includes total costs of materials and services without any distinction or division into those related to economic activity and those of purely operational character.

Table 6 Profit and loss account statement with product specification

Marking of the lines	Item of the profit and loss statement
I.	Revenues / Sales from goods and services
A.	Costs of sales including adjustments of values
*	Gross profit or loss
B.	Selling expenses
C.	Administrative expenses
II.	Other operational revenues
D.	Other operational costs
*	Economic result of operation +/-

Source: Author´s elaboration

Statement with product specification expressing functions of the expenses (Table 6) is more suitable for the detection of fictitious services. Revenues and expenses (costs) related to economic activity create the gross profit or loss. These are the items that influence the added value and economic result.

Table 7 Proposal of modified Profit and loss account statement according to method of value chain

Item a	Denomination of the item
1.	Revenues from sales of goods and services +
2.	Revenues from sales of goods +
3.	Value-creating activities -
*	Gross profit or loss +/-
5.	Other operational revenues +
6.	Other operational costs -
**	Economic result of operation +/-

Source: Author´s elaboration

This modified Profit and loss account statement according to method of value chain is classified into je revenues from the main economic activity and value-creating activities costs that really create added value. The difference of these two items of the profit and loss statement, revenues minus costs create gross profit or loss from the main economic activity. Value-creating activities specifically include calculated purpose related personnel costs, amortization/depreciation of the assets which are used in the given, calculated participation on the rent and related services, calculated participation on the overheads, costs of capital and purpose related participation on advertising and transfer transactions of the concern and so on. Other revenues and costs that can not be purpose related to the value-creating activities would be reported in the economic result of operation under Gross profit or loss from the main activity. The issue of accounting and reporting of controlled transfer transaction concentrates on purpose relation with projects. Part of the services (received controlled

transactions) that are related with the project calculation can be included into value-creating activities and part of the services that can not be proven as related to the project calculation will be included into operational cost under the reported gross profit or loss. Accordingly the costs of outside capital which can be proven as financing the project would be reported as part of the value-creating activities and part of the costs of outside capital which is not related to the project would be reported in the economic financial result. Primary indicator of over-indebtedness of a corporation the statement of balance sheet is the item own capital. Provided this item is in negative values it is a signal for investors and tax authorities that the corporation is over-indebted and the purpose of over-indebtedness must be closely investigated. The Modified Profit and loss account statement according to method of value chain indicates this primary indicator in the item Gross profit or loss from the main economic activity. Provided this item shows negative values is send a signal to investors and tax authority that the corporation realizes its projects, orders or products without the minimal margin or intentionally overvalues the costs of projects and orders by fictitious services. The controlled transactions of multinationals (transfer prices) belong to such costs. To improve the credibility and support for the reported services and costs of outside capital in the Profit and loss statement it would be suitable to set the obligation to specify and describe the division and purpose of received services and prescribed costs of outside capital in the descriptive part of the financial statement on services and costs assignable into calculation of price of service or goods which form the added value (adjusted added value) and on other services and costs of outside capital. Provided these other services are not properly justified and explained, that means no time and purpose relationship with operational or investment part of the corporation enterprise is proven then these services can be qualified as fictitious cost which is part transfer services with the purpose of international tax optimization. All accounting costs and revenues related to the controlled transaction must lead to improving profit, economic value added of the enterprise (EVA) and maximization of shareholder value of the concern or multinational group of business corporations.

Table 8 Comparison of values of a selected company

Statement with specific classification	in thousands CZK	Modified statement	in thousands CZK
Revenue / Sales from services	202,646	Revenue / Sales from services	202,646
Production consumption	80,402	Value-creating activities	107,683
Added value	122,214	Gross profit or loss	94,963
Personnel costs	60,764	Other personnel costs	20,264
Adjustments of values (depreciation, adjustments)	1,462	Other adjustments of values	733
Other operational revenues	2,434	Other operational revenues	2,434
Other operational costs	10,813	Other operational costs	24,813
Economic result of operation	46,741	Economic result of operation	46,719

Source: Author´s elaboration

The difference between the items of the Profit and loss statements is evident from table 8. The comparison of statements based on different classification allows insight into the distortion and limited objectivity of the values of the Profit and loss statement with the specific classification. The added value of the modified statement does not include the personnel costs and does not reflect the depreciation of assets. It is absolutely not possible to analyze and detect services and costs of outside capital that are purpose related with the project or order. Gross profit in the author´s modified profit and loss statement objectively includes personnel costs, depreciation of assets used in some phases of the project but also costs of outside capital in financing the project.

6 Conclusion

Controlled transfer transactions are within the extent of calculated costs value-creating activities. Changes in accounting legislation in the area of reporting, financial statement and accounting standards for evaluation of not only unfinished production would lead to improved success rate in detection of accounting fraud and fictitious controlled services. Accounting based on calculated activities would considerably increase the transparency of every accounting unit. Investors and the tax authority would have a simpler task while analyzing the main economic activity of each corporation and detecting fictitious services reported in other operational costs. The modified Profit and loss account statement according to the method of value chains reflects all the suggestions and proposals.

References

Bakeš, M., Karfíková, M., Kotáb, P., Marková, H., & kol. (2009) *Finanční právo*. 5. vydání. Praha: C H BECK. ISBN: 978-80-7400-801-6

Beneish, M. D. (1999) *The detection of Earning Manipulation*. Bloomington, Indiana. Indiana University. Načteno: https://ru.scribd.com

Brabenec, T. (2008) *Transferové ceny v manažerském a daňovém rozhodování*. Časopis Oceňování. Roč. 1. č. 1.

Hradecká, M. (2018). *Kalkulace, možná metoda pro předcházení podvodů v účetnictví při poskytování služeb*. Konference doktorandů VŠFS 2018, konaná dne (16. 5. 2018)

Innes, J., & Mitchell, F. (2000) Activity based costing. London. The Chartered Institute of Management Accountants. Načteno: https://www.sciencedirect.com

Kislingerová, E. (2010) Manažerské finance. 3. Vydání. Praha: C.H.Beck. Beckova edice ekonomie. ISBN 978-80-7400-194-9

Kislingerová, E., Kopalová, H. & Krause, J. (2006) *Nová teorie ekonomiky a management organizací*. Sborník z mezinárodní vědecké konference VŠE. ISBN 80-245-1091-X

Kouřilová, J., et al. (2014) *Ekonomické dopady legislativních změn v oblasti financí, účetnictví a daní*. Jihočeská univerzita v Českých Budějovicích. Sborník vědeckých prací studentů. ISBN 978-80-7394-485-8

Kubatová, K. (2009) *Daňová teorie – úvod do problematiky*. 2. vydání. Praha: ASPI. ISBN: 978-80-7357-423-9

Král B., et al. (2008) *Manažerské účetnictví*. Management press. ISBN978-80-7261-141-6

Krupová, L. (2001) *Kreativní účetnictví: možnosti a meze*. Praha. Komora auditorů České republiky

Krišťak, J. (2007) *TOC - Theory of constraints*. Slovensko. Načteno: ttps://www.ipaczech.cz/cz/ipa-slovnik/toc-theory-of-constraints

Mantone, P. S. (2013) *Using Analytics to Detect Possible Fraud: Tools and Techniques*. New Jersey: John Wiley & Sons.

Porter, M. E. (1985) *Competitive advantage. Creating and substaining superior performance*. Free Press. NEW YORK. https://www.hbs.edu/faculty/Pages/item.aspx?num=193

Synek, M., Kislingerová, E., et al. (2010) *Podniková ekonomika*. 5. vydání. Praha: C H BECK. ISBN: 978-80-7400-336-3.

Zákon č. 563/1991 Sb. o účetnictví, v platném znění

Vyhláška 500/2002 Sb., prováděcí vyhláška k zákonu o účetnictví, v platném znění

https://ec.europa.eu/taxation_customs/business/company-tax/transfer-pricing-eu

https://www.iras.gov.sg/irashome/Businesses/Companies/Working-out-Corporate-Income

www.accountingtools.com/transfer-pricing/

www.dashofer.cz/download/seminare/TransferoveCeny-2018/

www.extension.iastate.edu

www.economicsonline.co.uk/transfer pricing.html/

www.financnisprava.cz/cs/mezinarodni-spoluprace/mezinarodni-zdanovani-prime-dane/prevodni-ceny-zdanovani-nadnarodnich-spolecnosti/smernice-oecd-2408

www.financnisprava.cz/Revize smlouvy OECD/Přehled srovnatelnosti a ziskových metod/

www.financnisprava.cz/Revize smlouvy OECD/Přehled srovnatelnosti a ziskových metod/Taxes

www.irs.gov/metody používané pro ocenění služeb metodou APA/

www.investopedia.com/transferprice.asp/

www.taxmann.com/transfer-pricing-meaning-objectice.aspx/

www.vutbr.cz

SESSION

MANAGEMENT OF SMALL AND MEDIUM SIZED ENTERPRISES

Relation of Size of Enterprise and Planned Robotization

Jaroslav Vrchota, Drahoš Vaněček, Martin Pech

Abstract*: The paper deals with the relation of enterprises and planned robotization, regarding the size and industry of the enterprises. Currently, the introduction of robots in the Czech Republic has been supported by low unemployment, and an increase of demand in the automotive industry and production. The number of robots increases by 10-20% each year, the most promoted by the automotive industry. The aim of the paper was to describe the relation of planned robotization in the manufacturing industry and size of the enterprises, defined by the number of employees. The statistic tests proved the difference of the enterprises planning robotization and the enterprises without robotization, regarding the size. The enterprises that are going to introduce robotization have more employees. The lack of the robots in the market is mostly seen by the small and micro-enterprises. The most common reason for the introduction of robots was related to the lack of employees.*

Key words: Industry 4.0 · Robotics · Small and Medium-sized enterprises · Robot

JEL Classification: M11 · O33

1 Introduction

So far, the Czech Industry took advantage of cheap labour force; however, such advantage does not exist anymore. Low unemployment drives cheap wage increases; their growth was record this year. There are not any new workers and there is no other option than to introduce more automation. In public, it is often a popular question when we reach productivity and wage levels in Germany. Within Europe, Germany, Denmark and Sweden exceed the average of EU Member States more significantly in these indicators; the Czech Republic lags behind in this direction and reaches only 80% of the EU average. Robotization in production and service could and should change Czech gap compared to industrialized countries. The International Federation for Robotics (Figure 1) states that in 2017 there were 119 robots per 10,000 employees in the Czech Republic (Statista, 2018), in Germany it was three times more. This is also reflected in the productivity achieved, according to the OECD (2017), the added value of the work of the Czech worker was USD 36 per hour, in Germany, however, USD 60 per hour. Germany is fully aware of this advantage and does not want to lose it. That is why a few years ago, its Industry 4.0 came up with the main directions of further development in manufacturing and services: digitization, robotization and artificial intelligence, which need to be intensively focused on (Úšela, 2018).

The Industry 4.0 initiative was also accepted by the Czech Republic, adapted to its conditions (MPO, 2015). In particular, it is important as Czech export to Germany accounts for 30% of all Czech exports. In addition to the final products, Czech companies supply mainly components and whole modules to Germany, mainly for the automotive industry. Here, there must be continuity between businesses, both in communication and information technology, as well as in the production area in terms of quality, subcontracting time, and the ability to respond flexibly to changing customer orders. Robotization has several good opportunities for its further development (lack of staff, linking a large part of the industry to Germany, the need to increase productivity and lower prices, etc.).

Robots are especially successful where they replace regular monotonous work (Pfeiffer, 2016), especially in unfavourable working conditions. Robots are mainly used in mass production and are a significant tool of increasing productivity (Mařík, 2016). The first robots were robust automated machines, using special software, and they could do nothing but what was programmed. For this reason, they had to work in wire cages so that no one could get close to them when working and get hurt.

Ing. Jaroslav Vrchota, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of management, Studentská 13, e-mail: vrchota@ef.jcu.cz

prof. Ing. Drahoš Vaněček, CSc., University of South Bohemia in České Budějovice, Faculty of Economics, Department of management, Studentská 13, e-mail: dvanecek@ef.jcu.cz

Ing. Martin Pech, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of management, Studentská 13, e-mail: mpechac@ef.jcu.cz

A robot is generally pictured as a machine with rigid bodies with rigid motion, characterized by their metal-like outer skin, with vivid image of nuts and bolts used to build these robot (Cho, Koh, Kim, Chu, Hong, & Ahn 2009). Miketa (2017) reports the results of the National Industry 4.0 study, according to which the most vulnerable professions include: office workers, administrators, drivers, cashiers and jobs using physical work (such as builders, foresters, miners, etc).

The next generation of robots gained ground is known as "co-bots", meaning a collaborative robot cooperating with an operator. They no longer pose a threat to humans and can stop in a certain position. They allow the exchange of machined parts between the robot and the co-worker, which significantly contributes to the increase of labour productivity. The effort is for these two partners to also exchange the necessary information.

The most famous representative of this robot generation is the YuMi robot, weighing only 9.5 kg, and it's just a mechanical hand that can be mounted anywhere and immediately involved in production. Therefore, the robotic, according to Weissler (2018), are also preferred for small and medium-sized enterprises. Similarly, Durakbasa, Bauer, Bas, & Krauter (2016) say that today's challenge means automation with the potential to use new sensors not only in large production complexes but also in small and medium-sized enterprises. Critical factors in introducing industrial robots to small and medium-sized businesses include flexibility and cost.

Figure 1 Number of installed industrial robots per 10,000 employees in the Czech Republic (1993-2017)
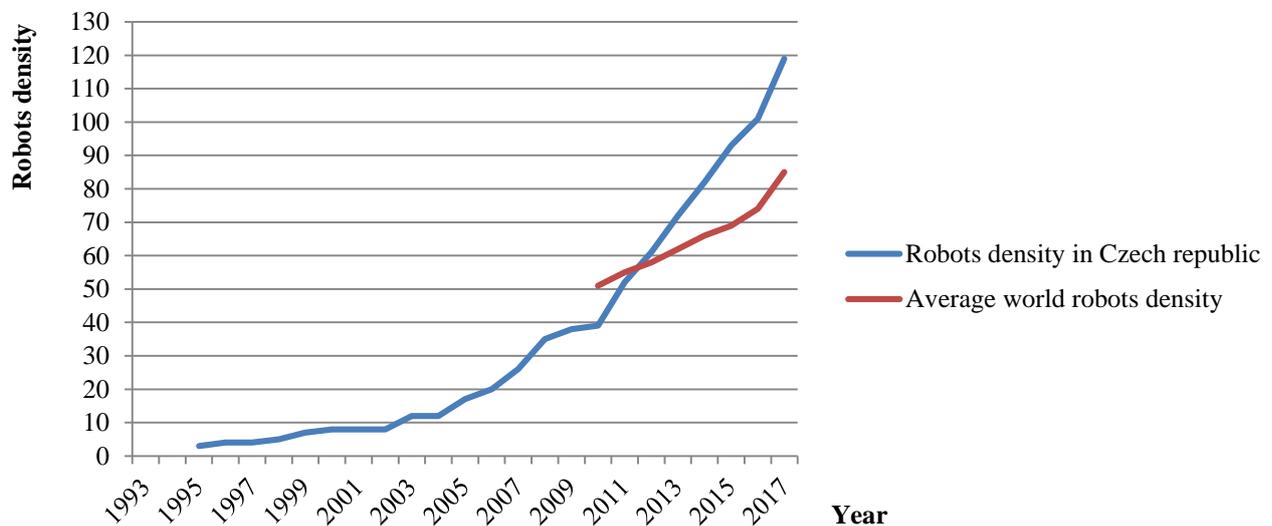
Source: International Federation of Robotics

Of course, robot development will continue quickly, and it will be all about robot lines, and factories, and not just single, separate robots. In this effort, a "digital twin" will be of great importance. It fulfils its task, according to Weissler (2018), both in the development of a new product and in the robotized line (a factory). The digital twin is the computer model of the product being developed, on which the company tests the product, and in the virtual world it exposes it to various tests. It is not necessary to create prototypes of the product in the real world. For each robotic production line, a there is a digital line with a digital twin for each machine (a robot). If an unexpected event occurs (a malfunction, a lack of material, etc.), the problem will first be solved in this virtual system, which then gives a command what the real robot should do to correct the errors. Only when a satisfactory solution is not found the virtual line will turn to an operator to decide about the following steps.

The current debate on robotics deals with artificial intelligence, the use of robots in wars and intelligent algorithms used for example in journalism, and legal sciences (Pfeiffer 2016). Robots are more and more often used in services, such as banking, insurance, etc. There are voice operators (chat-bots) who receive telephone inquiries from customers and try to answer them. Only when they do not know the advice they switch the call to a responsible worker. Stahl, McBride, Wakunuma, & Flick (2014) deal with the use of robots in the areas of care for others and the problem of robot empathy. The use of verbal interaction and robot communication with humans makes it possible to use robots in areas such as home-helpers and lab assistants, assistants in special groups, robotic receptionists, robotic educators, robots in shopping malls, museum robots, robo-guides, autonomous wheelchair robots, robots for serving social drinks, up to exotic applications such as robo-actors, robo-musicians or robo-dancers (Mavridis, 2015). Such applications are also related to the ethical issues addressed by the 7th ETICA Framework Program. According to Ford (2017), new technologies and robotics pose a threat to "white-collar" jobs. There are also the possibilities of easier hacker attack. The digital factory has all the

information in digital form (including how the product is to be manufactured) and this information can be infringed or stolen. Therefore, with the introduction of robotization, the issue of data security must also be taken into account (Kreč, 2016).

2 Methods

The aim of the paper is to describe the relation between planned robotization in the enterprises in the manufacturing industry and the size of the enterprise represented by the number of its employees. The data is based on a questionnaire survey carried out in 2018 in 164 enterprises of the Czech Republic (53 large enterprises and 111 small and medium-sized enterprises). In the sample, there are 12% of micro enterprises, 27% of small enterprises, 29% of medium-sized enterprises and 32% of large enterprises as the most common.

The calculation was done to test the hypothesis, that the distribution functions of both distributions are the same, meaning that the medians are equal, compared to the alternative, that the first of the medians (x0.50) is greater than the second one. The data was tested using two-sample Wilcoxon test (Freeman, 2017) and its asymptotic version. This is a non-parametric two-sample test, which is most often used when the normality of data is not met. A slight disturbance of normality in the samples larger than 30 does not have a significant impact on test results (Devore, 2015).

$X_1, ..., X_n$ and $Y_1, ..., Y_m$ are two random samples of two continuous distributions. Their distribution functions might differ by a shift only. $x_{0.50}$ and $y_{0.50}$ are labelled as the medians of the first and the second distribution (Budíková 2010, Keller 2014). According to Meloun (2012) the equation is:

$$H_0 = x_{0.50} - y_{0.50} = 0 \text{ compared to } H_A = x_{0.50} > y_{0.50} \tag{1}$$

At first, all $(n + m)$ values of $X_1, ..., X_n$ a $Y_1, ..., Y_m$ are ordered by their size. This step is done electronically by Statistika, software ver.10, so that this step is not recorded as is it an easy operation only. After that, the sum of the $X_1, ..., X_n$ values is found and labelled as T_1. The sum of the $Y_1, ..., Y_n$ values is labelled as T_2. Finally, the test statistics is calculated for U_1 and U_2, with $U_1 + U_2 = mn$ (Budíková, 2010).

$$U_1 = mn \frac{n(n+1)}{2} - T_1 \text{ , } U_2 = mn \frac{m(m+1)}{2} - T_2 \tag{2}$$

If the statistics of $\min \{U_1, U_2\} \geq$ tabled critical value for the range of both samples and the level of significance, it is possible to reject null hypothesis at the significance level of $\alpha = 0.05$. As n, m are more than 30 in both samples and all tested cases, the asymptotic version of Wilcoxon test is used. This version (Meloun, 2012) is used for n and m of more than 30, with $U_1' = \min \{U_1, U_2\}$.

$$U_0 \frac{U_1' - \frac{mn}{2}}{\sqrt{\frac{mn(m+n+1)}{12}}} \tag{2}$$

The critical values of the right-side alternative of $W = <k_2, n>$ of non-negative values k_1 and k_2 are stated in the literature. H_0 is rejected at the significance level of α if $U_0 \in W$ (Freeman, 2017).

A detailed analysis also used two and three-sample statistic test analysing the fit of frequencies (R software).

3 Research results

So far, the research has shown that the robotization in the Czech Republic has developed successfully in the large enterprises, mostly in the automotive industry. On the other hand, the small and medium sized enterprises rather lag behind. The robotization has been developing fast; however, the response of the managers is not the same in all the enterprises.

The main results of robotization include an increase in production, cost reduction, restructuring the supply chains (from a global perspective to a local one), and increased labour productivity. Robotization also brings negative effects such as job losses, lifelong unemployment, and misuse in wars, moral problems, and political issues (such as the use of artificial intelligence).

3.1 Relation of robotization and enterprise size

At first, the enterprises were questioned about the introduction of the robots into production. There were two reasons why the enterprise is not going to introduce the robots: the robots with required abilities are not available or are robots are too expensive. Other option was that the enterprise is going to introduce the robots mostly due to a lack of workers.

In general, robotization is planned by 34% of the sample enterprises; mostly in medium-high technology sector (58%), followed by low technology sector (24%). Regarding the size, 95% of the micro-enterprises are not going to introduce robots; compared to 51% of the large enterprises that are going to introduce robots. In small and medium-sized enterprise, the share is rather equal: 30% / 70% to the disadvantage of robotization. The distribution in relation to the size is seen below (Figure 2).

Figure 2 Data distribution - robotization compared to the size of enterprises
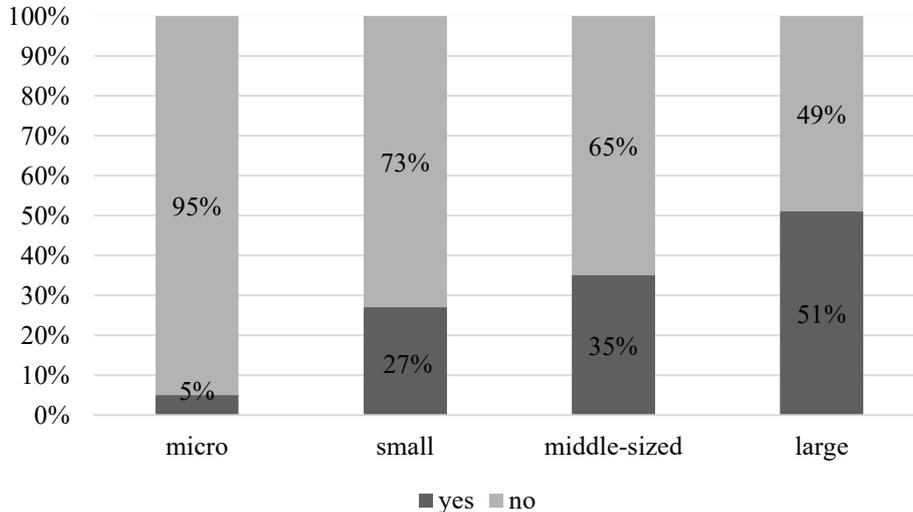
Source: authors

In the research, null hypothesis of equality of the enterprises regarding robotization and the size was constructed; with H0 = x0.50 – y0.50 = 0 ; HA= x0.50 > y0.50 if X are the enterprises with planned robotization and Y are those that do not plan robotization. The test statistics using two-sample Willcoxon test at a significance level of α = 0.05 rejected null hypothesis in favour of the alternative saying that the enterprises that are going to implement robotization have more employees, as evidenced by the p-value close to zero and the positive value of Z test statistics. Therefore, the assumption that the size of the enterprise will increase the use of robots was confirmed.

Table 1 Results of Mann-Whitney U test

	Robotization Yes	Robotization No	*U*	*Z*	p-value
Number of employees	5712.500	7817.500	1822.500	4.090789	0.000043

Source: authors

The results were further subjected to a detailed analysis focusing on the specific differences between the possibilities (a, b, c) in the enterprise-size questionnaire. To this more detailed analysis, a paired statistical test on frequency matching was used.

a) Differences between the enterprises regarding the size of the possibility "the enterprise is not going to introduce the robots as the robots with required abilities are not available."

The statistics revealed a significant difference between the small (including micro-enterprises) and the large enterprises (p-value = 0.045) that are not going to introduce the robots as the robots are not available. It is clear that the lack of robots in the market is seen by the small and micro enterprises in particular. The current market offer is likely to be tailored to large companies.

b) Differences between the enterprises regarding the size of the possibility "the enterprise is not going to introduce the robots as they are too expensive."

No statistically significant differences were found for this option by enterprise size.

c) Differences between the enterprises regarding the size of the possibility "the enterprise is going to introduce the robots mostly due to a lack of workers."

The statistics also revealed a significant difference between the small (including micro-enterprises) and the large enterprises (p-value = 0.0018) preferring to introduce the robots due to the lack of workers. This result shows that, in particular, large enterprises introduce the robots because of the lack of workers. Small and micro enterprises are rather likely to deal with the lack of workers by recruiting and looking for job seekers, keeping up their current technology.

3.2 Relation of robotization and industry

Next part of the research focused on the differences in introducing robotization and different types of manufacturing industry, as classified by CZ-NACE. As revealed by the results, the lack of workers is the most common reason for introducing the robots in engineering and electro-technical production (64.8%). By means of a three-sample statistical test on frequency matching, the significant results (marked with * in table 2) were found in engineering and electro-technical production (p-value = 0.047). Other statistically significant differences were not found in the other fields. Most robots are reported in the automotive and electro-technical industries in the IRF statistics, which fall into the field of engineering production. The results of the questionnaire survey are consistent with these figures.

Table 2 Results of the questionnaire survey classified by NACE (manufacturing industry C)

NACE	Description	a) robots are not available	b) Not going to implement – expensive	c) going to implement –lack of workers
Groups 17-23	*Chemical, paper and non-metallic production*	13.2 %	17.6 %	11.1 %
Groups 24-30	*Engineering and electro technical production*	45.3 %	43.1 %	**64.8 %***
Groups 13-16, 31	*Production of products for domestic use*	22.6 %	23.5 %	9.3 %
Groups 11-12	*Food production industry*	18.9 %	15.7 %	14.8 %
Overall number of enterprises		**53**	**51**	**54**

Source: authors

4 Conclusions

As revealed by the results, the enterprises that are going to introduce the robots have more employees. Mostly, they are large enterprises with enough finance to purchase the robots. The least number of robots is introduced by the small and micro enterprises, as there is a lack of available robots. It could even be said that the current market offer is particularly suited to large enterprises. The large enterprises, on the other hand, introduce robots due to the lack of workers. This result is in line with the current labour market situation and a high level of employment. From the industry point of view, the use of robots due to the lack of workers was found in the engineering (including automotive) and electro-technical industries only. These industries are more labour-intensive and new technologies allow a higher proportion of robotics.

In the future, it is expected that production automation might gradually take place in small and medium-sized enterprises. Leasing is a possible way in which these might be able to afford the use of robots. In addition, according to IRF, there will also be links between production and virtual reality, the expansion of smart factories, the use of learning robots, artificial IoT intelligence, co-bots. The production will be tailor-made to customers thanks to flexible automation, the use of new materials and learning robots based on Cloud Robotics. For these reasons, it is advisable to monitor the use of robots even in the future.

References

Budíková, M., Králová, M., & Maroš, B. (2010). *Průvodce základními statistickými metodami* (První vydání). Praha: Grada Publishing.

Devore, J. L. (2015). *Probability and Statistics for Engineering and the Sciences* (9 edition). Boston, MA: Brooks Cole.

Durakbasa, N. M., Bauer, M. J., G. Bas, G. & Krauter, L. 2016. Novel Trends in the Development of Autonomation and Robotics in Metrology for Production in the Future. *Ifac Papersonline*, 49(29), 6-11.

Ford, M. (2017). *The Rise of the Robots*. London: Oneworld Publications.

Freeman, J., Shoesmith, E., Sweeney, D., Anderson, D., & Williams, T. (2017). *Statistics for Business and Economics* (4th Revised edition edition). Place of publication not identified: Cengage Learning EMEA.

Cho, K. J., Koh, J. S., Kim, S., Chu, W. S., Hong, Y., & Ahn, S. H. (2009). Review of manufacturing processes for soft biomimetic robots. *International Journal of Precision Engineering and Manufacturing*, 10(3), 171-181. doi: 10.1007/s12541-009-0064-6

International Federation of Robotics (IFR). *World Robotics 2005*. New York.

International Federation of Robotics (IFR). 2015. *World robotics industrial robots 2015*, ISBN 978-3-8163-0679-5. Frankfurt, Germany.

Keller, G. (2014). *Statistics for Management and Economics* (10 edition). Stamford, CT, USA : Cengage Learning: South-Western College Pub.

Kreč, L. (2016). S láskou vaši roboti. *Hospodářské noviny*, 7.6.2016.

Mavridis, N. (2015). A review of verbal and non-verbal human-robot interactive communication. *Robotics and Autonomous Systems*, 63, 22-35. doi: 10.1016/j.robot.2014.09.031

Mařík, V. (2016). *Průmysl 4.0. Výzva pro Českou republiku*. Management Press.

Meloun, M., Militký, J., & Hill, M. (2012). *Statistická analýza vícerozměrných dat v příkladech* (vydání 2). Praha: Academia.

Miketa, K. (2017). *Smart revoluce*. Praha: Mladá Fronta.

Ministerstvo průmyslu a obchodu (2015). *Národní iniciativa Průmysl 4.0.* [online]. [cit. 2018-10-08]. Available from: https://www.mpo.cz/assets/dokumenty/53723/64358/658713/priloha001.pdf

STATISTA.COM (2018). Nu*mber of multipurpose industrial robots in the automotive sector in selected countries worldwide in 2016 (in units per 10,000 employees)* [online]. [cit. 05-03-2018]. Available from: https://www.statista.com/statistics/911938/industrial-robot-density-by-country/.

Stahl, B. C., McBride, N., Wakunuma, K., & Flick, C. (2014). The empathic care robot: A prototype of responsible research and innovation. *Technological Forecasting and Social Change*, 84, 74-85. doi: 10.1016/j.techfore.2013.08.001

Pfeiffer, S., 2016. Robots, Industry 4.0 and Humans, or Why Assembly Work Is More than Routine Work. *Societies*, 6(2), 1-26.

Úšela, J. (2018). Český průmysl naráží na své limity. *Hospodářské noviny*, 7.6. 2018.

Weissler, W. (2018). Digitální dvojče umí zrychlit cestu výrobku na trh a zrychlit a optimalizovat výrobu. *Hospodářské noviny*, Veletržní příloha – rozhovor, 1.10 2018.

The Role of Corporate Social Responsibility in the Management of Small and Medium - Sized Enterprises (SMEs)

Ioannis Koukoumpliakos, Petr Řehoř, Labros Sdrolias, Dagmar Škodová Parmová

Abstract: *Objective of this proposal is to highlight the role of corporate social responsibility in the management of small and medium-sized enterprises. Corporate Social Responsibility is a continuous commitment of businesses to social and environmental issues. It concerns both the internal and external environment of the business and aims at their responsible development. It expresses an administration philosophy that focuses on values and principles that require trust, dialogue and collaboration with stakeholders.*

The aim of the paper is to approach corporate social responsibility in business management, the specific features of this, the approach of the organization of the parties involved. The methodology used is based on bibliographic research, text analysis and the linking of findings from research to the current state of affairs.

The expected results of the survey are estimated to the need to take initiatives to improve the quality of corporate social responsibility for small and medium-sized enterprises and the need for changes in these organizational structures in order to gain more responsibility and effectiveness.

The above findings can help to inform the public about the current situation of small and medium-sized enterprises and identify the causes of delays in the development of better corporate social responsibility in the business environment.

Key words: Managemant of Small and Medium Sized Enterprises

JEL Classification: M10 · M14

1 Introduction

Business administration includes the management of the staff, internal operations and processes and the external activities of the company concerned. At the same time, the mission of any business is to achieve specific goals that will bring economic prosperity and development to this business. Of course, in order to be able to fulfill its goals and expectations, the company has to show and support its moral function and incorporate in its practices the principles of corporate governance.

 In particular, corporate governance includes all the instruments and the non-typical mechanisms that govern the relationships between those who manage the business and those who invest in it. In addition, corporate governance includes all those principles and rules associated with improving corporate governance (Aspridis, 2015).

A basic component of corporate governance is the corporate organization. In particular, the term organization describes a situation in which parts of an enterprise can coexist and act together. Therefore, there is a need for an organized administration that can ensure all the business activities of the company (Stiakakis and Kantzos, 2002).

The science of the organization studies the work of an individual who is making an effort to produce action. However, in order to be able to complete this process, management has to include in its actions and its technological means, with

MSc.Ioannis Koukoumpliakos,University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05 Ceske Budejovice, e-mail: jkoukoubliakos@gmail.com

doc. Ing. Petr Řehoř, Ph.D., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05 Ceske Budejovice, e-mail: rehor@ef.jcu.cz

Labros Sdrolias Vice- Rector for Economics, Programming and Development,Technological Educational Institute (T.E.I) of Thessaly, 411 10 Larissa-Greece, e-mail: lsdrolias@teilar.gr

doc. Dr. Ing. Dagmar Škodová Parmová, University of South Bohemia, Faculty of Economics, Department of Regional Management, Ceske Budejovice, Studentská 13, 370 05 Ceske Budejovice, e-mail: parmova@ef.jcu.cz

the help of which it is possible to improve, among others, the methods of completing the work of the enterprise in a much smaller time (Frank et al.,2007).

Then, in order to allow the proper functioning of the social units, an organizational chart should also be used, through which the strategic planning of the activities of the organization can be drawn up and these particularities can be promoted. In organizing the company, it would be useful to take into account the following three elements:

- The project and the actions required to achieve the goals set by the company.

- The use of an organizational chart is considered necessary to determine the appropriate link between the work required to be completed and the ability of the workers to be responsible for completing this work.

- To make full use of facilities and available materials needed to complete the actions (Casey and Goldma, 2010).

All enterprises are small or large entities that are closely linked to the societies in which they operate, act and are influenced by the circumstances of the time and sometimes their space of action. They must, therefore, recognize their responsibility in the course of their work, against society and the environment in which they operate.

This recognition of their corporate responsibility can be expressed through a variety of actions. More characteristic of these is when the companies themselves during their production show respect for the principles and values that govern and characterize our culture.

In particular, the recognition of their corporate responsibility can be expressed when the companies themselves attach particular respect to humanity, human dignity, improving the standard of living and quality of life of all, and respect for the natural environment. In this way, the principles and values of Corporate Social Responsibility of enterprises are gradually being implemented.

In an effort to increase corporate responsibility of the enterprises, antitrust rules were gradually introduced and the concept of protecting citizens in the law was introduced. The result of all these processes was the consolidation of two general principles: charity and management. The development of voluntary actions aimed at promoting social interest, such as charitable actions by businesses, was initially observed. On the other hand, the management principle referred to the work of executives who aimed at the social interest and were influenced by the decisions of the administration (Porter and Kramer, 2006).

Managing a project is one of the most important management tools in many businesses. Companies running project management plans are in a position to predict their future. In particular, project managers are able to identify upcoming problems for the company and prepare themselves in advance (Rehor and Vrchota, 2017). Strategic management represents the current direction of administration and management and applies to all types of companies including small and large enterprises (Rolínek et al., 2014).

Strategic management is a process that aims to ensure a long-term prosperity of managed issues. Its condition is based on the project executives (management, owners, key interest groups) to define the strategic objectives and then a resource management strategy in the most effective way and taking into account the external factors (Rolínek et al.,2015).

In 1999, it was almost the time when voices against globalization and international entrepreneurship increased significantly, restoring, among others, Corporate Social Responsibility at the forefront (Masaka, 2008).

2 Methods

Based on the above reports, the aim of this work is to highlight the role of Corporate Social Responsibility in the management of small and medium-sized enterprises. The research methodology used is based on bibliographic research, text analysis and the linking of the research findings to the current prevailing situation in the field of small and medium-sized enterprises.

Each company is considered to be an integral part of society, as it incorporates employees, customers and therefore resources. Therefore, if it disclaims even a limited responsibility, its interests may be affected by consumer boycotting, negative advertising, loss of social well-being or even legislative initiatives. The areas of implementation of Corporate Social Responsibility programs can be distinguished from those relating to the business environment and those relating to the external environment (Dahlsrud, 2006).

As far as the internal environment is concerned, and in particular in relation to the workforce, enterprises have to give priority to health and safety at work. In more details, health should be explored in terms of the dynamic balance between personal characteristics such as physiology, behavior, various psychological factors such as stress, various social factors such as working conditions, living conditions, quality of life, environmental systems such as culture, economy, conditions

in the work and social environment. Health must therefore be assessed, taking into account the physical, working and social environment in which everyone lives, works, participates and acts (Koffas et al., 2016).

During the process of acceptance by the employee of his work role, a type of contract is concluded between himself and the representatives of the undertaking, specifying the obligations which someone undertakes to carry out (Sdrolias et al., 2003).

Many businesses attempt to identify all those factors that may affect employees' feelings, their way of thinking, their values, their beliefs, their interpersonal relationships and their behavior in order to achieve what makes workers more effective at work, to be satisfied with their work in order to stay in a particular company for a long time (Belias et al, 2014).

A successful management must lead the employees towards achieving the company's goals. This can be achieved by meeting the human needs of employees (Sdrolias et al., 2017). Workplace conditions are considered to be particularly important because workers who have a strong understanding of lack of understanding and support from high-ranking executives feel deeply disappointed (Sdrolias et al., 2016).

Initially, it should be noted that the term organization describes a situation in which the parties of a business can co-exist and act together. Therefore, there is a need for an organized administration that can ensure all the company's activities.

A basic part of the study of organizational culture and work-related phenomena is the behavior of workers. In more details, the science of the organization studies the work of an individual who is making an effort to act.

However, in order to be able to complete this process, management has to include in its actions and technological means, with the help of which it is possible to improve, among other things, the methods of completing the work of the enterprise in a much shorter time (Frank et al., 2007).

Safety, hygiene, human working conditions, productivity incentives, educational initiatives, volunteering, human resources management, recruitment and utilization of skilled human resources, lifelong learning, equal opportunities are part of Corporate Social Responsibility actions (Aspridis et al., 2014).

3 Research results

Based on the above, it is understood that businesses should be led to the need to take initiatives to improve the quality of Corporate Social Responsibility for small and medium-sized enterprises.

In addition, the need for changes in corporate organizational structures becomes more imperative in order to gain greater responsibility as Corporate Social Responsibility contributes to improving employee attitudes, thus improving their image and overall image of the business itself.

Regarding the environment, it is particularly important to respect and protect it during the productive operation of businesses. Reducing company waste in the productive activities of industrial plants, ecological waste management, are a series from actions within the framework of Corporate Social Responsibility.

Of course, to achieve all this, a change of mindset is required. Proper environmental education, for example, could be used in the future (Koukoumpliakos & Nousia, 2008).

In the next stage of the study, a survey will be carried out on the application of the principles of Corporate Social Responsibility to enterprises operating throughout the Greek territory.

In more detail, interviews will be held with the managers of the companies in order to collect data from the companies themselves and to obtain a complete picture of the application of the principles and values of Corporate Social Responsibility. Companies will be selected as sample from Greece.

The reason why this country was chosen is because Greece is a country which comes from a deep economic crisis. It is therefore of particular importance to collect new data from a country that has experienced the prolonged economic recession.

4 Conclusions

The primary function of Corporate Social Responsibility is the effective integration of businesses into society. The market tends to distinguish moral businesses and rewards their choices. Compliance with laws is necessary, but it is no longer sufficient.

Actions beyond compliance with laws are now the road to gaining competitive advantage. "Ethics" includes corporate principles and actions that support democratic principles, pay taxes, punish marketing, and support labor rights.

In the market, the factors influencing and influenced by the responsible way of operating a business are customers, shareholders, suppliers and their partners.

In relation to the company's consumers, Corporate Social Responsibility has meaning in terms of consumer protection, quality and security of the products offered, decent pricing, information and certification, reasonable use of marketing, respect for the consumer and the transparency of corporate activities.

Thus, the market is in line with the concept of Corporate Social Responsibility in the right choice of supplier and partner.

References

Aspridis, G. (2015). *Corporate Social Responsibility – The view of human resources.* Athens : Association of Greek Academic Libraries, p. 33 – 38. ISBN 978-960-603-397-1, Retrieved from https://repository.kallipos.gr. available in the website http://repository.kallipos.gr/handle/11419/4801.

Aspridis, G., Vasiliadis, L., & Grigoriou, S. (2014). Corporate Social Responsibility – The view of human resources. *Mediterranean Journal of Social Sciences,* Vol. 5 (4), pp 11-20.

Belias, D., Koustelios, A., Sdrolias, L., Koutiva, M., Zournatzi, E., & Varsanis, K. (2014). Motivation and job satisfaction among Greek bank employees. *PRIME*, Vol. 7: 71-81.

Casey, A. & Goldman, E. F. 2010. *Enhancing the Ability to Think Strategically: A Learning Model*. Management Learning, 41(2):167–185.

Dahlsrud, A. (2006). How corporate social responsibility is defined: An analysis of 37 definitions. *Corporate Social Responsibility and Environmental Management,* 15, 1-13.

Frank, R., Le,s G. & Masoud, A. (2007). *Operations Management in Context*, 2nd Edition, Published by Elsevier Ltd.

Koffas S., Aspridis G., Nikova D., Skodova-Parmova D., & Sdrolias L., (2016). Health Policy and the Co-perception of Individual Responsibility in the Neoliberal Model, in: *Proceedings of the 1st International Conference in Contemporary Social Sciences (ICCSS 2016) - Crisis and the Social Sciences: New Challenges and Perspectives*, Rethymno, Greece,10-12 June, pp. (accepted).

Koukoumpliakos I., & Nousia M. (2008) The human growth and the healthy environment as a condition of balanced development for the course of human. *Journal of Engineering Science and Technology Review* 1 (2008) 49-52.

Masaka, D. (2008). Why enforcing corporate social responsibility (CSR) is morally questionable, *Electronic Journal of Business Ethics and Organizational Studies,* 13(1), 13-21.

Porter, M., & Kramer, M. (2006). Strategy & society: The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84(12), 78–92.

Rehor,P., & Vrchota,J. (2017) Influence of project approach implementation on the occurrence and perception of crisis in agricultural enterprises in the Czech Republic, *ACTA Universitatis Agriculturae et Silviculturae Mendelianae Brunesis*, Vol. 65 108(3).

Rolínek, L., Cudlinova, E., Klufova, R., Leitmanova, F.I., Jilek, M., & Rehor, P. (2015) Model strategy for village development in the Czech Republic, *Journal of Central European Agriculture*, 16(1), p.148-158.

Rolínek, L., Holátová, D., Březinová, M., & Kantnerová, L., (2014) Behavior of small and medium-sized enterprises in terms of their strategic management and their goals. *Mathematical Methods in Engineering and Economics* p.92.

Sdrolias, L., Mourgas, A., Sahinidis, A., Kakkos, N., Skodova -Parmova, D., Alina Hyz, Belias, D., Peros, N., & Perou, P. (2016) Complaints Management Strategies in Greek Hotel Units. *Proceedings of the 6th International Conference on Tourism and Hospitality Management*, 1-3 June, Athens, Greece, p. 103.

Sdrolias L., Anyfantis I, Koukoubliakos I., Nikova D., & Meleas I., (2017), The Importance of Human Resource Management for the Development of Effective Corporate Culture in Hotel Units, in: Katsoni V., Upadhva A., Stratigea A. (Eds.), Tourism, Culture and Heritage in a Smart Economy, Part II, Technological Educational Institute (T.E.I) of Athens, *Springer International Publishing*, Athens, Greece, pp.183-188.

Sdrolias, L., Terzidis, K., & Polyzos, S. (2003) The psychological alienation of the business personnel from the working environment. Conceptual Approach - Causes - Symptoms of the phenomenon. *Inspection of economic sciences* (3), pp. 101-118.

Stiakakis, E. & Katzos, N. (2002) *Management, A contemporary view*, Thessaloniki, 100 – 126.

How to raise interest of generation Y, Z for entrepreneurship

Michaela Slabová

Abstract: *Considering that every 5th person in Central and Eastern Europe belongs to this group, it is almost 20% probable that you and Y will meet on the Y generation. This is a good reason for better knowledge, especially when you are one of them. The main factor determining the nature of our behavior is personal values. Recently, in Assessment Systems, we conducted a study on whether Generation Y really differs so much from previous generations? We used high-quality methodological tools to evaluate the main motivators and personality characteristics specific to the group.*

Key words: Generation Y · Generation Z · Motivation for entrepreneurship

JEL Classification: M12

1 Introduction

New trends are aimed at encouraging young people to start their business. The Czech environment is still behind the trends of the Western world. In order for the current business climate to offer candidates, they must first recognize their needs and motivators.

Many companies face a critical shortage of labor. When searching for new colleagues, those companies who know how and how to take on an individual age generation have advantages. There are five in the labor market. Age diversi-ty is attributed to later retirement. Traditional, Baby Boomers, X, Y, Z. Five generations in the labor market. Some are trying to be loyal, loyal and loyal to their boss forgive, other employees are unstable, critics and do not make the prob-lem to change their jobs once they do not like it. How to attract and retain a team of different generations? And does it go at all?

How to focus on generation Y and Z?

First of all, it is a good idea to start with the generational trait and to know the biggest differences between them today.

Traditional and Baby Boomers: Thanks for being - Their desires in the field of employment are very similar. They belong to the most frivolous employees who have taken up their jobs when they have not regularly changed their jobs. Moreover, now that the retirees or just before retirement are afraid of being unable to retire due to age, they are among the mild colleagues who do not complain. These people are particularly looking for the certainty of permanent employ-ment and good interpersonal relationships at the workplace. The oldest things like phone calls, phone calls, mastery and Skype, Baby boomers send and write SMS without problems, but they do not like the new technologies (Finance.id-nes.cz,2018).

Generation X: Technical innovation - including some of the world's leading business and technology innovators - Jeff Bezos, founder of Amazon Elon Musk, co-founder and CEO of Tesla or Larry Page, one of Google's founders. "Genera-tion X witnessed the contrast of a working world without computers and the advent of technology and digital innovation. They are highly comparing and able to appreciate the scale and impact of these innovations, so they favor forward-thinking organizations and follow current technological trends, "explains Ladislav Kucera of Hays. An important deci-sion-making factor for the X generation is also the balance between private and work life - they are responsible for family, children. This generation is more than any other willing to discount from their wage claims if they are offered other benefits such as flexible working hours, extra holidays, health care and the ability to work from home (Finance.id-nes.cz,2018).

Milenials: Career progress - although there are some regional differences, it is essentially a generation that has stalled the economic recession in 2007 to 2009, which is considered the worst global economic decline since the 1930s. But it is also a generation that has enjoyed career opportunities. "This age group is considered to be particularly persistent, ambi-tious, who are not afraid to take a little risk in their careers. He wants to hear constructive feedback from his employer, he expects to go through his role and society, "says Ladislav Kučera, staff. Millennials do not want to be bounded. They are aware of their opportunities and want to travel and gain foreign experience. This generation is looking for motivation

Ing. Michaela Slabová, University of South Bohemia, Faculty of economics, Department of management, Studenstká 15, 370 05 České Budějovice, e-mail: slabova2@seznam.cz

bonuses related to performance. Therefore, if Y-members decide to change their employer, they prefer career advancement, reward, education and development, or the opportunity to work abroad (Finance.idnes.cz,2018)

Generation Z: A strong brand-generation that grew up in social media and is common to spend up to 10 hours a day online. They use current technology trends for a range of activities - from entertainment, work to socializing. More than other generations attach importance to the reputation and name of the employer. It is subject to significant parental influence, in the family discussing the potential employer, the role it offers, and the wage. For many of the generation Z and their parents, the employer's brand is often more important than the actual work they will perform. That's why they search for companies that are active on social networks in the media, they work with websites and can defend why they are leaders in their field (Finance.idnes.cz,2018).

Generation Y in business

Generation Y employees can shine in the business if they take into account their strengths and provide them with the right work environment. (CZ.aystem.as., 2018)

In spite of the high qualities of average people, Generation Y does not mean they have everything they need for a successful business. According to the expert experience of rating systems, there are usually four factors needed for business confidence. Above all, it is necessary to have high ambitions in order to achieve success, see opportunities instead of obstacles and have a positive approach to problems. One should not be satisfied with the status quo - the entrepreneur should always look for new challenges and opportunities (ceskovdatech.cz, 2018).

Undoubtedly, the individual should also be strategically oriented in order to anticipate and predict the possible results of the decisions made. Business also means continuous market analysis and perception of change. This requires the internal need to inform and learn new things if necessary. Last but not least, for a high level of business confidence, one should have a general interest in making money and maximizing profits, which also means that he is interested in business topics and deals with money alone. In general, if someone meets these requirements, they can be a successful entrepreneur. While some of Generation Y's features are great for 21st Century workers, its members would need to learn from older colleagues, how to properly learn new things, how to put the details in context, and how to handle the business. On the other hand, their experienced colleagues should try to provide them with the flexibility and opportunity for interaction that Generation Y will make to prosper (Ceskovdatech.cz, 2018).

Generation Z in business

The main reason why the Generation Z is interested in more and more experts in various fields is the simple fact that roughly one third of the generation is already "mature" into productive age, entering the labor market, and with that, the labor market is beginning to change to its image. As a Generation Z we refer to those of us who were born sometime between 1995 and 2014 (but the exact range does not exist and can vary slightly in different sources), and there are over 20% in the Czech Republic, as well as members of previous generations (Generation X, or Husak's children, born approximately between 1966-79 and Y generation, or millennials, born between 1980 and 1994) (Ceskovdatech.cz, 2018).

One third of Generation Z, about 6.5% of our population, is today between the ages of 17 and 23. Another roughly a third of this generation consists of schoolchildren aged 10 to 16 who become economically active over the next few years. The young labor force is incredibly demanding on the market, and it will have a much longer lifetime purchasing power than previous generations. In addition, she will live longer - life expectancy at birth has increased from 1990 to 8 years for men (76 years) and 7 years for women (82 years) (Ceskovdatech.cz, 2018).

The share of generations in the total population of the Czech Republic is seen on picture below.

Figure 1 The share of generations in the total population of the Czech Republic
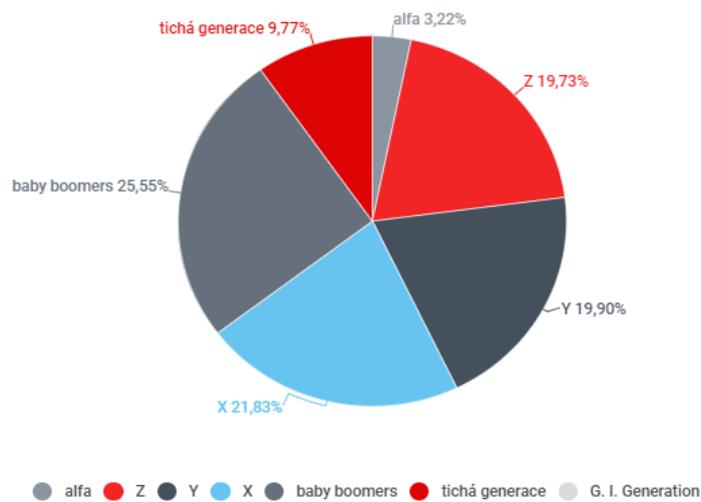
Source: Ceskovdatech.cz, 2018

New future?

The results of the research among young people appear relatively positive if some of them entered the business. If they themselves desire flexibility and are aware of discriminatory behavior in the labor market, it can be assumed that their desires and knowledge will also be reflected in their employability role. On the other hand, some responses show that young people are still quite optimistic, non-indifferent - an exemplary example is the belief that work depends on hard work - and it is a question of what makes their views and visions work-oriented. As well as how family models and social stereotypes reflect their true behavior. Because the young family, according to experts from GS, has a great influence on their opinions and behaviour (Podnikatel.cz, 2008).

An example of the generation gap in the workplace in 2020 is seen below.

Figure 2 The generation gap in the workplace in 2020
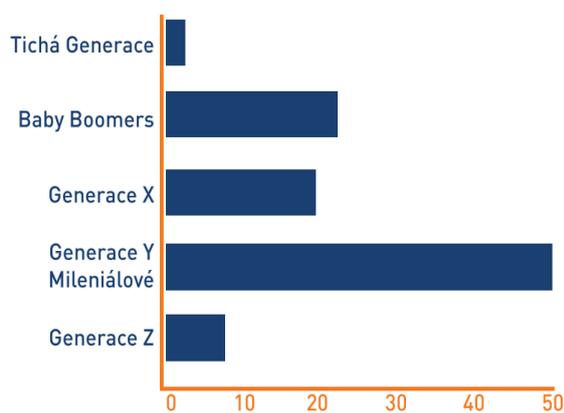
Source: Cz. asystems.as, 2018

Barriers to Entrepreneurship for generation Y, Z

"Today young people are even more afraid of failure, it is not easy to find a hole in the market. They also have other options, excellent conditions to go to multinational companies, large corporations. In fact, they have a much simpler life and a very decent comfort there."

Karel Havlíček - Chairman of the SME Association

In most cases the youth do not have any avenues for saving money and accumulating the margin money needed for business. They are often required to raise the initial capital through the support of family and friends. In such cases the amount of funds that can be put together would be meagre and not sufficient to get going. Very often the youth would have to repay the education loan taken for funding their studies and hence will already be in debt servicing mode leaving no possibilities for saving any money. Such youth are not considered to be safe and are perceived to be potential risk by the bankers. Even if the youth has a very good business opportunity, the required technical knowledge and other capabilities to make it a success, financing the business becomes a major hurdle (Managementstudyguide.com, 2018).

Motivation generation Y, Z to start business

Association of small and medium-sized enterprises and nurses of the czech republic involves youth to business. Young people do not attract business and aim for certainty of a dependent / employee relationship. The unfavorable trend is confirmed by the surprisingly low number of new entrepreneurs and the fact that we can not popularize tangible patterns. Permanently reminiscent stories, a couple of domestic christians from chalk magazines are laughing and contempt for the young generation. There are hundreds of top regional entrepreneurs who, for two decades, generate good added value, invest, employ, speak less, and help selflessly. The business card manager of the 6th line of a multinational company in Prague is a bigger attraction than to try to prove its own abilities in the region's own yard. All of this has led us to stop playing a passive game and to mobilize creative individuals to try to convince them that it is better to produce boxes than they are in a multinational company (Svou-cestou.cz, 2015).

The project is being prepared in cooperation with our long-term partner - Komerční banka and media partner TRADE NEWS. Since 2018, it has also been linked to the practical Business To! Workshops that help participants develop their own real goals and do not rely on their ass. These workshops are currently taking place at nine Czech universities, several other educational institutions and hundreds of graduates. Their founder, Jakub Tížek, became the guarantor of his project - Young Business. They do not offer any closed club and they do not want financial contributions. Theycreate a broad platform of young people who have the ambition to convince them that acting is independent (Svou-cestou.cz, 2015).

One of the main projects of the AMSP CR was launched in 2013 by a press conference, where we presented the results of a unique survey among young people and continues with activities based on five pillars:

- introducing patterns,
- setting up businesses,
- Evaluating intentions,
- raising investors
- Foreign cooperation.

Source: Svou-cestou.cz, 2015.

These colliding trends—the growing use of automated technologies and a new generation entering the workforce—are creating an opportunity for organizations to reexamine the way they have defined entry-level work. Will the entry level continue to serve as a learning environment for future leaders, with junior professionals focused on executing the basic tasks that serve as the foundation for a profession? How can organizations ensure the flow of tacit knowledge in a digitally driven environment? And, if entry-level jobs evolve, as we expect them to, will Gen Z be capable of delivering on them? While universities may ultimately shift focus to close some of these skill gaps, employers and, specifically, talent organizations, should evolve to secure the future talent pipeline. To do so requires a reexamination of the life cycle of the entry-level employee experience. This includes reevaluating traditional approaches to employee acquisition as well as job assignments, employee development, and influencing overall organizational culture. We will unpack each of these parts of the overall employee experience and explore alternative ways to design the entry-level role of the future (Deloitte.com, 2017).

2 Conclusions

The Czech environment should be adapted to the needs of generation x and y and, in this connection, to create a new learning platform for competence development. Thanks to the emerging support that not only leads to raising entrepreneurial awareness, young people can also take advantage of start-up financial packages and mentoring in the early beginnings of their business.

Entrepreneurship, it becomes imperative to study the current situation, identify the pitfalls and shortcomings and design new strategies to overcome and remove the obstacles and make the path easier and clear for the youth to pursue. The

other area of importance happens to be to educate and empower the youth with the required knowledge, skills and training to enable them to become successful entrepreneurs.

As a new generation enters the workforce, uniquely shaped by the time in which they live and the experiences that they've had, organizations have the opportunity to evolve and take advantage of this generation's emerging strengths, putting them in a position to create lasting value for the organization. In either case, this article underscores the importance of these practices and how they should be considered by business and talent leaders alike to support the incoming Gen Z professionals.

References

Finance idnes.cz. (2018). *How to get to five generations of employees and keep them in the team*. Retrieved from https://finance.idnes.cz/zamestnani-prace-generace-milenialove-spoluprace-motivace-pol-/podnikani.aspx?c=A180312_113554_podnikani_kho

Ceskovdatech.cz. (2018). *The Czech Z has reached a productive age*. Retrieved from https://www.ceskovdatech.cz/clanek/95-ceska-zetka-generace-z-dospela-do-produktivniho-veku/

Cz.systems.as. (2018). *Why we can not forget generation Y*. Retrieved from https://cz.asystems.as/proc-nesmime-opominat-generaci-y/

Podnikatel.cz. (2008). *Generation Y - a new concept in the business*. Retrieved from https://www.podnikatel.cz/clanky/generace-y-novy-pojem-take-u-podnikatelu/

Managementstudyguide.com. (2018). *Financial barriers in youth entrepreneurship*. Retrieved from https://www.managementstudyguide.com/financial-barriers-in-youth-entrepreneurship.htm

Svoucestou.cz. (2015). Project for support new generation in business. Retrieved from https://www.svou-cestou.cz/o-projektu 2015

Deloitte.com. (2017). *Generation Z enters workforce*. Retrieved from https://www2.deloitte.com/insights/us/en/focus/technology-and-the-future-of-work/generation-z-enters-workforce.html

Telework and Financial Indicators in Industry 4.0

Miroslava Vlčková, Jaroslav Vrchota, Zuzana Frantíková

Abstract: *Telework is defined as work that is carried out outside the central office. For more and more companies, it is an interesting alternative to set the way employees work. At present, telework is mainly benefit for employees. Flexible modification of work is created thanks to innovation and optimization of communication tools. As a result, considerable savings can be achieved. The indicators of financial analysis serve for the evaluation of the financial situation of companies. The source of information is mainly data from annual reports, i. e. financial statements, attachments and other supplementary information issued annually.*

Industry 4.0, also known under the name "the fourth industrial revolution" comprises not only the trend of automation but also data exchange in manufacturing technologies. Furthermore, it includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing. In this paper, a certain link between the introduction of telework in the company and the financial indicators within the industry 4.0. was identified. The indicators that were assessed within the analyzed enterprises were: total assets, total inventory, return on equity, return on assets, EBIT, cash flow and labour productivity.

Key words: Telework · SME' s · Financial and Economic Indicators · Industry 4.0

JEL Classification: G30 · J53 · M12 · M41

1 Introduction

Telework is defined as work outside the company's office, usually with using IT, when the results are trans-mitted by the communication technologies, or work on assigned tasks is carried out directly on the remote server via an Internet connection (Verbeke et al., 2008). Telework has spread rapidly in recent years. Telework as a concept was first introduced as telecommuting by Jack Nilles (Nilles, Carlson, Gray, & Hanneman, 1976). Since telework can be defined in many ways, we are interested in all situations where an employee works from home at least some of the time. The proportion of teleworkers in the Czech Republic has been estimated to be in the range of 2,92 % among all workers (see EUROSTAT, 2017). However, these estimates are typically based on cases where employees regularly or always use telework and could exclude cases where employees telework on an occasional or irregular basis.

Telework is more and more interesting alternative to set the way employees work. Since it can bring many benefits for employers, such as lowering the cost of running a job by the reduction of the need for real estate, office space, supplies (Peters et al., 2010; Verbeke et al., 2008) and other overheads (Morgan, 2004), the possibility of getting a cheaper work-force by employing people from "poorer" areas or the possibility of employing experts that are rare and certainly it may produce more satisfied employees that were given the chance to balance their work and life. Nevertheless, telework has its cons as well. This type of employment can bring about certain shortcomings, such as more demanding communication with colleagues, loss of social contacts, difficulty in employee discipline (Bláha, Mateicius, & Kaňáková, 2005) or increase of cost on employee's side (Baruch, 2000). From a security point of view, data protection and integrity, as well as user privacy, must be ensured.

Several researchers have found a small but robust empirical relationship between the use of specific work practices and firm level outcomes such as profitability and productivity (e.g. Delery and Doty, 1996; Gerhart et al., 2000; Huselid, 1995; Jiang et al., 2012; Wright and McMahan, 1992). One reason why strategically chosen organizational practices can

Ing. Miroslava Vlčková, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Accounting and Finance, Studentská 13, České Budějovice, Czech Republic, mvlckova02@ef.jcu.cz

Ing. Jaroslav Vrchota, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Management, Studentská 13, České Budějovice, Czech Republic, vrchota@ef.jcu.cz

Mgr. et Mgr. Zuzana Frantíková, University of South Bohemia in České Budějovice, Faculty of Economics, Department of Law, Studentská 13, České Budějovice, Czech Republic, frantikova@ef.jcu.cz

lead to improved firm performance is that the human capital of a workforce can be unleashed and fully utilized (see Wright and McMahan, 2011).

Financial analysis is a tool that allows you to monitor, measure and evaluate the internal and external financial performance of a company using key financial indicators and then accept effective management decisions (Petřík, 2005). The pillar of the entire financial analysis is data from the financial statements prepared by companies in accordance with the Accounting Act. They are the balance sheet, the profit and loss and the appendix to the financial statements.

In industrialized countries, the industry is currently shaped by the development towards the fourth stage of industrialization, called Industry 4.0. Industry 4.0 is part of economy that produces fully mechanized and automated performances, based on advanced digitization, combination of Internet technologies and future-oriented technologies in the field of intelligent objects. Industry 4.0. is caused and driven by the social, economic and political change (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014).

According Rüßmann et al. (2015) it was found out that the fourth wave of the technological progress will bring advantages in the following four areas:

- labour productivity – over the next five to ten years, Industry 4.0 will be accepted by more businesses, increasing productivity in the manufacturing industry. Improving cost-effectiveness, excluding material costs, will range from 15 to 25 percent,

- income growth – Industry 4.0 will also lead to revenue growth. Although manufacturers' demand for enhanced equipment and new data applications will grow, this area will bring additional revenue,

- employment – growth that stimulates productivity and revenue growth will lead to an increase in employment of 6% over the next ten years, and the engineering industry may grow even more – up to 10%. However, different skills will be required. In the short term, this trend will lead to more automation, and some, often unskilled, laborers who perform simple, repetitive tasks will be replaced by robots. At the same time, the growing use of software will increase the demand for employees with competencies in the field of software development and information technology,

- investments – adapting production processes to integrate Industry 4.0 will require billions of euros.

Under Industry 4.0, people and machines will therefore cooperate using cognitive technologies in industrial environments. Intelligent machines can help people do most of their work by speech recognition, computer vision, machine learning, and advanced synchronization models. Advanced robot learning models are therefore important for people and machines to develop skills that complement each other under any working conditions (Zhong, Xu, Klotz, & Newman, 2017).

2 Methods

The main goal of this paper is to evaluate the relation between financial indicators as total assets, total inventory, return on equity, return on assets, EBIT, cash flow and labour productivity within the Industry 4.0 in enterprises that have implemented telework.

As a statistical test it was used Mann-Whitney U test. The test, usually called U test, whose distribution under the null hypothesis is known. U is then given by:

$$U_1 = R_1 - \frac{n_1(n_1+1)}{2} \qquad (1)$$

where n_1 is the sample size for sample 1, and R_1 is the sum of the ranks in sample 1.

The equally valid formula for U is:

$$U_2 = R_2 - \frac{n_2(n_2+1)}{2} \qquad (2)$$

The smaller value of U1 and U2 is the one used when consulting significance tables. The sum of the two values is given by:

$$U_1 + U_2 = R_1 - \frac{n_1(n_1+1)}{2} + R_2 - \frac{n_2(n_2+1)}{2} \qquad (3)$$

Knowing that $R_1 + R_2 = \frac{N(N+1)}{2}$ and $N = n_1 + n_2$, and doing some algebra, we find that the sum is $U_1 + U_2 = n_1 n_2$.

Financial indicators that were analyzed are:

- total assets,
- total inventory,
- return on equity,

$$Return\ on\ equity\ (ROE) = \frac{EBIT}{owner's\ equity}\ x\ 100 \tag{4}$$

- return on assets,

$$Return\ on\ assets\ (ROE) = \frac{EBIT}{total\ assets}\ x\ 100 \tag{5}$$

- EBIT (earnings before interest and taxes),
- cash flow and
- labour productivity

$$Labour\ productivity\ per\ month = \frac{\frac{Sales}{Average\ number\ of\ employees}}{12} \tag{6}$$

Assets represents the property of the enterprise. Under property, we mean the sum of all tangible and intangible assets, money, receivables and other property values that belong to entrepreneurs and are used for business. Assets are means-tested assets that are expected to bring future economic benefits to the enterprise (Warren, Reeve, & Duchac, 2012).

Stocks are among the current assets or short-time assets of the enterprise. Their characteristic feature is that they are consumed or, on the other hand, being consumed when the business is doing. An exception to this characteristic is goods. Stocks include material, own production stocks, young animals, and fattening animals and goods (Welsch, & Zlatkovich, 1989).

The basic aspect of the breakdown of assets is their usefulness, the difficulty of their conversion into cash - liquidity (Spiller, 2004). Profitability indicators are, in practice, the most closely monitored indicators, because profitability expresses the efficiency of a business with which new sources of invested capital are created. Return on equity (ROE) is one of the indicators of profitability and expresses how effectively the organization manages funds injected by shareholders / shareholders (Holečková, 2008). Return on assets is among the indicators of profitability. It shows for how long a business could refinance assets from profits (Brigham, & Ehrhardt, 2005).

EBIT is a term that denotes profit before tax and interest. It evaluates the performance of a business regardless of the chosen method of financing (interest) and taxation. Cash flow is the flow of money. It is the main indicator of the enterprise's ability to finance business. It is possible to look at it as the difference between the income and expenditure for a certain period (Larson, 1988).

Labour productivity we can count as total sales divided by average number of employees (Drury, 2012). The total sales are the sum of the funds received by an entrepreneur or at a establishment for the goods or services provided during the relevant time period.

3 Research results and discussion

The aim of the paper is to compare the above financial indicators for businesses that have established telework and at the same time feel to be affected by industry 4.0. The study comprises 606 companies and the data were obtained based on quantitative and qualitative research, i. e. both questionnaire survey and data collection from Albertina Gold Edition database. The analyzed businesses are those that have established telework. The businesses have been divided into two categories: the category of businesses that are affected by industry 4.0 and the category of businesses that are not affected by industry 4.0. There were seven basic absolute and ratio financial indicators obtained from individual balance sheets and profit and loss statements of businesses. It was tested at the significance level of the p-value <0.05. For indicators where the difference in both groups was demonstrated, the p-value was close to zero. The results are in Table 1, which shows that significant differences are in total assets, stocks, EBIT, cash flow, ROA and labour productivity.

Table 1 Financial indicators and the influence of the industry 4.0

Variable	According to the variables. Industry 4.0 Highlighted tests are significant on the level p <0.05000								
	Yes	No	U	Z	p-value	Z adjusted	p-value	Number of YES	Number of NO
Total assets	126626,5	55479,50	33534,50	3,751721	0,000176	3,751722	0,000176	394	209
Total inventory	104342,5	39573,50	23283,50	5,170684	0,000000	5,171094	0,000000	356	180
EBIT	126856,5	53443,50	31915,50	4,339616	0,000014	4,339617	0,000014	393	207
Cash Flow	130316,0	52394,00	30658,00	5,165072	0,000000	5,165073	0,000000	396	208
ROE	122441,0	60269,00	38533,00	1,300653	0,193378	1,300654	0,193378	396	208
ROA	125421,5	57288,50	35552,50	2,763244	0,005723	2,763246	0,005723	396	208
Labour productivity	120328,0	56387,00	35681,00	2,018823	0,043506	2,018840	0,043505	391	203

Source: Databasis Albertina Gold Edition, own research, own processing

The values are also shown below on selected boxplots of individual frequencies, where it is obvious that the Industry 4.0 businesses have higher maximum values and wider dispersion values in the middle quartiles.

Figure 1-5 Selected boxplots (Total inventory, EBIT, Cash Flow, ROA and Labour Productivity)
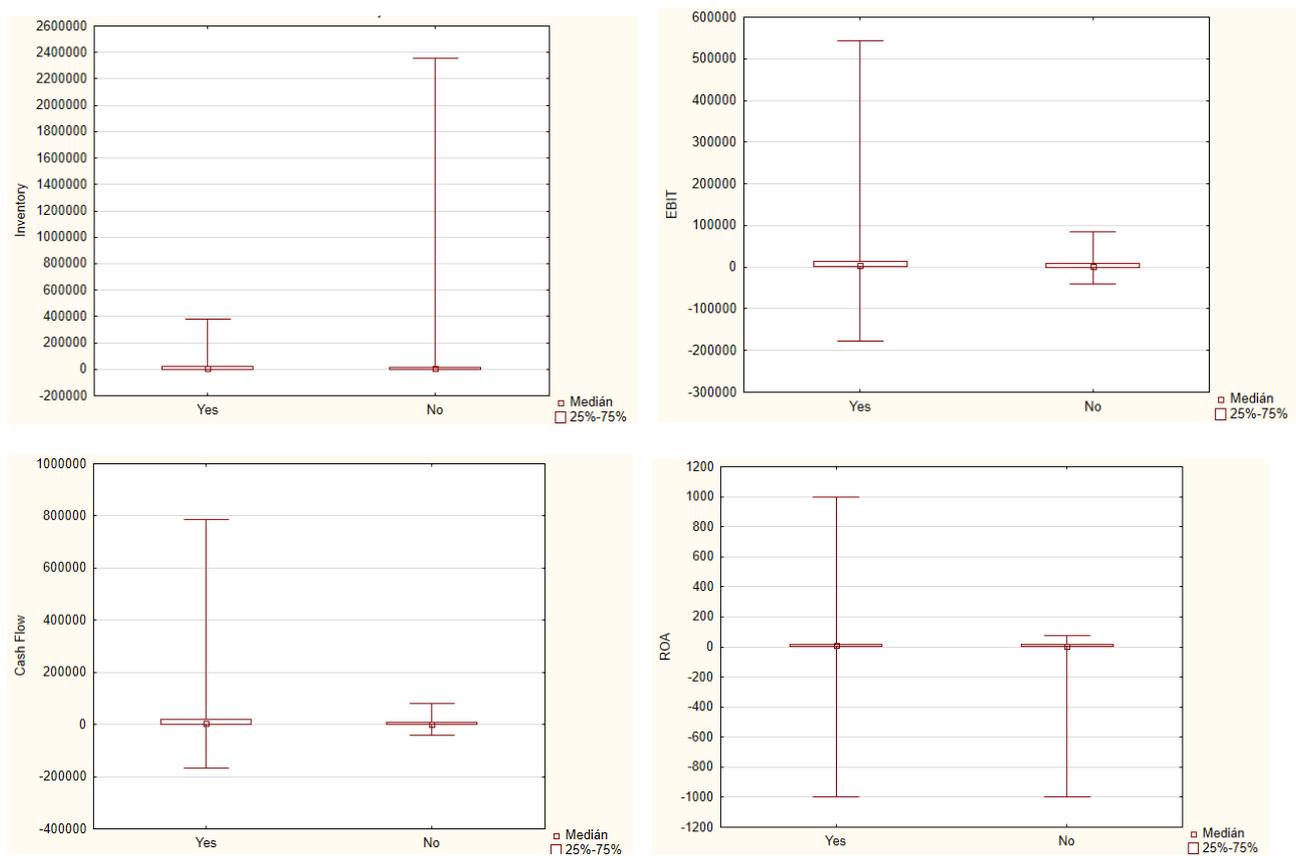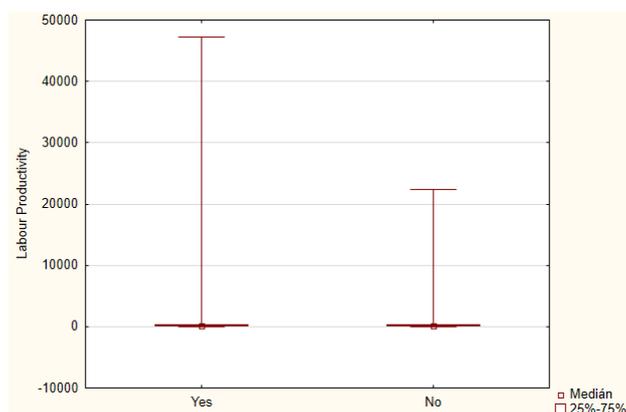
Source: Databasis Albertina Gold Edition, own research, own processing

From the above-mentioned statistics in the table 1 and boxplots 1 – 5 it is apparent that there are many significant differences with respect to the indicators such as total assets, total inventory, EBIT, Cash Flow and ROA in case of businesses influenced or not influenced by industry 4.0. It is only the financial indicator ROE that has not proved statistically significant difference between those two groups.

The results are very interesting both as individual values and combinations of values. The value of total assets is higher for businesses affected by industry 4.0. By contrast, this group of businesses shows a lower value of total inventory. This may be because businesses that are affected by industry 4.0 have a better managed supply and rather use the just in time method. This can be intertwined with another indicator, as the lower value of inventory at the same time generates even lower storage costs and thus higher profit. Profit or EBIT for businesses that are affected by industry 4.0 is more than double than average for businesses that are not affected by industry 4.0. These companies also show even higher cash flow rates (again more than doubled). ROE and ROA are higher for businesses in the first group, although this difference is statistically significant only for ROA. The average monthly productivity of these businesses is also higher.

4 Conclusions

The research was conducted in the companies with established telework. Telework is an opportunity to work from home which is often considered to be an employee benefit. The advantage of this type of work is the time savings spent by the individual on the way and on the other hand, the organization will save the costs associated with the job created. These businesses were then divided into two groups: a) the businesses that are affected by industry 4.0 and b) the businesses that are not affected by industry 4.0. There were 606 businesses that were analyzed with respect to their total assets, total inventories, return on equity, return on assets, EBIT, cash flow and labor productivity. It was found that in case of the ROE there are no statistically significant differences (at the alpha significance level greater than 0.05) between the two groups. For the other indicators, the differences were statistically significant. The companies affected by industry 4.0 were found to have higher total assets, EBIT, cash flow, ROA, higher labor productivity and lower total inventory. Overall, the selected indicators for the companies affected by industry 4.0 show more positive values than those that are not affected by industry 4.0.

Acknowledgement

References

Baruch, Y. (2000). Teleworking: Benefits and pitfalls as perceived by professionals and managers. New Technology, Work and Employment, 15(1), 34–49. https://doi.org/10.1111/1468-005X.00063

Bláha, J., Mateicius, A., & Kaňáková, Z. (2005). Personalistika pro malé a střední firmy. 1. vyd. Brno: CP Books.

Brigham, E. F., & Ehrhardt, M. C. (2005). Financial Management: Theory and Practice. Ohio: South-Western.

Delery, J. E., & Doty, D. H. (1996). Modes of theorizing in strategic human resource management: Tests of universalistic, contingency, and configurational performance predictions. Academy of Management Journal, 39(4), 802–835. https://doi.org/10.2307/256713

Drury, C. (2012). Management and Cost Accounting. 8th Rev. ed. Hampshire: Cengage Learning.

Gerhart, B., Wright, P. M., McMahan, G. C., & Snell, S. A. (2000). Measurement error in research on human resources and firm performance: How much error is there and how does it influence effect size estimates? Personnel Psychology, 53(4), 803–834. https://doi.org/10.1111/j.1744-6570.2000.tb02418.x

Holečková, J. (2008) Finanční analýza firmy. 1. vyd. Praha: ASPI, Wolters Kluwer.

Huselid, M. A. (1995). The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance. Academy of Management Journal, 38, 635–672. https://doi.org/10.2307/256741

Jiang, K., Lepak, D. P., Hu, J., & Baer, J. C. (2012). How does human resource management influence organizational outcomes? A meta-analytic investigation of mediating mechanisms. Academy of Management Journal, 55(6), 1264–1294. https://doi.org/10.5465/amj.2011.0088

Larson, K. D. (1988). Fundamental accounting principles: statement of cash flows edition. 11th ed. Homewood: Irwin.

Lasi, H., Fettke, P., Kemper, H.-G., Feld, T., & Hoffmann, M. (2014). Industry 4.0. Business & Information Systems Engineering, 6(4), 239–242. https://doi.org/10.1007/s12599-014-0334-4.

Morgan, R. E. (2004). Teleworking: an assessment of the benefits and challenges. European Business Review, 16(4), 344–357. https://doi.org/10.1108/09555340410699613

Nilles, J. M., Carlson, F. R., Gray, P., & Hanneman, G. J. (1976). The Telecommunications-Transportation Tradeoff. London:

John Wiley.Petřík, T. (2005). Ekonomické a finanční řízení firmy. Manažerské účetnictví v praxi. 1. vyd. Praha: Grada Publishing.

Peters, P., den Dulk, L., & de Ruijter, J. (2010). May I work from home? Views of the employment relationship reflected in line managers' telework attitudes in six financial-sector organizations. Equality, Diversity and Inclusion: An International Journal, 29(5), 517–531. https://doi.org/10.1108/02610151011052799

Spiller, E. A. (2004). Financial accounting: basic concepts. 5th ed. Homewood: Irwin.

Rüßmann, M., Lorenz, M., Gerbert, P., Waldner, M., Justus, J., & Harnisch, M. (2015). Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries. Retrieved from: http://www.inovasyon.org/pdf/bcg.perspectives_Industry.4.0_2015.pdf.

Verbeke, A. et al. (2008) Growing the Virtual Workplace: The Integrative Value Proposition for Telework, Cheltenham, UK & Northampton, US: Edward Elgar.

Warren, C. S., Reeve J. M., & Duchac, J. E. (2012). Financial Accounting 12th ed. Mason: Cengage Learning.

Welsch, G. A., & Zlatkovich, Ch. T. (1989). Intermediate accounting. 8th ed. Homewood, IL: Irwin.

Wright, P. M., & McMahan, G. C. (1992). Theoretical perspectives for strategic human resource management. Journal of Management. https://doi.org/10.1177/014920639201800205

Wright, P. M., & Mcmahan, G. C. (2011). Exploring human capital: Putting "human" back into strategic human resource management. Human Resource Management Journal, 21(2), 93–104. https://doi.org/10.1111/j.1748-8583.2010.00165.x

Zhong, R. Y., Xu, X., Klotz, E., & Newman, S. T. (2017). Intelligent Manufacturing in the Context of Industry 4.0: A Review. Engineering, 3(5), 616–630. https://doi.org/10.1016/J.ENG.2017.05.015.

Effective Communication of a Manager in Small and Medium-sized Enterprises - Personality Characteristics

Alena Čarvašová, Petr Řehoř

Abstract *The paper deals with communication of a manager in small and medium-sized enterprises (SMEs). In the SMEs, communication plays a very important role in many respects. Existing theory and psychology of the management offers a variety of ways to recognize workers' competencies, to appropriately occupy positions and to create the prerequisites for establishing effective managerial communication. However, these personality traits are difficult to measure. The paper aims to find easily measurable characteristics such as gender, age, education, child care, and the siblings of the managers and their subordinates. Data was gathered in the framework of a pilot research that was conducted to find accurately measurable characteristics of managers and staff that imply effective management communication.*

Key words: Managerial communication · Small and Medium-sized enterprises · Typology theories · Psychology · Personality characteristics

JEL Classification: M10 · L20

1 Introduction

Choosing a suitable worker who is highly likely to be able to establish effective communication is particularly important for the following reasons: saving on the cost of recruiting new workers, saving the costs of training new workers, minimizing the cost of removing disagreements caused by inefficient communication, If managers choose to use existing personality theory when selecting workers, they use soft data they receive on the basis of testing the jobseekers. Testing is related to the risk of deliberately incorrect answers, is time-consuming, and requires professional co-operation with a psychologist, often not available to SMEs, to interpret the results properly. If the relation of effective management communication with one of the above-mentioned measurable characteristics is demonstrated, the selection of the workers is significantly easier.

Within an organization, communication is a primary component of organizational success. Members of an organization spend the bulk of their time communicating with one another; this is particularly true of manager and subordinate communication (Emanoil et al., 2013). Communication is a means to improve commitment and to stimulate employees to achieve organizational goals (Tsai, Chuang & Hsieh, 2009).

Managerial communications is defined as the exchange of information from above and below, through both formal and informal channels, which makes it possible to achieve the goals of the managers (Březinová, Holátová et al., 2014). Daniela (2013) states that effective managerial communication in conjunction with efficient management practices provided a level of safety in any domain of activity within an organization. Whereas Mahajan et al. (2012) views communication as a managerial responsibility, Uusi-Rauva & Nurkka (2010) discuss communication with employees as a corporate responsibility.

Specialists identify various functions of communication in organization (Hynes, 2005; Ahmed et al., 2010): transmission of decisions, to motivate employees, employees training, to promote organizational culture, information regarding activities and implementing decisions, to create the image (Nothhaft, 2010).

The paper deals with managerial communication in the small and medium-sized enterprises, where the number of employees within the organizational structure is crucial, not financial and property indicators. A small and medium-sized

Ing. Alena Čarvašová, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: acarvasova@ef.jcu.cz

doc. Ing. Petr Řehoř, Ph.D., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: rehor@ef.jcu.cz

enterprise (SME) is defined as an enterprise with less than 250 employees and an annual turnover not exceeding EUR 50 million or its balance sheet total does not exceed EUR 43 million (Commission Recommendation, 2003). In the paper, the definition based on the number of employees of less than 250 for each identification number of an organization is primarily used.

Communication is one of the most challenging skills of an efficient manager. A good manager is a good communicator and a good management is based on good communication skills of the manager (Tanrıverdi et al., 2010). The personality of a manager is crucial in this case. As Mikuláštík (2015) reports, a personality is an integrated set of mental and physical traits, internally organized, dynamic, variable, adaptable and unrepeatable. It is a sum of inborn assumptions and learned patterns of behaviour. The personality is open to the influences of the environment and other personalities from the social environment and has its own development. There are a number of personality theories. The theory of typology and the theory of traits are best used in the management practice. Using these theories, the manager is more familiar with the worker's personality and learns how to communicate with the employees.

Typology theories are often created in an intuitive way, yet they are the most common as they simplify the view of human qualities into a certain stereotype. As a rule, they are based on the basic characteristics of temperament. The following typologies are used:

- sanguine, choleric, melancholic, and phlegmatic by Galen and Hippocrates;
- extravert/introvert, perception/feeling, thinking/intuition, judging/perception, known as MBTI – Myers-Briggs Type Indicator (Kroeger, Thuesenová & Rutledge, 2006).

The theory of traits works with personality traits as bipolar dimensions to which each person can be included. In this group, personality models based on factor analysis are included. There are the following examples:

- The model of T. Leary – scale of affiliation-aggression, dominance-submission, dependency-egocentrism, reservedness-responsiveness;
- Theory of Kaiser & Koffey – types of managers: executive (friendly - dominant), dictator (hostile - dominating), bureaucrat (hostile - submissive), sociable (friendly –submissive);
- The model of seven dimension (Cloninger, 1993) – combines four factors of temperament that are innate (neofilia, avoidance of harm, dependence on reward, endurance) and three factors of character that are learned (self-determination, ability and willingness to cooperate, self-transcendence).

Current theoretical knowledge provides the managers with ways to select suitable staff and establish effective communication with them. These methods, however, are based on precisely measurable psychological testing of the personality.

In the current literature, no expert platform has been found offering the designation of a worker for effective managerial communication according to uniquely measurable data. Bartes (2006) recommends various methods, such as BCG matrix, innovation life-cycle analysis and Balanced scoreboard. A number of authors (such as Dvořák, 2006; Hauschildt, 2014; Žižlavský, 2012) recommend assessing different effects of innovation, classifying such effects as technical, economic and other. Other authors mention that innovation can be seen as an investment and, therefore, it is possible to use the same financial indicators (Erner & Presse, 2010; Kislingerová, 2008). Žižlavský (2012) proposes to supplement the financial indicators with the non-financial indicators of internal processes.

2 Methods

The aim of the paper is to present the results of a pilot research aimed at finding characteristics of employers and employees which correlate with effective management communication.

The pilot research data was gathered through a questionnaire survey carried out in 2017 in 20 SMEs from the tertiary sector of the Czech economy. The selection of the enterprises was done randomly. The managers of the organization were asked to fill in a printed questionnaire with 37 questions. After filling in, the managers chose one of their subordinates, whom they described as effectively communicating. An effectively communicating worker was defined as a worker who understands the instructions, performs the tasks in accordance with the expectations of the assigning manager, puts meaningful questions and provides feedback on the accomplishment of the tasks. This worker was then asked to complete a questionnaire of 38 questions. The questions in both questionnaires (both for the manager and for the communicating worker) were similar in order to analyze the correspondence of the answers. For the purpose of this article, five questions were selected from the questionnaires, and analyzed. Questions were oriented on gender, age, education, siblings order and childcare. Both, the manager and the best cummunicating employee get 5 questions. The reasons for selection this questions were:

- definitely measurable,

- definitely comprehensible,

- empirical probable for fulfilment of hypothesis.

There were two very similar questionnaire in every SME – one for the manager and one for the subordinate. The first respondent in SME was always the manager. The manager had to have minimal 2 subordinates. After completing the questionnaire choosed the manager one of his subordinates. He choosed such a subordinate who was the best in communication with him. Than he asked the choosen employee for comlete the questionnaire.

The aim was to prove the following hypotheses:

Hypothesis 1: Characteristics such as gender, age, education, child care, and position among the siblings between the manager and the worker show a significant correlation rate, the canonical correlation test is significant.

Hypothesis 2: The frequency of gender, age, education, childcare, and position among the siblings for a worker marked by their managers as effectively communicating exceeds 50%.

The following statistical methods will be used to verify hypotheses: canonical correlation test, frequency of occurrence.

3 Research results

Multidimensional analytical information with a nominal binary (gender, childcare) and multicast (age group, education, siblings) was obtained from the pilot questionnaire survey. However, it was always a nominal scale where only equality and inequality operators were introduced, with qualitative variables marked with different digits.

The purpose of the statistical analysis was to find out if some of the characters mentioned by the organizational managers correlate with the specific characters of their effectively communicating subordinates. For this purpose, a canonical correlation analysis was used to find a pair correlation coefficient.

Analysing the correlation between the left and right sets (see Table 1), when the left set is manager information and the right set is the information of an effectively communicating worker, it was found that the strongest correlation arose between employee education and child care by the employee (the higher educational attainment, the lower tolerance of childcare).

On the contrary, the smallest correlation was shown between the age of manager and education of an effectively communicating employee, and in the existence of a child care by the manager and the sibling position of an effectively communicating employee.

Table 1 Analysis of the left and right sets

Manager /Effectively communicating employee	Gender	Age	Education	Childcare	Siblings
Gender	0,2	0,14	0,08	0,06	0,12
Age	-0,02	0,16	-0,35	0,06	-0,04
Education	0,03	0,05	0,18	0,57	0,14
Childcare	-0,29	0,16	0,37	-0,06	-0,35
Siblings	0,34	0,09	0,27	0,06	0,08

Source: own processing

The strong correlation between manager education and child care by the employee is evident due to the high canonical R = 0.84, however p = 0.2386, at the same time, meaning the insufficient significance of the correlation justifying the low number of random selection elements n = 20 (see Table 2). Hypothesis 1 was confirmed. The canonical correlation test is significant (R = 0.84). The correlation between the manager's education and the presence of childcare is 0.5659. However, it was a pilot research that will be expanded on the basis of the result - there will be an increase in the random selection elements, i.e. in other SMEs in the tertiary sector of the economy.

Table 2 Statistical results of analysis of the left and right sets

Canonical R	0,84
Chí quadrate	29,63
p	0,24

Number of valid cases	20

Source: own processing

The frequency of occurrence of the characteristics of workers identified as effectively communicating is summarized in the following tables. As reported by table 3, the question: "Do you take care of a child of less than 10 years old for at least 15 days of a month?" was answered yes by 5 out of 20 effectively communicating employees and 15 out of 20 answered no. 75% of the respondents of effectively communicating workers do not provide care for a child under 10 years of age at least 15 days in a calendar month.

For the question "Gender," 20 of the respondents who were effectively communicating 14 chose "Female" and six chose the option "Male" - see. Table 4. 70% of the workers whom their managers identified as effectively communicating are women.

Table 3 Frequency of childcare in effectively communicating workers

Yes	No
5	15

Source: own processing

Table 4 Frequency of gender in effectively communicating workers

Female	Male
14	6

Source: own processing

For the "Age" option, the option "up to 25 years old" was chosen by four workers, the option "26-35 years old" was selected by seven workers, the option "36-45 years old" was selected by four employees, the option "46-55 years old" was selected by two employees and "over 55 years of age" were chosen by three workers. Among the workers that their managers identified as effectively communicating, by Table 5, the age group 26-35 was the most common. This group accounted for 35% of all respondents who were effectively communicating. The least common age group of 46-55 years old represented 10%.

Table 5 Frequency of age in effectively communicating workers

up to 25 years	26-35 years	36-45 years	46-55 years	over 55 years
4	7	4	2	3

Source: own processing

Regarding the "Education", the option "university education" was chosen by five workers, the option of "secondary school or college of higher education" was selected by eleven of these employees, the option "vocational school" was selected by four employees and the option "primary education" was chosen by none of the employees. Among the workers identified by their managers as effectively communicating, the education group of "secondary school or college of higher education „ was the most common, as reported by Table 6. This group accounted for 55% of all respondents who were effectively communicating. The "primary" educational group was not represented at all.

Table 6 Frequency of education in effectively communicating workers

University education	Secondary school	Vocational school	Primary education
5	11	4	0

Source: own processing

The question "I am..." was answered "A single child" by three of the workers; „first born" by seven of them, "second born" by eight and the "third born" by two of the effectively communicating employees. Among the workers, described by their managers as effectively communicating, the "second born" group was the most represented. This group, according to Table 7, accounted for 40% of all respondents who were effectively communicating. The second largest group was the first born, who accounted for 35% of all respondents who were effectively communicating. The least represented group was the „third born" group, which accounted for 10% of the respondents who were effectively communicating.

Table 7 Frequency of sibling position in effectively communicating workers

Single child	First born	Second born	Third born
3	7	8	2

Source: own processing

Hypothesis 2 was confirmed. The frequency of occurrence of some of these characteristics exceeded 50%. These are the following characteristics: child care, gender, education. The statistically most significant finding in monitoring the occurrence frequency was the fact that 75% of the workers identified in the pilot research as communicating effectively were of non-child care workers. Less than 75% were women, but women who do not care for a child. More than 50% of workers identified as communicating effectively completed secondary education with Maturita exam or a college of further education.

However, the interesting findings of the pilot research although not the subject of the research was related to the fact that the 13 out of 20 interviewed managers were the first-born (if a single child accounted as the first born too, then it would be 15 managers out of 20). Thus, the hypothesis arises that the first-born children are most likely to become the managers in SMEs in the tertiary sector.

4 Conclusions

Based on the data obtained so far, it could be advisable to select female employees not taking care of a child and those with secondary education with Maturita examination or a college of further education. However, this is only a pilot survey with a small number of respondents, which does not provide sufficient degree of significance. Both hypotheses were confirmed.

The more educated the manager, the more often they a person who does not take care of a child choose as an effective communicator. More than 50% of effectively communicating workers were non-child care workers and women (no child-care), and those with secondary education with Maturita exam or a college of further education. The data, however, are not relevant to creating a valid conclusion. To this end, there is a need to increase the number of organizations surveyed.

Both of the pilot research hypotheses were confirmed and provide a relevant reason for continuing the research. The key task of further research will have to reject or confirm the hypothesis that, more than 50% of the respondents identify a person who does not take care of a child as an effectively communicating worker. If this hypothesis is confirmed, it will be necessary to create a base for effective communication with those who take care of a child. It will be necessary to find out whether it is possible to create a more appropriate working environment for these people (such as flexible forms of work as stated in the research of Hari, 2016 or Kang & Sung, 2018), whether there is scope for their more effective motivation following Pink (2009), and whether it is possible to create specific tools for effective communication between the manager and the child care workers.

There were not found any other studies occupieing the same theme. The paper is inovating in the area which concetrates in. It works with easy measurable characteristic of staff which can lead to effectively communication in the SME. The study has its limitations. The limitation is in existence of latent variables of every personality.

Acknowledgement

References

Ahmed Z., Shields F., White R., & Wilbert J. (2010). Managerial communication: the link between frontline leadership and organizational performance, *Journal of Organizational Culture, Communications & Conflict*, 14(1).

Belbin, R. M. (2004). *Team Roles at Work*. Oxford: Elsevier Butterworth-Heinemann.

Březinová, M., Holátová, D. & et al. (2014). *Řízení lidských zdrojů v malých a středních podnicích*. Žilina, Slovensko: Georg.

Brownell, J. (2003). Applied Research In Managerial Communication: The Critical Link between Knowledge and Practice. Available at: http://business.highbeam.com/4074/article-1G1-101938452/applied-research-managerialcommunication-critical

Daniela, P. (2013). The interdependence between management, communication, organizational behavior and performance. *Annals of the University of Oradea, Economic Science Series*, 22, 1554–1562.

Doporučení Komise (2003). Úřední věstník Evropské unie L 124.

Emanoil, M., Ramona, T., & Lucia, F. (2013). Efficient organizational communication- A key to success. *Studies in Business & Economics, 8*(2), 74–78.

Erner, M., & Presse V. (2010). Financial evaluation of innovations: structure and implementation. An analysis using a case study from the telecommunications industry. Berlin: Springer.

Evangelu, J.E. (2008). *Diagnostické metody v personalistice*. Praha: Grada Publishing.

Finkelstein, J. (2010). *12 critical strategies for effective e-mail communication*. Smashwords Edition

Hari, A. (2016). *Who Gets to 'Work Hard, Play Hard'*? Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/gwao.12146

Hennig, G., Pelz, G. (2008). *Transakční analýza*. Praha: Grada Publishing.

Holá, J. (2011). *Jak zlepšit interní komunikaci*. Brno: Computer Press.

Horáková, I., Stejskalová, D., & Škapová, H. (2000). *Strategie firemní komunikace*. Praha: Management Press.

Hynes G.E. (2005). *Managerial communication: Strategies and applications*, McGraw-Hill.

Kang, M., & Sung, M. (2017). *How symmetrical employee communication leads to employee engagement and positive employee communication behaviors.* Research Gate Available at: https://www.researchgate.net/publication/313361891_How_symmetrical_employee_communication_leads_to_employee_engagement_and_positive_employee_communication_behaviors_The_mediation_of_employee-organization_relationships

Kroeger, O., Thuesenová, J.M., & Rutledge, H. (2006). *Typologie pro manažery*. Praha: Triton.

Mahajan, A., Bishop, J., & Scott, D. (2012). Does trust in top management mediate top management communication, employee involvement and organizational commitment relationships? *Journal of Managerial Issues*, 24(2), 173–190.

Meloun, M., & Militký, J. (2004). *Statistická analýza experimentálních dat.* Praha: ACADEMIA.

Mikuláštík, M. (2007). *Manažerská psychologie*. Praha: Grada Publishing.

Navarro, J. (2009). *The Psychology of Body Language*. eBook

Nothhaft, H. (2010). Communication management as a second-order management function: Roles and functions of the communication executive-results from a shadowing study, *Journal of Communication Management*, 14(2).

Paludi, A., Jones E., Chrisler, J.C., & Johnston-Robledo, I. (2013). *Psychology for Business Success. Toward a motherfriendly workplace.* Research Gate. Available at: https://www.researchgate.net/publication/266080814_Toward_a_mother-friendly_workplace_Workplace_flexibility_intervention_outcomes

Pink, D. (2009). *Drive: The Surprising Truth About What Motivates Us*. New York: Penguin Group

Plamínek, J. (2004). *Sebeřízení*. Praha: Grada Publishing.

Řehoř, P. (2012). *Manažerská komunikace*. České Budějovice: Jihočeská univerzita v Č. Budějovicích, Ekonomická fakulta.

Rektořík, J., et al. (2007). *Organizace neziskového sektoru*. Praha: Ekopress.

Tanrıverdi, H., Adı güzel, O., & Çiftçi, M. (2010). The Impacts of the Health Managers' Communicational Efficiency On the Performance of the Staff: A Case of State Hospital. *Journal of Süleyman Demirel University Institute of Social Sciences Year*, 1(11).

Tsai, M.T., Chuang, S.S. & Hsieh, W.P. (2009). An Integrated Process Model of Communication Satisfaction and Organizational Outcomes. *Social Behavior and Personality*, 37 (6): 825-834.

Uusi-Rauva, C., & Nurkka, J. (2010). Effective internal environment-related communication: An employee perspective. *Corporate Communications: An International Journal*, 15(3), 299–314.

Zia, A, et al. (2010). *Managerial communication: the link between frontline leadership and organizational performance*. Available at: http://www.thefreelibrary.com/Managerial+communication%3A+the+link+between+frontline+leadership+and...-a0235623724

Innovation management in a selected organization

Ladislav Uhlíř, Petr Řehoř

Abstract *At present, human society is at a time when the world around us is changing at the fastest pace in the history of humanity. Innovation is not only an opportunity for business but is becoming a necessity without which organizations would be condemned to disappear. It should be remembered that only a good idea is not enough. For businesses, it is essential that ideas are matched by successful innovations. In other words, it depends on the quality management of innovation processes. The paper is about managing innovation. The object of the survey was a medium-sized manufacturing enterprise. This article evaluates the innovation management in the sample enterprise and, at the same time, is suggests particular improvements in this area.*

Key words: Innovation management · Innovation process · Innovation · Improvement proposals · Innovation evaluation

JEL Classification: M10 · L20

1 Introduction

The definition of innovation in the paper is based on the definition of the European Commission: Innovation is the reconstruction and expansion of a range of products and services and the related markets, the creation of new production, supply, and distribution methods, and the implementation of changes in management, the organization of labour, working conditions and the skills of the workforce (MPO, 2004). Innovations are closely linked to management. Innovation management is a very dynamic field that is not linear and repeatable. It is open to cooperation with others, from the level of workers, through cross-departmental cooperation to co-operation between different market entities and industries (Morente & Ferras, 2017). As a proces within organisations, innovation is about new products or processes leading to the enhancement of value for customers and shareholders (Adams et al., 2006; Bessant, 2003).

It follows from the above that there are different types of innovation. Also, there are different views related to the classification of innovations. Regarding the degree of the change caused by innovation, Pitra (2006) defines significant innovation (such as a new product; a new line of products) and continuous innovation (such as a change in the characteristics of a product). Innovation has been regarded as a dependable way to generate long-term stability, achieve shareholder returns, maximize employee satisfaction, and stay at the forefront of the industry through attaining a sustainable position (Cottam et al., 2001).

Tidd, Bessant and Pavitt (2007) together with Ghosh, Kato and Morita (2017) mention radical and incremental innovations. Dvořák (2006) sees the types of innovation in a similar way, defining evolutionary and revolutionary innovation, and also considering the size of the investment needed, the source of innovation impulse and the extent of risk. A more detailed classification of innovation according to the magnitude of change, was defined by František Valenta in the 1950s. Each innovation can be assigned to one of the nine levels (Švejda & kolektiv, 2007; Valenta, 2001). However, the division of innovations can also be seen from a material point of view. As an example, Košturiak & Chaľ (2008) define product innovation, process innovation and business system innovation. Francis and Bessant (2005) introduced the concept of 4P innovation. There are product, process, position, and paradigm innovations in the model (Abdel-Razek & Alsanad, 2013).

The paper uses the classification of the Oslo Manual, defining product, process, organizational and marketing innovation (OECD & Communities, 2005). The Oslo Manual also lists the most important factors that can act as the barriers to innovation. These are economic, business and other factors (OECD & Communities, 2005). Goepel et al. (2012) states that the sources of innovation barriers are the internal organizational elements of the enterprise and the individual behaviour of those involved in innovation. Different barriers exist among individual people involved in innovation, at the level of workers and business units, at the enterprise level, at the sector level and at the regional and national level (Karlsson & Stetler, 2015).

Ing. Ladislav Uhlíř, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: uhlirl03@jcu.cz

doc. Ing. Petr Řehoř, Ph.D., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: rehor@ef.jcu.cz

The studies on innovation barriers at an enterprise and organization level revealed that the most frequent obstacles to an effective innovation process are funding and cost issues, knowledge factors, technological barriers, risk aversion, social and cultural barriers, poorly chosen strategies, and heavy workload (D'este, Immarino, Savona & Von Tunzelmann, 2012). At the individual level, the most common barriers include lack of cooperation, unclear targeting and lack of resources influenced by such factors as corporate culture, support of the top management and individual skills and creativity of the employees (Uzkurt, Kumar & Ensari, 2013). As Fiorentino (2010) states, it is important for successful businesses to apply a systematic approach to innovation management. An important area is related to the assessment of innovation performance. More (2011) states, that there are a number of approaches in the innovation assessment. By him, it is not possible to use the financial indicators of success only, because innovation can generate value, even if it makes losses.

Tidd & Isaksen (2002) stated that innovation management is defined as the process of designing new ideas and organizing them into widely practice. According to the literature, innovation management needs to be directed at products, markets, production competencies as well as administrative competencies (Tomala & Séméchal, 2004).

According to Pratali (2003), managing innovation involves two simultaneous, interrelated fundamental objectives of competitiveness: improving product quality (a prerequisite to success), and improving the company's overall technological quality (a prerequisite to lasting success). Process innovation embraces quality function deployment and business process reengineering (Cumming, 1998). According to Johne (1999), it provides the means for safeguarding and improving quality and for saving costs. He also maintains that process innovation is important in both the supply of the core product as well as in the support part of any offer.

Bartes (2006) recommends various methods, such as BCG matrix, innovation life-cycle analysis and Balanced scoreboard. A number of authors (such as Dvořák, 2006; Hauschildt, 2014; Žižlavský, 2012) recommend assessing different effects of innovation, classifying such effects as technical, economic and other. Other authors mention that innovation can be seen as an investment and, therefore, it is possible to use the same financial indicators (Erner & Presse, 2010; Kislingerová, 2008). Žižlavský (2012) proposes to supplement the financial indicators with the non-financial indicators of internal processes.

2 Methods

The aim of the paper is to evaluate innovation management in a sample organization and to propose changes to improve the current state. Qualitative methods of research were used to do so. After the necessary insights into the field of innovation management, a series of questions were created for semi-structured interviews with the managers of the sample organization. These interviews took place in February and March 2018.

The first interview was conducted with the managing director, who talked mainly about more general topics, about the organization and the significant changes that have occurred in the organization in recent years. The second interview was conducted with the manager of the technical department. The central theme of this interview was the management of innovation across the enterprise, the involvement of the departments and staff. In addition, the documentation related to the innovation management and the continuous process improvement approach introduced in 2017 was also discussed. The third interview was conducted with the manager of the production hall, which is responsible for preparing the currently planned process innovation. This interview aimed to get as much information as possible about the management process of a particular innovation to describe it in detail and to identify possible shortcomings.

Another method used in the research was the analysis of internal documents of the enterprise. Specifically, this involved documentation on the intended process innovations and the financial statements for 2008-2016. As an additional method of data collection, direct participation in the workplace and observation of the internal processes we used.

The information obtained by the above mentioned methods has enabled the authors to describe the current state of innovation management in the sample organization and then evaluate it critically. The organization surveyed is the largest from a group, measured by the number of employees, and the group's main production facility. The research and development of new products takes place almost exclusively in the parent company in Germany.

3 Research results

In the surveyed organization, the product innovations are therefore addressed only marginally, mostly as the incremental innovations. It is usually dealing with a better technical and economical solution for one of the final product parts. The process and organizational innovation are of greater importance in the organization.

The management of innovation activities in the organization is primarily a task for the production hall manager and the head of the technical department. The manager of the production hall is in charge of managing larger process innovations, such as acquiring new equipment in production. The manager of the technical department is concerned with the smaller product innovations mentioned above, employee improvement suggestions, and CPI approach - Continuous Process Improvement.

In general, innovation is seen in a friendly way. The management is aware of the dynamism of the changes taking place in society and the fact that, without innovation, the organization would sooner or later be condemned to extinction. At the same time, they do not want to take on only a reactive position and adapt to change, but want to be the market leader in all aspects. Consequently, the management is not only focused on performance and sales, they want the company to be an example for the employees, the neighbourhood and the environment.

Openness and overall access to innovation are some of the positive signs of innovation management in an organization. A degree of flexibility is another positive feature. For example, it is characterized by a willingness to promptly change the current innovation activities in the case of a more favourable option and changing the entry conditions. It is very positive to use the CPI approach in the field of innovation management. This is characterized by continuous monitoring of all processes in the organization and the search for opportunities to improve them.

On the other hand, the absence of a systematic approach to innovation management is one of the issues. This is manifested, for example, by the fact that innovations are controlled quite randomly. Also, no specific person is responsible for managing the innovation. Nowadays, the management of the innovations is mainly concerned by the manager of the technical department and the manager of the production hall section. However, their powers and responsibilities are not firmly defined in this area. Another lack of a non-systematic approach is the fact that the organization is not consistently guided by documentation of innovation processes. This results, for example, from not realizing some of the ideas, but also the inability to reverse the failure of a particular innovation. A significant shortcoming has been identified in the decision-making process on innovative alternatives. The only financial indicator when deciding on a variant was the indicator of a simple repayment period. However, this method does not take into account the income flowing after the repayment period and therefore it is not appropriate to use it separately in the decision-making.

Based on the situation, five specific proposals were designed to improve the management of innovation processes. The suggestions are described below. The first proposal is to create a job position to manage innovation activities in the enterprise. An employee in this position would be responsible for coordinating all activities related to the innovation activity. Part of the task would be to constantly monitor the processes in the organization and look for opportunities for improvement, regular communication with staff from different departments on improvement and innovation, and addressing these topics. This person would be responsible for managing the ongoing innovation processes.

The innovation manager would monitor the progress of the innovation process, create project teams for specific situations, communicate across the departments, and delegate the tasks.

Table 2 Benefit card

Benefit for production process	**Benefit for workers**
Benefit for the whole organization	**Benefit for customers**

Source: own processing

Making decisions about implementing a particular innovation has a significant subjective aspect in the organization. In order to provide greater objectivity in deciding on potential future innovations, it is therefore proposed to introduce a structured assessment system of innovative options. The proposed method consists of creating two tables - a benefit card

and a scoreboard. The benefit card lists all the benefits of a particular innovation according to its field of application - benefits for the customer, employee, production process and society as a whole. The benefit card is shown in Table 1.

The scoreboard then evaluates the benefits for areas of influence and the financial side of innovation. The amount of the weighted benefits then represents the means for deciding on the variation. The scoreboard can be seen in Table 2. The introduction of this method should be used as a tool for assessing the innovations in an enterprise, which includes both financial indicators and benefit indicators for different areas of influence. This method has two uses. First, it provides a guideline for deciding between several innovative variants. It also allows retrospective evaluation of the innovations.

There is currently no system for rewarding the employees who will contribute to the improvement proposal. It is recommended introducing a system of financial reward for the improvement proposals made for employees. It can be assumed that, with the vision of a possible monetary valuation, employees will be more likely to communicate their proposals and, at the same time, this evaluation will encourage more workers to think about possible improvements.

Table 2 Scoreboard

Area of influence	Benefit assesment (0-5)	Weight of area	Weighted average
Whole organization			
Customers			
Employees			
Production proces			
Capital intensity			
Payback period			
NPV			
Total	X	1	

Source: own processing

The organization lacks a systematic approach to managing innovation. At the same time, an evaluation of the management of innovation activities is not carried out. The solution for both of these areas can be the creation of the innovative scorecard - a system of interconnected balanced indicators of innovation management.

As can be seen from the theoretical part, it is not appropriate to evaluate innovation activities solely by means of the financial results. The creation of a system based on the Balanced Scorecard can therefore be a good solution. The prospective perspectives should include input indicators into the innovation process, process progress indicators, learning and growth outlook indicators, and financial indicators. In a prudent selection of indicators, this method, on the one hand, provides management with a means of assessing the performance of innovation management, but can also be a means of transferring an innovation strategy to specific tasks across departments. The objectives should be measurable in order to objectively decide on their fulfilment. An example of possible linking of individual indicators is shown in Figure 1.

The latest proposal is to create a database containing records of innovative activities. All ideas for improvement or innovation, innovations, stakeholders, etc. should be centrally centralized. An unsuccessful innovation area should be an important part - at which stage of the process failure has occurred? What was the reason? Was the deadline or budget exceeded? The existence of such documentation, on the one hand, makes it possible to return to previously unrealized ideas, but it also provides a valuable resource for analyzing the failure of innovation activities and thus a means to subsequently improve these shortcomings in future projects.

Figure 1 Balanced scoreboard of the innovation process management
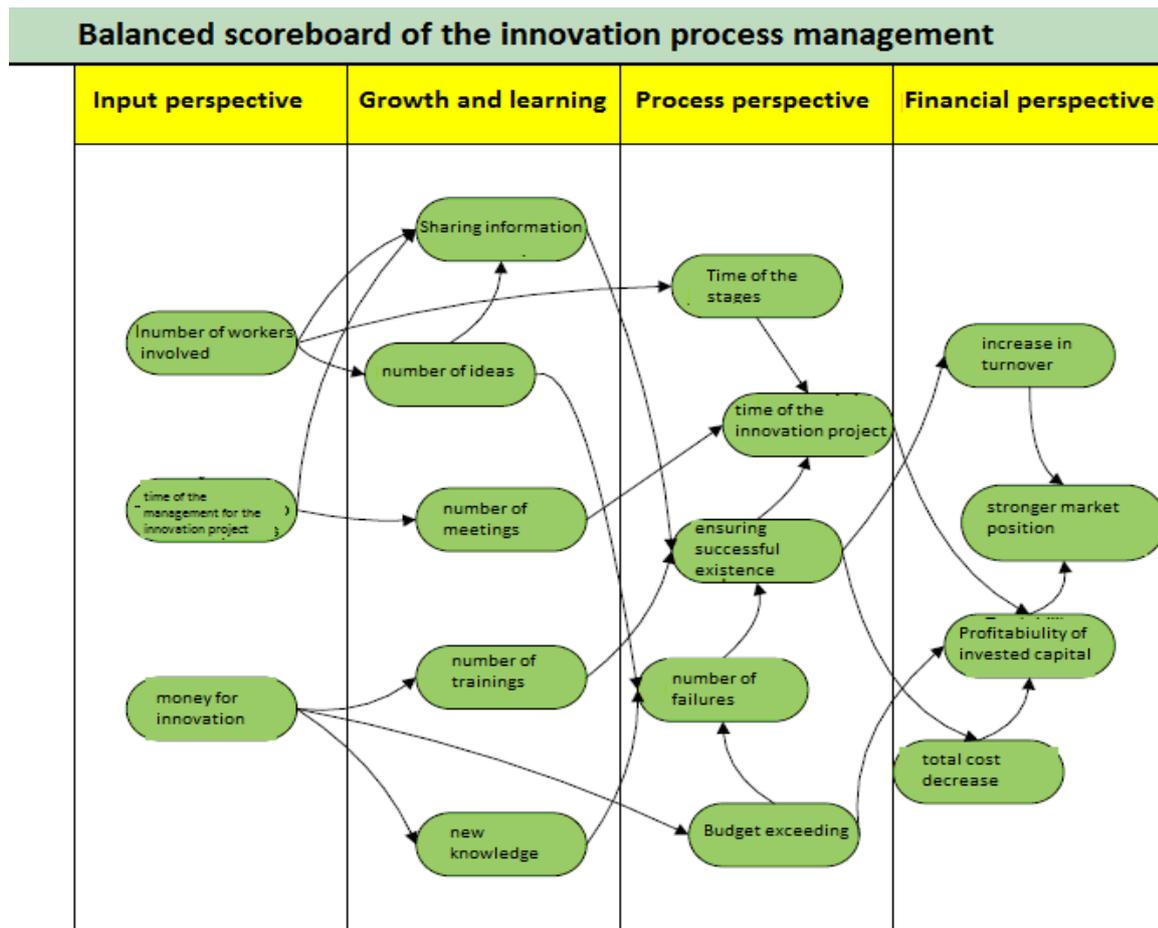
Source: own processing

4 Conclusions

The paper reviewed the status of innovation management in a selected organization. Both its negative and positive parts were presented. Innovation management refers to the enterprise can utilize new management elements (such as new method, new model, etc.) to integrate the enterprise management system in order to make more effective and achieve the goals. Although innovation in an organization is perceived as an important source of competitiveness, no emphasis is placed on their management. Based on identified shortcomings, specific proposals have been made to improve the current state of innovation management. Companies are recommended, for example, to create an innovation manager position and use a more consistent approach to documenting innovation. It is also recommended to create a system for rewarding the improvement suggestions of the employees. A specific methodology is proposed for evaluating the improvement proposals and determining the amount of reward. In addition, a system for evaluating the management of the innovation process is created. This system is based on the Balanced Scorecard and allows assessing the level of management of the innovation process, but it is also a tool for the management. These suggestions can help other organizations to streamline their innovation process.

References

Abdel-Razek, R. H., & Alsanad, D. (2013). *Evaluating Innovation by Simultaneous Mappyng and Auditing*. ISPIM Innovation Symposium. Manchester: International Society for Professional Innovation Management.

Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measure: A review. *International Journal of Management Reviews*, 8(1), 21–47.

Bessant, J. (2003). *High Involvement Innovation: Building and Sustaining Competitive Advantage through Continuous Change*. John Wiley, Chichester.

Cottam, A., Ensor, J., & Band, C. (2001). A benchmark study of strategic commitment to innovation, *European Journal of Innovation Management*, 4(2), 88-94.

Cumming, B.S. (1998). Innovation overview and future challenges, *European Journal of Innovation Management*, 1(1), 21-30.

D'este, P., Immarino, S., Savona, M., & Von Tunzelmann, N. (2012). What hampers innovation? Revealed barriers versus deterring barriers. *Research Policy*, 482-488.

Dvořák, J., & kolektiv. (2006). *Management inovací*. Praha: Vysoká škola manažerské informatiky a ekonomiky.

Erner, M., & Presse, V. (2010). Financial Evaluation of Innovations: Structure and Implementation. *Innovation Performance Accounting: Financing Decisions and Risk Assessment of Innovation Processes*, 19-39.

Fiorentino, R. (2010). Performance measurement in strategic changes. *Performance Measurement and management control: Innovative Concepts and practise*, 253-283.

Francis, D., & Bessant, J. (2005). Targeting innovation and implications for capability development. *Technovation*, 17-183.

Ghosh, A., & kolektiv. (2017). Incremental innovation and competitive pressure in the presence of discrete innovation. *Journal of Economic Behavior & Organization*, 1-14.

Goepel, M., Hölze, K., & Knyphausen-Aufsess, D. (2012). Individuals' innovation response behaviour: A fremework od antecedents and opportunities for future research. *Creativity and Innovation Management*, 412-426.

Hauschildt. (2014). *Innovationsmanagement.* München: Vahlen

Johne, A. (1999). Successful market innovation, *European Journal of Innovation*, 2(1), 6-10.

Karlsson, A., & Stetler, K. L. (2015). Frequency Versus Effect - Obstacles to Innovation and Their Relationship to Innovation Self-Efficacy. *International Journal of Innovation and Technology Management*, 1-19.

Kislingerová, E. (2008). *Inovace nástrojů ekonomiky a managementu organizací*. Praha: C.H. Beck.

Košturiak, J., & Chaľ, J. (2008). *Inovace - Vaše konkurenční výhoda*. Brno: Computer Press.

More, R. (2011). What is succes in innovation? *Ivey business journal.*

Morente, F., & Ferras, X. (2017). Innovation management from the inside: An approach from attention and everyday praxis. *Intangible Capital,* 640-667.

Ministerstvo průmyslu a obchodu (2004). *Národní inovační strategie*. Available at: http://www.mpo.cz/dokument11662.html

OECD, & Communities, S. O. (2005). *Oslo manual: Guidelines for collecting and interpreting innovation data*. Paris: Organisation for Economic Co-operation and Development.

Pitra, Z. (2006). *Management inovačních aktivit*. Praha: Professional Publishing.

Pratali, P. (2003). Strategic management of technological innovations in the small to medium enterprise, *European Journal of Innovation Management*, 6(1), 18-31.

Švejda, P., & kolektiv. (2007). *Inovační podnikání*. Praha: Asociace inovačního podnikání.

Tidd, J., & Isaksen, S. (2002). *Meeting the Innovation Challenge: Leadership for Transformation and Growth*. John Wiley & Sons, Chichester.

Tomala,F. & Séméchal. O. (2004). Innovation management: a synthesis of academic and industrial points of view. I*nternational Journal of Project Management,* 22(2), 281–287.

Uzkurt, C., Kumar, R., & Ensari, N. (2013). Assessing organisational readiness for innovation: An exploratory study on organizational characteristics of innovativeness. *International Journal of Innovation and Technology Management*, 1-26.

Valenta, F. (2001). *Inovace v manažerské praxi*. Praha: Velryba.

Žižlavský, O. (2012). *Manuál hodnocení inovační výkonnosti*. Brno: Akademické nakladatelství CERM

Innovation Literacy Quantification in Social Enterprises

Petra Krejčí

Abstract: *The main goal of the paper is to set competencies for the evaluation of the innovation literacy rate in social enterprises in the field of innovation creation. A literature review will be made in order to determine literacy types and competencies for the narrower definition of innovation literacy. Based on these findings, theoretically set competencies in social enterprises in the field of innovation creation in the Czech Republic will be defined. The added value of this paper will be the focus on entrepreneurs' opinions on the creations of social innovation in social enterprises in the Czech Republic from the point of view of superiority and subordination. Furthermore, competencies are allocated to three types of innovation in a social enterprise. These three types of innovation include employee-focused innovation, product-oriented innovation and enterprise-wide innovation. The final evaluation is based on secondary research on the literacy rate in enterprises by using pre-set competencies. In the conclusion part of the paper we will highlight the possibilities of further primary research following on from this research. Competencies should help in the development of future primary research focusing on innovation literacy in social enterprises in the Czech Republic.*

Key words: Literacy · Social enterprise · Innovation · Literacy rate · Competencies

JEL Classification: L31 · O35

1 Introduction

Social entrepreneurship is currently a very intensively discussed topic, especially in the Czech Republic. Social risks are an inherent part of every society and social enterprises are able to partially solve this issue in an efficient manner (Gojová). There are approximately 222 indirectly registered social enterprises in the Czech Republic and their number is still rising (Ministry of Labour and Social Affairs, 2018). Their increasing number and importance in addressing social risks in society inspired an interest in their functioning and the potential integration of this activity in legislation. The development of social entrepreneurship is very often accompanied with a positive approach to innovation. Inside a social enterprise, innovations and their creation are broadly discussed issues. Each social enterprise handles innovation differently and the general literacy rate in this area is not known. Due to the abovementioned facts, it is advisable to determine the innovation literacy rate in these enterprises applying the pre-set parameters.

In general, authors do not agree on the definition of social entrepreneurship and social enterprise. The definitions in this field are mostly formulated in line with the research that the author focuses on. This situation logically follows from the fact that neither social entrepreneurship nor social enterprise has been legally defined at all. Therefore, one encounters many different definitions of social enterprises. (Mulgan, 2006; Loudín, 2015; Baregheh et al., 2009; Gidron and Yekeskel, 2012)

In this paper social enterprises include social integration enterprises and all enterprises that can be classified as social enterprises, as defined in the Social Economy Thematic Network (TESSEA). Social entrepreneurship can be defined as an activity contributing to the improvement of the environment and society. These activities are important for regional development, for example, by creating jobs for people at a disadvantage in the labour market. Social entrepreneurship is associated with promotion of public benefits and at the same time with profit-making. A social enterprise may be defined as a legal entity that is a "social entrepreneurship entity" and has been or has in part been founded under private law. A social enterprise can also be defined as a natural entity that meets the principles of a social enterprise. A social enterprise should be established, but also developed on the basis of economic, social and environmental benefits, and should fulfil the public benefit objectives defined in the foundation documents. An integration social enterprise is defined as a "social entrepreneurship entity" that can be both a legal entity and a natural entity. In both cases, the integration social enterprise must meet the principles of a social enterprise, fulfil the public benefit objectives and be established and developed on the basis of economic, social and environmental benefits. Public benefit objectives are understood as social inclusion and employment of people at a disadvantage in the labour market (TESSEA, 2018).

Ing. Petra Krejčí, Silesian University in Opava, School of Business Administration in Karvina, Univerzitní náměstí 1934/3, 733 40 Karviná

Defined in a varied manner depending on the focus, literacy represents an inherent part of a well-functioning business, whether it concerns entrepreneurship in a social or different enterprise. Classified as one of the types of literacy, functional literacy can be understood in a variety of ways. M. Dobrovská (2001) states that functional literacy does not cover solely the ability to write, read and calculate, but also the ability to actively participate in the world of information (Dobrovská, 2001). In addition, applying a different point of view, functional literacy may be divided into three parts, specifically, into functional literary, documentary and numerical literacy. Moreover, functional literacy does not include only mastery of one's own native tongue, but also of a foreign language (Pavelková et al., 2012). In contrast, Fasnerová claims that functional literacy means skills a person is furnished with for the implementation of various activities required by modern day civilization (Fasnerová, 2018). According to Pavelková et al. (2012) functional literacy also encompasses information literacy. This type of literacy is described as mastering work with information including information and communication technologies (Pavelková et al., 2012).

However, information literacy may represent a separate type of literacy. In this case, information literacy is closely linked to education and similarly as functional literacy, it can be divided into literary, documentary and numerical literacy, while being extended with language and computer literacy (Dobrovská et al., 2004). As to financial literacy, it is very widespread and nowadays it is necessary not only in the field of business, but in many other areas. It represents the skills associated with understanding numbers, dealing with numbers, being aware of basic financial products and the associated risks, which encourage the ability to handle funds and assets. Based on numerical literacy in general, it is a separate component of information literacy (Pavelková et al., 2012).

A major component for the determination of literacy is competencies that clearly set out the rate of the required literacy. Regarded as unique and individual, competencies are important for successful negotiations in a variety of situations. In general, competencies also include the attitudes and motivation of their holders (Veleška, 2008). Furthermore, competencies can also be referred to as abilities or qualifications, namely in connection with managerial competencies. Due to this, competencies divide managers into two categories - average and excellent (Kubeš et al., 2004). It is generally presumed that competencies can be valued, are detectible and relevant for practice. In view of this, they can be described at various levels, learned and further developed. In addition, a strong relationship with organizational efficiency is presumed. (Caird, 1992; Prahalad and Hamel, 1990)

This paper aims to set profile competencies for the evaluation of the literacy rate in social enterprises in terms of innovation creation. The profile competencies set by this secondary research will be suitable for quantifying innovation literacy. Therefore, all of the set profile competencies are expected to be quantifiable items, whether from the point of view of superiority or subordination.

2 Methods

Several methods were applied in the successive steps leading to the definitive conclusion:

- the first step was the secondary research, drawing on the published public data,

- the second step was processing the data using historical and theoretical analysis, building on the applied secondary research,

- the third step was to draw conclusions resulting from the literature review, where logical induction was applied,

- the fourth step was the final deriving of usable competencies, applying the deduction method,

- the full conclusion is based on the logical induction method (Vaceková et al., 2015).

Within the methodology for this paper it has been stipulated that competencies are understood as the ability to cope with the workload in the context of working with innovations in a social enterprise and having the knowledge and skills required for this position. Competencies are part of innovation literacy. Innovation literacy is derived from the definitions referred to in the introduction of this paper and is defined as an individual ability to understand and identify separate areas in the content including the knowledge relating to innovations in a social enterprise.

3 Research results

Literacy and associated competencies are expedient for an enterprise that intends to develop further in the given market. This paper focuses on innovation literacy in a social enterprise. Social enterprises in the Czech Republic are not familiar with innovation literacy. Therefore, only secondary data from certain social enterprises that share information about their activities with the public are available. In view of this fact it is suitable to conduct primary research in the future, focusing on the quantification of innovation literacy in the area of social enterprises. This paper prepares the ground for such

primary research. For the compilation of an appropriate questionnaire, to be used in future primary research, it is necessary to set the appropriate competencies for the quality quantification of innovation literacy.

For further research individual competencies have been specially set for three types of innovation. These three innovations are employee-focused innovation, product-oriented innovation and enterprise-wide innovation. Employee-focused innovation aims at improving the employees' quality of life in a social enterprise (for example, it may concern an innovation that makes work easier for disabled employees). Product-oriented innovations are aimed at improving the quality of production or products manufactured by the enterprise (for example, it may entail purchasing new technology). Enterprise-wide innovation focuses on improving the environment in a social enterprise (for example, it may mean repairing a roof or the reconstruction of the outer area of the enterprise) (Krejčí and Šebestová, 2018).

3.1 Competencies

Innovation competencies include experience, skills, abilities, knowledge, and motivation. Experience is understood as a continuing understanding further usable for innovation development in a social enterprise. Skills mean a disposition in the area of innovation obtained via practical experience and learning. Abilities are understood as the premise and potential to cope with activities promoting innovation in the enterprise. Knowledge means a summary of the findings and understanding gained from study or practical experience in the area of innovation. Motivation means an external or internal factor influencing attitudes toward innovation in the enterprise. All of the below set competencies in the individual areas are aimed at the possibility of better targeting of questions in future research.

Table 1 presents a list of competencies, which can be further used and developed into individual types of innovation. The table contains the competencies that may also be required in all of the three innovation types. All of the competencies in Table 1 focus on innovation in a social enterprise.

Table 1 Profile competencies in the area of innovation in a social enterprise

Area	Experience	Skills	Abilities	Knowledge	Motivation
Profile competencies in the area of innovation in a social enterprise	In working under stress	Organising	Initiatives	Expertise	Empathy of superiors
	In innovation implementation process	Planning	Team work	Terminology (of innovations)	Openness toward employees
	In introducing innovations	Decision-making	Training of employees	Gained from practical experience	Communication with employees
	Practical experience	Administrative work	Practical application of knowledge	Types of innovation financing	Self-reflection in relation to subordinates
	In dealing with a crisis during innovation work	Efficient checks	Creativity	Legislation	Self-reflection in relation to superiors
		Efficient utilisation of debt capital	Innovation implementation	Production process	Involvement of employees in the process
			Creating a stimulating environment		

Source: own processing

Experience in Table 1 is associated with working under stress, the innovation implementation process, introducing innovations as well as practical experience and experience in dealing with a crisis during innovation work. All of this experience can be found in all three types of innovation. Whatever type of innovation is conducted in the enterprise, it is a great advantage if both the superiors and subordinates possess the above competencies.

Skills in Table 1 are associated with organising, planning, decision-making, administrative work, efficient checks and efficient utilisation of debt capital. Similarly as above, all of these competencies are beneficial for all of the innovation types. In this area, however, these competencies are required mainly from superiors. Follow-up research on this issue should therefore be focused mainly on managers, directors or owners of social enterprises.

Abilities in Table 1 are associated with initiatives, teamwork, employee training, practical application of knowledge, creativity, innovation implementation and creating a stimulating environment. Employee training and practical application of knowledge are predominantly most necessary for production innovations that may be related to, for example, the operation of a new machine in the process of product manufacturing. Creating a stimulating environment is generally related to the enterprise-wide innovation, which may promote a positive attitude of employees towards the social enterprise. Other abilities can be used in various forms in all three innovation types.

Knowledge in Table 1 is associated with expertise, terminology, experience-based knowledge, types of innovation financing, legislation and production process. Expert knowledge, experience-based knowledge and knowledge of the production process is closely linked with production innovations. Lack of familiarity in these areas can result in poor quality and inefficient use of innovations and innovated parts of the production process in the enterprise. It is beneficial to take advantage of the other types of knowledge during each innovation process in the enterprise.

Motivation in Table 1 is associated with empathy of superiors, openness toward employees, communication with employees, self-reflection in relation to subordinates and superiors as well as the involvement of employees in the innovation process. All competencies can be used in all three types of innovation. In the area of innovation it is particularly beneficial for the subordinates and their desire to further support innovations in the enterprise with their ideas, thus contributing to the development of the enterprise.

The pre-setting of the competencies and their possible use in all of the innovation types in social enterprises is a suitable tool for the preparation of a questionnaire or an interview aimed at research innovation in social enterprises. The competencies should ensure the appropriate structuring of the questionnaire into individual types of competencies as well as targeting questions at specific innovation areas. The next suitable point relating to targeting is to separate questions, for the manager (or possibly owner) of the enterprise, and into individual sections for superiors and subordinates. This division will clearly determine who the question is intended for.

The viewpoint of the manager or owner of the enterprise concerning individual areas of innovations and their competencies is a useful factor in the innovation literacy rate quantification. It is possible to take advantage of it also when comparing individual outputs from social enterprises in primary research.

4 Conclusion

The conducted secondary research has dealt with innovation literacy and its quantification applying profile competencies. Therefore, this study has presented profile competencies that can be used in the quantification of the innovation literacy rate in social enterprises. The follow-up research should take advantage of these profile competencies in the preparation of primary research in social enterprises in the field of innovation literacy, as is clearly indicated in the introduction of this paper in its response to the unquantified innovation literacy rate in the Czech Republic, especially in social enterprises. This fact further emerges from the small, but ever increasing number of social enterprises in the Czech Republic (CSP, 2018).

The result of this paper is fully transposable across all social enterprises in the Czech Republic regardless of their area of focus. Given the set of competencies, a whole range of questions emerges along with their possible use in future primary research on innovation literacy. A question suitable for further research is for example: "Is innovation literacy among social enterprises in the Czech Republic comparable?" Subsequently, this question opens up issues for conducting research in this area attempting to determine whether social enterprises in the Czech Republic have the same or different innovation literacy.

References

Caird, S. (1992). Problems with the identification of enterprise competences and the implication for assessment and development. *Management Education and Development*. 23. 6–17.

CSP. (2018), České sociální podnikání. Adresář sociálních podniků. Dostupné z: *https://www.ceske-socialni-podnikani.cz/adresar-socialnich-podniku*. Viděno: 23. 11. 2018

Baregheh, A., Rowley, J., & Sambrook S., (2009).Towards a multidisciplinary definition of innovation. *Management Decision*. 47(8). 1323–1339.

Gajová, V. (2014). Integrační cíle sociálních podniků – možnosti sociální práce. Scientific Papers of the University of Pardubice. 8(1), 6-19.

Gidron, B., & Yekeskel, H. (2012). Social enterprises: an organizational perspective. *New York: Palgrave Macmillan*. 253 p. ISBN 978-023-0358-799.

Fasnerová, M. (2018). Prvopočáteční čtení a psaní. Praha: Grada. ISBN 978-80-271-0289-1.

Dobrovská, M. (2001). Informační gramotnost: funkční gramotnost v informační společnosti. Praha: UK SV ISS VSP (Diplomová práce).

Dobrovská, M., Landová, H., & Tichá, L. (2004). Informační gramotnost - teorie a praxe v ČR. *Národní knihovna.* 15(1), 7-19. Dostupný z: http://knihovna.nkp.cz/nkkr0401/0401007.html. ISSN 1214-0678.

Krejčí, P., & Šebestová, J. (2018). Social innovation ties: A dilemma of product and employee orientation. *Polish Journal of Management Studies.* 17 (2). 123-133.

Kubeš, M., Kurnický, R., & Spillerová, D., (2004). Manažerské kompetence: způsobilosti výjimečných manažerů. *Praha: Grada. Manažer.* ISBN 80-247-0698-9.

Loudín, J. (2015). Sociální inovace: doba hledání a tříbení. *Teorie vědy/theory of science.* 31(1). 97-112.

MPSV. (2018). Co je to sociální podnikání? Vývoj počtu sociálních podniků v ČR. Dostupné z: http://www.policy.eu/co-je-to-socialni-podnikani/soc_pod_tab/, Viděno: 20. 11. 2018

Mulgan, G. (2006). The Process of Social Innovation. *MIT Press Journals. Innov.* 1. 145-162.

Pavelková, J., Preuss, K., & Knaifl, O. (2012). Funkční a finanční gramotnost. *In Speciální pedagogika.* 22(2), 108-119. ISSN 1211-2720.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review.* 68. 79–91.

Vaceková, G. (2015). Social Enterpreneurship in the Czech Republic. Current Trends in Research on Hybridity. *Scientific Papers of the University of Pardubice*. Series D. 22(35). 161-172.

Veteška, J. (2008). Kompetence ve vzdělávání. Praha: Grada Publishing, a. s. ISBN 978-80-247-1770-8.

Effect of Customer Orientation on Business Performance - Case of Slovakia

Simona Budinská, Janka Táborecká-Petrovičová

Abstract: *In current situation on the market, one of the key capabilities of business in order to achieve competitive advantage is the ability to satisfy needs of the customers better than competitors. The culture or behaviour those essence is to place customer needs into the centre of attention of business is called market orientation. Market orientation origi- nates from the marketing concept and it seems to be the key for increasing business performance. There are various ways of market orientation measurements that involve a lot of aspects and dimensions but one of them emphasizes especially focus on customers, resp. customer orientation. Based on previous studies we expect that the level businesses achieve in this orientation is directly reflected in their performance. It means the higher customer orientation businesses achieve, the better they will perform. Based on that we formulated the main aim of our paper as: to examine customer orientation of businesses operating in Slovakia through CUSTOR measurement method with the respect to business performance represented by financial and non-financial indicators. We studied 230 companies of various sizes, scopes of business and from various regions in online survey to confirm our hypothesis. The results will serve for managers as a base for en- hancement of customer-oriented culture in their companies that could result in better performance in both financial and non-financial field.*

Key words: Customer orientation · Business performance· Market orientation · Indicators

JEL Classification: M1 · M3

1 Introduction

Market orientation (and one of its core dimension – the customer orientation) originates from the marketing concept which assumes that to achieve sustainable success business should be able to identify and satisfy needs of the customers more effectively than competitors. Application of market orientation consists in implementation of marketing activities, such as identification and satisfaction of consumer needs, marketing research, segmentation, positioning and targeting, product development, and differentiation. Market orientation affects wide range of business processes including human resource management, marketing information system, customer relationship management, etc. Market orientation is also consid- ered as a part of marketing management and significant factor during the process of marketing strategy development. Caruana (1999) states that the level of market orientation of business depends on the degree of the marketing concept implementation. Since the 1990s market orientation is one of the key concepts in marketing literature. The issue of market orientation represents very actual topic not only for scientists, but also for business practice. Dynamic changes in con- sumers' increasing access to information made crucial for businesses to monitor situation in the market and satisfy evolv- ing needs and wants of customers. Regarding current situation in the market, businesses need to be more market-oriented than ever before when they want to succeed. Here arises the question what does that mean to be market oriented vs. customer oriented. Narver and Slater (1998) in their research differentiate between the first, being "customer-led", short- term philosophy in which businesses respond to customers expressed wants and the second, being "market-oriented", long-term philosophy of commitment to understanding customers expressed and latent needs, and to producing superior customer value through the developing innovative solutions. Although market-orientation is more complex issue, we decided to focus in this paper specifically on customer orientation.

To measure market orientation scientists are using various methods. The most well-known are the ones developed by Narver and Slater in 1990 (MKTOR) and Kohli and Javorski (MARKOR). However, there exist also other approaches. Hajjat (2002) developed CUSTOR method which is focused on measuring of customer orientation. Customer orientation

Ing. Simona Budinská, PhD., Matej Bel University, Faculty of Economics, Department of Corporate Economics and Management, Tajovskeho 10, 975 90, Banska Bystrica, Slovakia, e-mail: simona.salyova@gmail.com

doc. Ing. Janka Táborecká-Petrovičová, PhD., Matej Bel University, Faculty of Economics, Department of Corporate Economics and Management, Tajovskeho 10, 975 90, Banska Bystrica, Slovakia, e-mail: janka.taborecka@umb.sk

is hypothesized to be a multidimensional construct which consist of customer intimacy, customer welfare, business transparency, and continuous improvement. According to Narver and Slater (1990) customer orientation is considered as a basic element of overall market orientation. An increasing number of studies have recently focused on the concept of market orientation with the aim of understanding the impact of its elements, e.g. customer orientation on business performance (Hajjat, 2002). This method consists of 17 items which are shown in table 1. In our opinion it could be very helpful to use this method in combination with another method to deeply understand important element of overall market orientation. Saxe and Weitz (1982) developed measuring method SOCO (Selling Orientation – Customer Orientation) for measuring the degree to which salespeople engage in customer-oriented selling (In: Jaramillo et al., 2007, p. 302).

Table 1 Measuring Items of CUSTOR Method

Customer orientation
1. Customers play a consultative role in the selling process.
2. Customers are not promised more than can be delivered.
3. Employees understand what product attributes customers value most.
4. Customers are given information that helps in developing realistic expectations.
5. Employees go beyond normal call of duty to please customers.
6. Company has a system for monitoring, analysing, and solving customers problems.
7. Customers can raise complaints very easily.
8. Information is continually sought and collected from customers.
9. Policies and procedures that do not create value for customers are eliminated.
10. Employees understand the company mission and objectives.
11. Customers' needs take precedence over company internal needs.
12. Employees are given adequate resources to meet customers' needs.
13. Customers' input and feedback are used into the product development process.
14. Company continually improves technologies, processes, and products.
15. Company continually reduces research and development cycle time.
16. Company continually invests in developing new ideas.
17. Management considers constant innovation a key to obtaining and sustaining competitive advantage.

Source: Hajjat, 2002, p. 431.

Market-oriented behaviour positively influences business' outcomes. Firstly, market orientation has a positive impact on employees; especially it increases *organizational commitment and esprit de corps*. Organizational commitment lies in loyalty of employees with the business and their willingness to stay work for it. Accordingly, committed employees used to spend more time, efforts and talent to their organization (Parasuraman, 1983). Meyer and Allen (1991) have categorized commitment into three dimensions. The first dimension is affective commitment represented by emotional attachment to the business. The second dimension is normative commitment which is characterized by socialization experience with other employees and the third dimension is continuance commitment which results in self-sacrificing when quitting a job (In: Zaman et al., 2012). According to Boyt et al., (1997) esprit de corps "consists of a set of enthusiastically shared feelings, beliefs, and values about group membership and performance, and manifests itself as a strong desire to achieve a common goal even in the face of hostility. At the work group level, esprit de corps exists when individuals in the same department or team enthusiastically share values and goals." Kohli e al. (1993) conclude that both organizational commitment and esprit de corps are outcomes of market-oriented behaviour of business.

Secondly, market orientation influences *business performance*. Many authors (Ngai and Ellis, 1998; Gaur et al, 2009; Gadimi et al., 2013; Eslahnia, 2014; Yadav and Tripathi, 2014) investigated the relationship between these variables. Businesses performance as a consequence of market orientation is mainly expressed by the level of *customer satisfaction* as a non-financial indicator and *several financial indicators*, including profitability, sales or overall performance. Vieira (2010) argue that market orientation is a source of differentiation on market and investments to marketing concept implementation should lead to superior business performance.

2 Methods

The main aim of the paper was to examine customer orientation of businesses operating in Slovakia through CUSTOR measurement method with the respect to business performance represented by financial and non-financial indicators. We assumed that the relationship between customer orientation and business performance indicators will be confirmed. Our research sample involved 230 completed questionnaires from businesses operating in Slovakia (realized in 2017). These businesses had to meet the conditions of profit-orientation and number of employees (10 employees and more). Our research sample copy the structure of population in the terms of legal form, number of employees, and region. We can generalize statistically verified result on whole population due to representative character of research sample. To achieve main objective, we formulated following three hypotheses:

H1: We assume that majority of studied businesses exhibit at least the value of 5.00 points (it means high customer orientation).

H2: We assume that customer orientation has impact on business performance.

H3: We assume that customer orientation will have higher impact on non-financial indicators than on financial indicators of business performance

Statistical population includes businesses of different size registered in Business Register of Slovak Republic. We gained the information about population from Statistical Office of the Slovak Republic and website of Business Register of the Slovak Republic. Because it is not possible to obtain all businesses operating in Slovakia, we applied our research on the representative sample of businesses. We utilized Chi Square test for verification of representativeness of our research. We also classified businesses according to the foreign equity participation, specifically only Slovak ownership, prevailing Slovak ownership, Slovak and foreign ownership in the same ratio, prevailing foreign ownership and only foreign ownership. We addressed businesses form different districts of Slovakia. For selection of research sample we used deliberate quota sampling based on predetermined characters. Researchers used to apply this type of sampling in order to ensure representativeness of the research sample. We classified businesses into categories according to their main activity (manufacture, trade, or services) for the identification of prevailing business activity. For the classification according to the size we used the criteria of European Union which consists of number of employees, annual turnover and balance sheet total. It means that we divided businesses into four groups, namely micro, small, medium and we also added large businesses while classification criterion is number of employees.

To measure customer orientation we used CUSTOR method. During our qualitative pre-research when we were comparing various measurement tools of market orientation, the majority of them answered that CUSTOR method expresses the market orientation the most. However, CUSTOR focus especially on customer orientation and inter-functional coordination. So, we assume that these respondents consider the orientation on customer as a basis of market-oriented behaviour. They also identified CUSTOR as the most user-friendly measuring method. The financial and non-financial indicators and their measurement scales have been chosen on the basis of previous literature review.

3 Results of the CUSTOR Measurement Method

To accomplish our objectives we firstly wanted to find out which level businesses achieved regarding customer orientation. We defined hypothesis H1: We assume that majority of studied businesses exhibit at least the value of 5.00 points (high customer orientation). To confirm it, we used statistical testing through the binomial test. We used 7-degree Likert scale in measuring methods and we consider 5.00 points as high market orientation. Results of testing are presented in table 2. This assumption was confirmed and we can generalize this result and conclude that majority of business exhibit high customer orientation.

Table 2 Verification of Hypothesis H1

		Binomial Test				
		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
CUSTOR	Group 1	1	149	0.65	0.50	0.000[a]
	Group 2	0	81	0.35		
	Total		230	1.00		

Source: Own elaboration according to SPSS output.

CUSTOR method contains only elements focused on customer orientation and inter-functional coordination.When we look deeper into the results (table 3) we can see that the highest value of customer orientation achieved respondents in item number 4 (i.e. 6.01). It is based on the Likert scale where 1=absolutely disagree and 7=absolutely agree. Businesses try to give customers information that helps to develop their realistic expectations about the products and services. Contrary, the respondents achieved the lowest value of customer orientation in item number 15 (i.e. 3.84). This item speaks about the efforts of business to reduce research and development cycle time.

Table 3 Mean Values Connected to the Items of CUSTOR method

I.	Customer Orientation and Inter-functional Coordination	Mean
1.	Customers play a consultative role in the selling process.	**5.02**
2.	Customers are not promised more than can be delivered.	**5.81**
3.	Employees understand what product attributes customers value most.	**5.71**
4.	Customers are given information that helps in developing realistic expectations.	**6.01**
5.	Employees go beyond normal call of duty to please customers.	**5.07**
6.	Company has a system for monitoring, analysing, and solving customers problems.	**4.17**
7.	Customers can raise complaints very easily.	**5.47**
8.	Information is continually sought and collected from customers.	**4.93**
9.	Policies and procedures that do not create value for customers are eliminated.	**4.41**
10.	Employees understand the company mission and objectives.	**5.52**
11.	Customers' needs take precedence over company internal needs.	**5.55**
12.	Employees are given adequate resources to meet customers' needs.	**5.70**
13.	Customers' input and feedback are used into the product development process.	**5.75**
14.	Company continually improves technologies, processes, and products.	**5.60**
15.	Company continually reduces research and development cycle time.	**3.84**
16.	Company continually invests in developing new ideas.	**5.07**
17.	Management considers constant innovation a key to obtaining and sustaining competitive advantage.	**5.38**
	Mean value of group	**5.24**

Source: Own elaboration.

In the second hypothesis H2 we assumed that customer orientation has impact on business performance (measured through financial and non-financial indicators). We realized correlation analysis to identify the impact of customer orientation on various indicators. Outputs from statistical program are shown in table 4. The p-value lower than significance level 0.01 or 0.05 means that there is significant correlation between customer orientation and all business performance indicators hence in all cases this impact was confirmed.

Thirdly, we expected in H3 that customer orientation will have higher impact on non-financial indicators than on financial indicators of business performance. Statistical testing confirmed significant correlation between customer orientation in *all tested non-financial indicators*. Spearman's rho speaks about the middle-strong positive correlation in the linkage to employees commitment (CUSTOR: +0.523), esprit de corps (CUSTOR: +0.438), and customer satisfaction (CUSTOR: +0.415). There is also statistically significant positive dependence between customer orientation and *all financial indicators*. (Balanced Scorecard is specific as it involves both financial and non-financial indicators). The intensity of dependence expressed through the Spearman's rho is slightly lower in case of all financial indicators than in linkage to non-financial indicators.

Table 4 The Effect of Market Orientation on Non-financial and Financial Performance Indicators

	p-value	Spearman's rho
Non-financial indicators		
Employees Commitment	0.000	0.523
Esprit de Corps	0.000	0.438
Customer Satisfaction	0.000	0.415
Financial indicators		
Overall Performance	0.000	0.388
Market Share	0.000	0.303
Profit	0.000	0.353
Sales	0.000	0.374
Sales Generated by New Products	0.000	0.334
Return on Sales (ROS)	0.000	0.413

Return on Assets (ROA)	0.000	0.367
Return on Investment (ROI)	0.000	0.370
Return on Equity (ROE)	0.000	0.358
Return on Marketing Investment (ROMI)	0.000	0.284
Net Present Value (NPV)	0.000	0.361
Economic Value Added (EVA)	0.000	0.346
Cash Flow Return on Investment (CFROI)	0.001	0.251
Market Value Added (MVA)	0.001	0.272
Balanced Scorecard	0.000	0.407

Source: Own elaboration according to SPSS output.

Our results are in accordance with previous studies. Indeed, several authors narrowed the range of market orientation only to the customer orientation (Jaramillo et al., 2007; Kennedy et al., 2003; Hajjat, 2002). Seilov (2015) also focused his attention on examination of customer orientation in linkage to business performance and confirmed the relationship between these variables. Zhu and Nakata (2007) examined the link between customer orientation and business performance with the moderating role of information systems. Firstly, authors tested the effect of customer orientation on market performance and then the effect of market performance on financial performance. Market performance was measured subjectively through the 5 items oriented on market assessments included market share, sales level, customer retention, product quality, and new product success. In measuring of financial performance were used indicators like gross profit margin and return on investment. Both relationships were confirmed through the statistical verification.

Based on the research results we can formulate some managerial implications for businesses to enhance customer orientation. We provide the list of these principles or best practices which are most frequently applied by the best businesses (performing highest customer orientation and performance) from our research sample. In their case: (1) customers play a consultative role in the selling process, (2) they are not promised more than can be delivered, (3) employees understand what product attributes customers value most, (4) customers are given information that helps in developing realistic expectations, (5) company has a system for monitoring, analysing, and solving customers problems, (6) customers can raise complaints very easily, (7) employees understand the company mission and objectives, (8) customers' needs take precedence over company internal needs, (9) employees are given adequate resources to meet customers' needs, (10) customers' input and feedback are used into the product development process, (11) company continually improves technologies, processes, and products, (12) company continually invests in developing new ideas, and (14) management considers constant innovation a key to obtaining and sustaining competitive advantage.

4 Conclusions

In order to formulate the proposals we provided the thorough analysis of research results in order to identify the businesses which achieved the highest values of customer orientation and the best performance. We focused on identification of the activities implemented by these businesses with the aim to summarize "the best practices". We think that learning from the best businesses could contribute to the increasing of customer orientation and subsequently performance of businesses which have decided to implement this concept. From our research sample we chose the businesses with the mean value of market orientation at least 6.00 points. After selecting these businesses we identify those who reach in the all examined business performance indicators values of at least 6.00 points. We looked at the answers on individual items reflected in measuring methods and thus we were able to identify the items in which businesses achieved the highest values. Activities realized by the business with the best results could be presented as the best practices for the other businesses. To sum up customer-oriented business is characterized by objectives driven by customer satisfaction, strong commitment to serving customer needs, competitive strategy based on a thorough understanding of customer needs, and business strategies driven by increasing value for customers. Businesses should assess the customer satisfaction at least once a quarter and close attention should be given to after-sales service. These activities are crucial also for achieving an increase in overall performance, profit, return on investments (ROI), and return on equity (ROE).

References

Boyt, T. E., Lusch, R. F., & Schuler, D. K. (1997). Fostering esprit de corps in marketing. In *Marketing Management*, vol. 6, no. 3, p. 21-28. ISSN 1061-3846.

Caruana, A. (1999). An assessment of the dimensions and the stability of items in the MARKOR scale. In *Marketing Intelligence & Planning*, vol. 17, no. 5, p. 248-253. ISSN 0263-4503.

Eslahnia, R. (2014). Market Orientation Strategies and Corporate Performance (Case Study : Iran Khodro Company). In *European Online Journal of Natural and Social Science* 2014, vol. 3, no. 3, p. 769-778. ISSN 1805-3602.

Gadimi, D., Hasanzadeh, M., & Ajirloo, M. B. (2013). Relationship between market orientation dimensions and business performance dimensions. In *International Journal of Management Research and Review*, vol. 3, no. 9, p. 3493-3500. ISSN 2249-7196.

Gaur, S. S., Vasudevan, H., & Gaur, A. S. (2009). Market orientation and manufacturing performance of Indian SMEs. In *European Journal of Marketing*, vol. 45, no. 7/8, p. 1172-1193. ISSN 0309-0566.

Hajjat, M. M. (2002). Customer Orientation: Construction and Validation of the CUSTOR Scale. In *Marketing Intelligence & Planning*, vol. 20, no. 7, p. 428-441. ISSN 0263-4503.

Jaramillo, F., Ladik, D. M., Marshall, G. W., & Mulki, J. P. (2007). A Meta-analysis of the Relationship Between Sales Orientation-Customer Orientation (SOCO) and Salesperson Job Performance, In *Journal of Business Industrial Marketing*, vol. 22, no. 5, p. 302-310. ISSN 0885-8624.

Kennedy, K. N., Goolsby, J. R., & Arnould, E. J. (2003). Implementing a customer orientation: extension of theory and application. In *Journal of Marketing*, vol. 67, no. 4, p. 67-81. ISSN 0022-2429.

Kohli, A. K., & Jaworski, B. J. (1990). Market Orientation: The Construct, Research Propositions, and Managerial Implications. In *Journal of Marketing*, vol. 54, no. 2, p. 90-113. ISSN 0022-2429.

Kohli, A. K., Jaworski, & B. J. Kumar, A. (1993). MARKOR: A measure of market orientation. In *Journal of Marketing Research*, vol. 30, no. 4, p. 467-477. ISSN 1547-7193.

Narver, J. C., & Slater, S. F. (1990). The effect of a market orientation on business profitability. In *Journal of Marketing*, vol. 54, no. 4, p. 20-35. ISSN 0022-2429.

Narver, J. C., & Slater, S. F. (1998). Research notes and communications. Customer-led and market-oriented: Let´s not confuse the two. In *Strategic Management Journal*, vol. 19, no. 10, p. 1001-1006. ISSN 1097-0266.

Ngai, J. C. H., & Ellis, P. (1998). Market Orientation and Business Performance: Some Evidence from Hong Kong. In *International Marketing Review*, vol. 15, no. 2, p. 119-139. ISSN 0265-1335.

Seilov, G. A. (2015). Does the adoption of customer and competitor orientations make small hospitality businesses more entrepreneurial? Evidence from Kazakhstan. In *International Journal of Contemporary Hospitality Management*, vol. 27, no. 1, p. 71-86, ISSN 0959-6119.

Vieira, V. A. (2010). Antecedents and consequences of market orientation: a Brazilian meta-analysis and an international meta-analysis. In *Brazilian Administration Review*, vol. 7, no. 1, p. 40-58. ISSN 1807-7692.

Yadav, S. K., & Tripathi, V. (2014). Market orientation and SME´s performance. In *Journal of Entrepreneurship and Management*, vol. 3, no. 3, ISSN 1555-1938.

Zaman, K., Javaid, N., Arshad, A., & Bibi, S. (2012). Impact of internal marketing on market orientation and business performance. In *International Journal of Business and Social Science*, vol. 3, no. 12, p. 76-87. ISSN 2219-1933.

Zhu, Z., & Nakata, Ch. (2007). Re-examining the link between customer orientation and business performance: The Role of information systems. In *Journal of Marketing Theory and Practice*, vol. 15, no. 3, p. 187-203. ISSN 1069-6679.

Business Environment Versus Entrepreneurial Reaction: Are Competencies Needed?

Jarmila Šebestová, Monika Lejková

Abstract: *Entrepreneurial competencies and reaction to solve business problems are closely linked together. Their relationship affects the final export activity success, which was supported by literature review. The aim of the paper is to suggest a model, which covers entrepreneurial reaction and hard competencies to support export activities – a primary research was used with statistical data evaluation. Those findings are supported by the results, presented in form of three models, with more than 60% of variance explained. The results are based on the results an empirical study (210 respondents, omnibus survey) in the Czech Republic. Moreover, the study concludes that the competence basis in businesses must be internally strong to meet decision on export and would be negative related to business age, business cycle and company branch.*

Key words: Business · Business environment · Competencies · Export

JEL Classification: L26 · O44 · R58

1 Introduction

Competencies in general represent a set of knowledge, skills, abilities, attitudes, and values that enable personal development. They could be divided into hard skills, which can be learned and improved, they can be measured fairly easily (Bednář, 2012), in opposite of soft skills, which are mostly are interpersonal and intra-personal skills and they objectively identified with a person´s Emotional Intelligence Quotient (Iland 2013, p. 10). Entrepreneurs use their competencies to have a successful business and could profit from them in particular areas such as decision making or in area of strategic planning. Not everyone is prepared to face challenges and fails in business life. Successful entrepreneurs can make mistakes even though they should never be fatal but more important is to learn from them and take actions that will prevent making the same mistakes again. Generally mentioned "pack of competencies" is knowledge, networking, customer orientation, strategic thinking, risk-taking, negotiation, integrity and the action. Especially knowledge is closely connected with innovations; exporting orientation and networking (Braunerhjelm 2008, Matthews and Brueggemann, 2015) Hand in hand with knowledge business decisions are determining the performance outcome in the future. The result could be seen in decision to entry to foreign market (Duhaime, Stimpert and Chesley, 2011, Hill, Roche and Allen, 2007). Business competencies are very complex and entrepreneurs' beliefs, actions, and aspiration for the business are widely influenced by their sense of values and beliefs. This influences the actions they take especially in challenging situations and affected final action to take a risk or the art of negotiating the deal (Parks, 2006, Badaracco and Ellsworth, 1989). Trying new things with possibly better outcomes in a sense of going beyond what has been done in the past. It means accepting the challenge, learning to make responsible choices and making sure to weight all the possible outcomes. The art of negotiating in combination with other parts of "competency pack" is to come to an agreement to make a win-win deal, especially at foreign market entrance. Finding the optimal pack of competencies would be necessary for proactive export activities (Moen, 1999). Following that a research question could be formulated: Is there any difference in behavior and competency requirement when companies are exporting? To be able to fulfill the main goal of this paper – a suggestion of a model, which covers entrepreneurial reaction and hard competencies to support export activities – a primary research was used with statistical data evaluation.

2 Methods

The primary quantitative research within business population in the Czech Republic was used to obtain relevant data by stratified sample use method. The final response rate was at 70%, when population of 300 respondents obtained the questionnaire and the working sample for final case study evaluation consists from 210 entities. It was obtained a representative sample at a confidence level of 95 % with a 5% margin of error (within the total business population in Czech

doc. Ing. Jarmila Šebestová, Ph.D., Silesian University in Opava, School of Business Administration in Karvina, Department of Business Economics and Management, Univerzitní nám. 1934/3, 73340 Karvina, Czech Republic, e-mail: sebestova@opf.slu.cz

Republic by stratified sample size based on company size). The aim of the questionnaire survey is to identify important factors which cause barriers in doing business and which competencies would be useful for sustainable business. Data collection started in February 2017 to April 2017 in the form of an electronic questionnaire.

To be able to evaluate previously mentioned research question, competency questions (based on EntreComp model of Bacigalupo et al., 2016) were coded into the one part from the questionnaire into subsections. All behavioral factors were evaluated by respondents on Likert scale 1 to 5 (where 1 – not connected with me and my business, 5 – I am dealing with that factor in my everyday life). There are five hard competencies (CP) and five environmental factors (ENV) presented and evaluated as equal groups of factors.

Competencies (CP) area is represented by five dimensions, which could affect business behavior, such as (1) *Localization in the region* (CP_LOCAL), how they are able to evaluate their business place within business opportunity (their choice); (2) *Payment behavior of customers* (CP_PAY_BEH) – which describes level of financial management, relationship with customers in financial contracts; (3) *Quality of workforce* (CP_WORK) - evaluation of entrepreneurial approach to HRM in area of clarity of workplace description, placement of employees to define a workforce demand; (4) *Tradition* (CP_TRAD) – an influence of business tradition in entrepreneur's family; (5) *Transport accessibility* (CP_TRANS) – knowledge of logistics issues, competence for solving transportation problems.

Environmental Factors (ENV) are represented by the equal number of dimensions, mostly mentioned in business environmental studies and research (Moen, 1999), namely (1) *Lack of alternative sources of financing* such as loans, micro-loans, etc. (ENV_ALT_FIN); (2) *Legislation factors* and conditions for start-up business in general (ENV_LEGIS); (3) Previous industrial activity in the region, eg. brownfields (ENV_PREV_ACT, see also Tureckova et. al., 2017); (4) Public administration, bureaucracy burden (ENV_BUREAU); (5) State / regional subsidy policy (ENV_SUPPORT).

Third group of factors which will be used are descriptive dimensions (DES) namely company size (DES_SIZE), age (DES_AGE), business cycle (DES_CYCLE), NACE (DES_NACE) and export activities (DES_EXPORT).

Examined companies in the sample were carrying out business in the industry, namely in 46 %, 27 % were active in in services, 21 % in trade (wholesale and retail) and 6 % in agriculture. The number of small businesses, namely enterprises employing up to 50 employees that took part of 58% from the sample, where enterprises employing up to 10 employees amounted to 20% and enterprises employing 11-49 employees 38%. Medium-sized enterprises (between 50 and 250 employees) were represented in 30% of cases and large companies (250+ employees) have their share of 12%. More than 75.2 % of companies in the sample were in growth phase, opposite to 24.8 % companies in the phase of crisis and decline in the last three years. Most of companies in operating on the market more than 10 years, so they have assumption of business experience and they export in 41.4 % (see table 1).

Table 1 Sample description

Descriptive dimension	Categories (percentage share [%])					
Business Experience	less than 3 years	4 to 10 years	11 to 15 years	16 to 25 years	more than 25 years	Total [%]
	9%	18%	18%	49%	8%	100%
Business Size (Employees)	till 9	10-49	50-249	250+	-	Total [%]
	20%	38%	30%	12%	-	100%
Main Business Field	Agriculture	Industry	Trade (Retail, Wholesale)	Services	-	Total [%]
	6%	46%	21%	27%	-	100%

Source: Own processing

To get sophisticated results a factor analysis was used. All obtained data were tested for reliability and Kaiser-Meyer-Olkin test (KMO) was above 0.6, when IBM SPSS software package was applied. To get principal components, a factor rotation VARIMAX was used. Three situations are presented in relationship with export activities to support research question.

3 Research results

In the first step of that analysis a basic comparison of selected ten factors was applied. As had been mentioned, results were sorted according export activities (dummy variable), when "export" was signal of success and possible growth, when "no export" could be connected mostly with small entrepreneurs, operating on local environment. In the table 2 a

comparison is made, when the most important factors are working force (CP_WORK), payment behavior of customers (CP_ PAY_BEH) and localization in the region (CP_LOCAL). Opposite to that less importance is a factor of previous industrial activity in the region (ENV_PREV_ACT).

Table 2 Overall comparison of entrepreneurial behavior

Type	Variable	Overall (N=210)		Exporting activities (N=87)			No Export (N=123)		
		Mean	Std. De-viation	Mean	Std. De-viation	Devia-tion to overall	Mean	Std. De-viation	Devia-tion to overall
		A	B	C	D	E (A-C)	F	G	H (A-F)
CP	LOCAL	3.319	1.369	3.241	1.470	0.077	3.374	1.295	-0.055
CP	TRANS	3.076	1.284	2.689	1.366	0.386	3.349	1.152	-0.273
CP	WORK	3.876	1.247	3.701	1.4315	0.174	4.000	1.086	-0.124
CP	TRAD	2.300	1.345	2.046	1.319	0.254	2.479	1.338	-0.179
CP	PAY_BEH	3.343	1.466	3.735	1.482	-0.392	3.065	1.395	0.278
ENV	LEGIS	3.100	1.361	3.046	1.388	0.054	3.138	1.344	-0.038
ENV	BUREAU	2.814	1.221	2.919	1.313	-0.105	2.739	1.151	0.074
ENV	SUPPORT	2.181	1.243	2.000	1.355	0.181	2.308	1.146	-0.127
ENV	PREV_ACT	1.786	1.038	1.620	1.025	0.165	1.902	1.035	-0.116
ENV	ALT_FIN	2.157	1.241	1.908	1.137	0.249	2.333	1.284	-0.176

Source: Own processing, based on Likert scale evaluation (1 – not connected with me and my business, 5 – I am dealing with that factor in my everyday life)

A maximum difference at evaluation (column A-C) in "*export-oriented*" companies is in factor „alternative sources of financing" (ENV_ALT_FIN). Those companies see this factor less important than overall group of companies. Opposite to that the most sensitive on payment behavior of customers (CP_ PAY_BEH), what is closely connected with their global transactions.

Locally operating companies (no export activities) are most sensitive on "transport accessibility" (CP_TRANS), what explains their local market orientation and additional cost with logistics. Opposite to that less importance is connected to "payment behavior of customers (CP_PAY_BEH), when most of relations are based on long-term cooperation.

To get a general set of competencies a factor analysis was realized (table 3). All three groups of factors were used (Competencies, Environment and descriptive) to obtain main picture of the sample, when the total variance explained was 65.055 % in six factor groups, when three of them have a factor loading more than 10 %. As main factor, which was confirmed was named as political environment (F1) and it consists of three environmental variables.

Table 3 General model of competencies (Factor analysis results)

Rotated Component Matrix							
Type	Variable/Factor loading	F1 (14.327 %)	F2 (11.181%)	F3 (10.592%)	F4 (9.842%)	F5 (9.687%)	F6 (9.427%)
ENV	BUREAU	0.825					
ENV	LEGIS	0.761					
ENV	ALT_FIN	0.697					
CP	TRANS		0.827				
CP	LOCAL		0.661				
DES	SIZE			0.783			
DES	AGE			0.744			
ENV	SUPPORT				0.805		
DES	NACE				-0.563		
CP	WORK					0.741	
CP	PAY_BEH					0.719	

Rotated Component Matrix							
Type	Variable/Factor loading	F1 (14.327 %)	F2 (11.181%)	F3 (10.592%)	F4 (9.842%)	F5 (9.687%)	F6 (9.427%)
ENV	PREV_ACT						0.792
CP	TRAD						0.566

Source: Own processing, KMO test = 0.636, Bartlett's Test of Sphericity - Approx. Chi-Square 429.947; df = 91; sig. 0.000

Second area, so important was a placement of business (F2) was describing relationship between two competency variables - transport and location. Finally, descriptive factors as size and age are playing significant role in competency use. This evaluation has shown that environmental issues and task are for business success on the first place and they have deeper relationship in business decision-making, as was mentioned in Dvoulety, (2017), Pilková et al. (2016) or Šebestová (2016) research findings. According to those descriptive results it is so important to analyze those independent groups of companies to be able to find out a set of competencies supporting export or in contrast to that which could be a barrier to "do not export". Based on that idea two more factor models were made, when export was a dummy variable.

3.1 An Export influence on competencies

Export was defined as dependent variable (export = 1). The same number of factors was extracted as in previous model (table 3), when three main factor groups explained 58.85% of variables (total variance of six factor groups was 68.486 %, sig.0.000). Scenario is presented below (Table 4). Those factor groups obtained sub index "e" to indicate export activities of examined business in the sample. There were five environmental and four competency variables, followed with three descriptive ties, extracted in total.

Table 4 Model of competencies for companies with export activities

Rotated Component Matrix							
Type	Variable/Factor loading	$F1_e$ (16.626 %)	$F2_e$ (12.322 %)	$F3_e$ (10.913 %)	$F4_e$ (9.723 %)	$F5_e$ (9.477 %)	$F6_e$ (9.425 %)
ENV	BUREAU	0.826					
ENV	LEGIS	0.801					
ENV	ALT_FIN	0.676					
ENV	PREV_ACT		0.754				
DES	CYCLE		0.724				
DES	AGE			0.838			
DES	SIZE			0.800			
CP	WORK				0.785		
CP	PAY_BEH				0.624		
CP	LOCAL					0.831	
CP	TRANS						0.802
ENV	SUPPORT						-0.559

Source: Own processing, KMO test = 0.686, Bartlett's Test of Sphericity - Approx. Chi-Square 316.097; df = 91; sig. 0.000

Similarity can be seen in the first factor named *Political environment*, when the structure of the factor is the same with overall results ($F1_e=F1$), also "type of business" as age and size is the last factor above 10 % variance level (F3e=F3). In contrast to overall results, second significant factor was connection with environment and business cycle – *reactive position of* company to export (F2e). A significant point in that model could be seen in factors F5e, when location is a separate factor influencing export and the ENV_SUPPORT comprises a negative tie to decision of choosing a location for business. It wasn't founded any connection with NACE or tradition (CP_TRAD). It could be interpreted by significance of opportunities, which give a power for success (Moen, 1999, Eickelpasch and Vogel, 2009). Opposite to that, locally operated companies (export=0) had mixed all factors which were used in questionnaire and environmental issues were on the first place (see table 5). The same number of factors groups as in previous models was extracted, when total variance at 69,221% (sig.0.000). Behaviour of those companies is very different from overall model. There is any connection with basic factor set from model 1 (compare table 3 and table 5). All factor groups in the table are unique.

Table 5 Model of competencies for companies without export activities

Type	Variable/Factor loading	F1L (13.812%)	F2L(12.059%)	F3L(12.034%)	F4L(11.556%)	F5L(10.882%)	F6L(8.878%)
ENV	LEGIS	0.755					
ENV	BUREAU	0.714					
DES	CYCLE	-0.629					
DES	AGE	-0.624					
CP	PAY_BEH		0.836				
CP	WORK		0.777				
ENV	PREV_ACT			0.707			
DES	NACE			-0.660			
ENV	ALT_FIN			0.653			
CP	LOCAL				0.859		
CP	TRANS				0.816		
CP	TRAD					0.757	
ENV	SUPPORT					0.755	
DES	SIZE						0.845

Source: Own processing, KMO test = 0.698, Bartlett's Test of Sphericity - Approx. Chi-Square 248.822; df = 91; sig. 0.000

Three negative ties were extracted, which business owners felt as a barrier – business cycle, business age and NACE classification. Unlike the previous version, all the elements are mixed. Essentially, if entrepreneur do not want to export, it's actually its own decision, no one else. Presented models (1-3; tables 3 to 5) support research question about the difference of behavior of businesses according export activities. It seems that competencies are more used in case of problems (Dejo-Oricain and Ramírez-Alesón, 2009).

4 Conclusions

There is often a problem, especially in SMEs, that they have poor business and economic competencies to reflect their current cycle and solve business problems effectively. Presented study shows, that entrepreneurs are affected mostly by environmental factors than by specific competencies. Main results of the study have shown that success and growth is dependent on current satisfaction with business environment. In contrast to theoretical background, business organizations need to take care of their competencies to avoid competence traps, which are important to business survival. Opposite to Moen (1999) was founded that export is related with company size. In decision making process Caughey and Chetty (1994) study was confirmed, that decision of export activities lies only on business owner and it depends on its "stimuli", named in our research in form of competencies.

References

Bacigalupo, M., Kampylis, P., Punie, Y., & Van den Brande, G. (2016). *EntreComp: The Entrepreneurship Competence Framework*. Luxembourg: Publication Office of the European Union.

Badaracco, J. L., & Ellsworth, R. R., (1989). *Leadership and the Quest for Integrity*. Boston: Harvard Business School Press.

Bednář, V. (2012). *Strategie vyjednávání*. Praha: Grada.

Braunerhjelm, P., (2008). Entrepreneurship, knowledge and economic growth. Boston: Now Publishers.

Caughey, M. & Chetty, S. (1994). Pre-Export Behaviour of Small Manufacturing Firms in New Zealand. *International Small Business Journal*, 12(3), 62-68.

Dejo-Oricain, N. & Ramírez-Alesón, M. (2009). Export Behaviour: a Study of Spanish SMEs. *GCG Georgetown University – Universia*, 3 (2), 52-67.

Duhaime, I. M., Stimpert, L. & Chesley, J., (2011). *Strategic thinking: today's business imperative*. New York: Routledge.

Dvouletý, O., (2017). Can policy makers count with positive impact of entrepreneurship on economic development of the Czech regions? *Journal of Entrepreneurship in Emerging Economies*, 9 (3), 286-299.

Eickelpasch, A. & Vogel, A. (2009). Determinants of export behaviour of German business services companies. *University of Lüneburg Working Paper Series in Economics*, No. 123, Leuphana-Univ., Lüneburg.

Hill, N., Roche, G. & Allen, R., (2007). *Customer Satisfaction: The Customer Experience Through the Customer's Eyes*. London: Cogent Publishing.

Iland, A., (2013). *Soft Skills: Be Professionally Proactive*. 2nd ed. Iland Business Pages.

Matthews, Ch., H. & Brueggemann, R. (2015). *Innovation and entrepreneurship: a competency framework*. New York: Routledge, Taylor & Francis Group.

Moen, O. (1999) The Relationship Between Firm Size, Competitive Advantages and Export Performance Revisited. *International Small Business Journal*, 18(1), 53-72.

Parks, S., (2006). *How to be an entrepreneur: the six secrets of self-made success*. New York: Prentice Hall Business.

Pilková, A., M. Holienka, Z. Kovačičová, & Rehák, J. (2016). *GEM Slovensko 2015: Komerčné, sociálne a inkluzívne podnikanie na Slovensku*. Bratislava: Univerzita Komenského Fakulta managementu.

Šebestová, J. & Rylková, Ž. (2011). Competencies and Innovation within Learning Organization. *The Journal Economics and Management*, 16 (1), 954-960.

Šebestová, J., 2016. Ovlivňuje motivace k podnikání vnímání podnikatelského prostředí? Případová studie z Moravskoslezského kraje. *Scientific papers of the University of Pardubice, Series D*, 23 (38), 177-189.

Tureckova, K., S. Martinat, J. Skrabal, P. Chmielova & Nevima, J. (2017). How Local Population Perceive Impact of Brownfields on The Residential Property Values: Some Remarks From Post-Industrial Areas in The Czech Republic. *Geographia Technica*, 12 (2), 150-164.

Motivation and development of the manager's personality

Růžena Krninská, Markéta Adamová, Nikola Soukupová, Ondřej Skopec

Abstract: *Contemporary societal changes are bringing the fourth industrial revolution. Industry 4.0 is not just a revolution of modern technologies linked to digitization and automation but also to innovation processes. These processes are associated with a new knowledge-based economy. Strongly motivated people are able to develop their knowledge, skills, and experience much more strongly. On the studied sample of EF JU students in České Budějovice, innovation can be related to the right hemisphere which has intuitive and creative qualities.*

Development of functionality of the right hemisfere should be supported if the students (future employees and managers) are to be more innovative. In order to develop the personality of the manager, it is necessary to motivate the individual internally to ensure high level of motivation in the long term and preferably through his own internal self-motivation related to the self-learning process. Motivation to cultivate and develop human potential leads to innovative approaches and thus to building a competitive advantage within the global world.

Key words: Motivation · Self-motivation · Self-development · Manager's personality

JEL Classification: M10 · M12

1 Introduction

At present, the world economy is undergoing another fundamental structural change that is driven not only by globalization but Industry 4.0 is entering the scene as the fourth industrial revolution. This cyber revolution is not just a revolution of specific technologies such as digitization, artificial intelligence, distributed knowledge and expert systems but also a revolution in people's thinking and in working with their knowledge. According to Gluckman (2018), the current digital revolution is unstoppable.

According to Kislinger (2011), the "new knowledge economy" has the ambition to mark a state of social cooperation where product creation with innovative approaches depends, in addition to capital, labor, natural resources and technical product, on education and knowledge. The new economic system can be characterized by increasing the importance of knowledge, increasing labor productivity and increasing competition at a global level (Satti & Nour, 2015). Gibson (2000) also says that the world is entering a "new economy" - a "knowledge economy" - linked to the use of human and intellectual capital which emphasizes the ability to use knowledge and skills as the driving force of change, innovation and competitiveness.

Armstrong & Taylor (2014) states that the importance of creative human potential and the development of "human capital" is growing in the process of globalization. The development of the overall human potential, with its knowledge and abilities, emphasizes their creative use in the direction of innovative approaches. The development of human potential and its creative abilities is connected with the development of personality in general. In order for an individual to enter into self-development processes, it is appropriate - to be motivated to do so ...

The human individuality can no more be seen only as a labor force. For a future knowledge society, it is desirable to engage in a qualitatively higher level of leadership and motivation to leading towards cultivation and development of human capital. According to Armstrong (2010), motivation can be characterized as a target-oriented behavior and divided

doc. Ing. Růžena Krninská, CSc., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: krninska@ef.jcu.cz

Ing. Markéta Adamová, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: adamom01@ef.jcu.cz

Ing. Nikola Soukupová, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: zidovn00@ef.jcu.cz

Ing. Ondřej Skopec, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: skopeo00@ef.jcu.cz

into two types: internal and external. Internal motivation is linked to motives - inner motives and with deeper and longer-lasting effects. External motivation is associated with external stimuli (requirement, challenge) with immediate effect but usually occurring only during an external stimulus. Dvořáková (2004) considers a significant differentiation of motivation in terms of duration. The short-term motivation is linked to the setting of objectives, their control and remuneration or sanctions. Medium-term motivation is related to job satisfaction. Long-term motivation is associated with the development of human capital and personality potential. Internal self-motivation to develop one's own personality has a long-term effect.

2 Methods

On the theoretical level, approach to motivation is built on Maslow's hierarchy of needs. The precondition for fulfilling the need for self-realization is self-knowledge and self-development that leads to self-realization. This signals the way to motivation for the near future coupled with the development of personality and creative abilities needed in the knowledge economy.

The practical level serves to demonstrate the results associated with the selected self-development technique which can motivate future managers' self-development tendencies. In 2016, 2017 and 2018, a standardized test measuring dominance of brain hemispheres was submitted to 283 students (future managers) in the field of Management and Business Economics and Business Entrepreneurship at Faculty of Economics of University of South Bohemia in České Budějovice.

From many tests being used for measuring the hemispheric brain dominance, the Left-Brain/Right-Brain Test was used, as it is not criticised as its other widely used alternative Hemispheric Mode Indicator (Hartman & Hylton, 1997) and is built purely for the purposes of measuring the brain dominance which makes it simplier to use than its other alternative SOLAT (Kordjazi & Ghonsooly, 2015).

The test has 19 items, were each item consists of 2 expresions which are opposite to each other and the respondent has to decide which of the expresions he agrees with. There were 33 % of men and 67 % of women in the sample.

3 Research results

For the new economy, human capital with the added value of developing human potential, creative and innovative approaches is a crucial element of competitiveness. The quality of human capital is related to the development of human potential - with education, knowledge, skills and attitudes, where attitudes and values are very important and relate to the inner motives of an individual. It depends on the stage of one's personality development which decides on further developmental tendencies.

It is establishement of a new higher-quality approach to a human being based on the new principles of work with human personality connected with the care of its development, not only on professional level (linked to the knowledge of the external material world), but above all on personal level (exercises of the inner world human subject). Assuming everyone is unique (everyone has different fingerprints and other brain scratches), self-motivation is needed to find their uniqueness and their unique creative and innovative approaches.

To motivate yourself to use your own potential, it is always advisable to start by self-knowledge. Self-development is an effort to understand yourself, to understand your nature, to discover your uniqueness, your talent and to learn to use your strengths and develop your talents (self-development). It is possible to get a solid point, with the support of which it is possible to orientate in oneself, to really perceive one's strengths and weaknesses and to deal with them objectively. This is the only way to be more open to personal experiences that decide on the other developmental tendencies of the individual - the human subject. Self-development is by no means an easy process. According to Mikuláštík (2015, 2013), the average person does not always understand all the stimuli that affect him because many mechanisms are unconscious. Other limitations of self-awareness are routines and habits as well as intense experiences that distort or even block the self-development.

Starting a self-learning process is one of the first conditions for developing inner motivation. The process of self-learning which leads to self-motivation and consequently to self-development, directs itself to self-management, the culmination of which is the self-realization of the human subject (Figure 1).

The culmination is to be able to apply the uniqueness of personality traits in society (self-realization). In realizing its own uniqueness, the goal is not only self-satisfaction but also the benefit of the whole community. Usually, if there is no full self-knowledge, there will be no self-realization.

The establishment of the process of self-learning in a human subject guarantees the possibility of a significant development of the human potential and the development of high creative potential (Plamínek, 2013). As far as the individual is orientated in himself and can manage his own subject (self-management), he is able to orient himself in the world around him, in addition to personality development, his professional proficiency also grows.

Figure 1 A. Maslow's five-level model of the hierarchy of needs
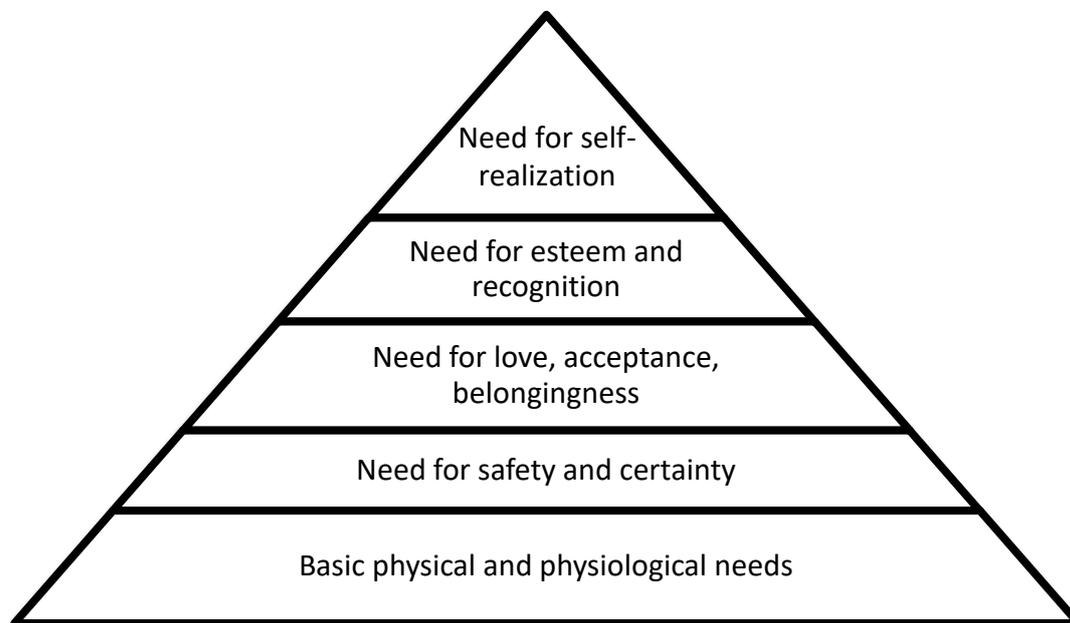
Source: Komárková & Provazník (2004)

According to Armstrong (2010) and Nakonečný (1997) Maslow said that "man is an animal with wishes"; only unmet need can motivate behavior and the dominant need is a basic motivator of behavior. Psychological development occurs by moving people up the hierarchy of needs, but it is not necessarily a straightforward development. Lower needs still exist even as motivators temporarily fall asleep, and people are consistently returning to previously satisfied needs.

The need for self-realization, however, can never be satisfied unless it transforms into transcendence. Self-realization at the level of transcendence expresses the relation with everything that is the essence of ours and of the universe as a whole (Krninská, 2012).

Contemporary physics in the knowledge of the functionality of the universe (including human beings) has come to quantum mechanics and string theory. With his 1924 theory for which he was awarded the Nobel Prize in 1929, Louis de Broglie explained his corpuscular wavelength dualism, confirming the concurrent existence of particles - corpuscles and wavelengths. Each moving particle is accompanied by a certain wave, and vice versa - each wave carries a material particle.

Nowadays, in terms of classical physics, the incomprehensible and paradoxical phenomenon or the fact of corpuscular-wave dualism is universally valid for the whole universe. And, apparently, the human brain, by being composed of two separate hemispheres, is adapted to perceiving quantum and wavelengths and processes them separately and then across the corpus callosum (a cluster of nerve fibers that connects both hemispheres). Nowadays, the connection of the natural sciences with the so-called social sciences (humanities) begins to be taken for granted.

The question remains to what extent these sciences manage to absorb the knowledge of a new modern physics that has so radically changed the view of our material reality in recent decades. Consequences of these new approaches include, for example, the conclusions of the American neurophysiologist Pribram (1992), according to which brain work is related to the principles of hologram function, and extrasensory perception associated with the non-conscious activity of the psyche works on the principles of quantum physics.

In light of these new discoveries, there is a need to rethink the relationship between man and nature and man and society, namely in terms of holistic approaches, continuity and interconnection of the material and spiritual world of man.

According to Pavlíčková (1993), there are also two ways of thinking that are connected on the one hand with the conscious (analytical) and on the other with the intuitive component of the psyche. They are based on different principles, although they complement and condition each other.

Thinking that is logical, rational, analytic-synthetic, convergent - fully conscious, based on causality and linear processes.

Thinking that is intuitive, creative, lateral, divergent - based on associations.

The American neurophysiologist Roger Wollcot Sperry won the Nobel Prize in physiology and medicine for his research on both brain hemispheres in 1981. Together with his colleagues he discovered that the field of activity of the left hemisphere of the brain is generally focused on: analytical thinking, logic, reality, facts, dates, details, words, language, numbers, writing, motor reactions, notion of time.

The right brain hemisphere has a general focus on mental activities in which it plays a crucial role: holistic thinking, it has the predominance of awareness of complex contexts, feelings, emotions, intuitions, hearing sensations and music, imagination, day dreaming, color, art and creativity, fantasy, symbols, paintings.

Sperry (1961) also revealed that when the left hemisphere of the brain is active, the right hemisphere will go into a relaxed, semi-modal state associated with alpha waves. If there is an inverted situation, i.e. when the right hemisphere is working, the left hemisphere will turn into the relaxed state. According to left-right brain theory, each hemisphere directs another type of thinking. And each one of us favors one of them in his everyday routine.

Figure 2 The results of the students of the Faculty of Economics of the University of South Bohemia (EF JU)
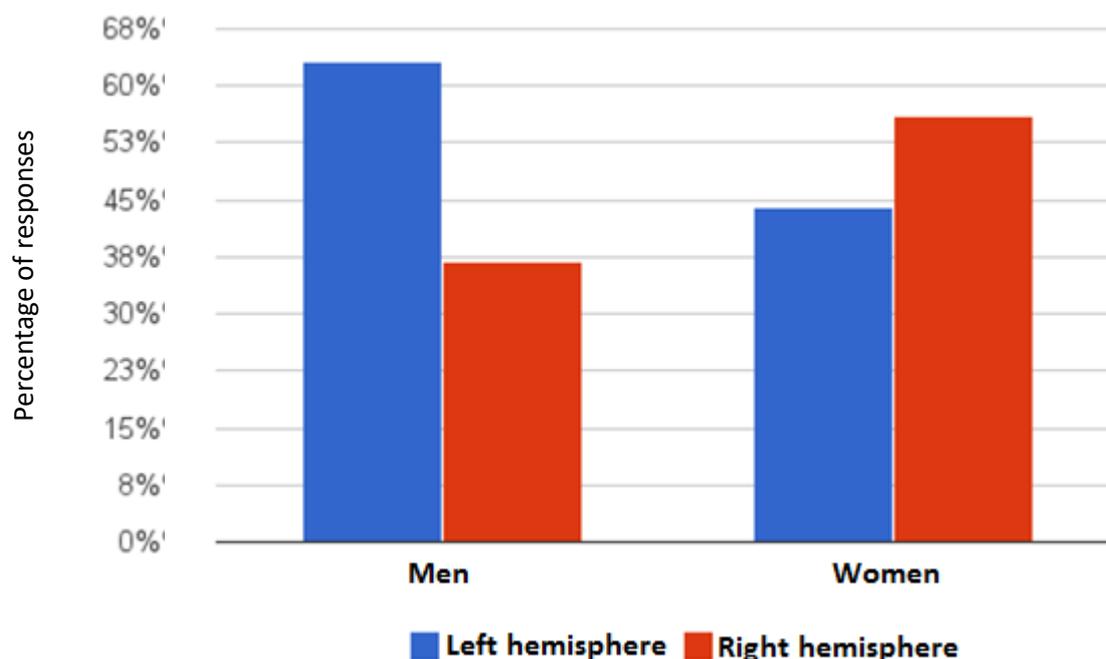
Source: own processing

For example, "left-brainers," as EF JU male students are, are generally logical, analytical, and objective while EF JU's female students which are generally "right-brainers" are intuitive, synthetic, and subjective. The truth is that there are female students amongst whom the left hemisphere is predominant over the right, as well as some of the male students have the predominance of the right hemisphere above the left. By the beginning of the eighties, the phenomenon of specific functions of the left and right brain hemispheres was known worldwide, and a number of books were written about the extremely important discovery.

In general, in European culture, the functionality of the left hemisphere prevails over the right. Mikuláštík (2015) stated that the left hemisphere is dominant. Eastern cultures (Chinese, Japanese), along with some ways of practicing (tai-chi),greatly care for the balanced co-operation of both hemispheres. The example shows how hemisphere is important: the left hemisphere is responsible for the formulation and the right combination of words but the right gives them intonation and tempo. Formally, the speech is "lateralised" in the left hemisphere but without the right hemisphere we would speak monotonously - like robots.

Subsequent experiments by American and German scientists (Buzan & Buzan, 1996) have shown that virtually everyone has a full range of mental capabilities. Unfortunately, due to poor education and misinformation, most of us tend to believe that it has innate talents only for some of these areas. It is assumed that they are oriented to activities associated with either the left or right hemispheres of the brain, and rarely they are the penetration of both.

Generally, it is a generalizing idea that the left half of the brain is rational while the right one is irrational. The functions of the left hemisphere are generally referred to as "intellectual", "academic" and "business", and right as "artistic", "creative" and "emotional". Today we can use the creative principle of the right hemisphere - as the innovative approaches in the knowledge economy demand. At the basic physical, physiological and potential level, each of us has a vast range of intellectual, mental and creative abilities that are only partially used. It is important to know the individual's individual state in order to build on potential abilities and to develop areas that have been left inactive for various reasons.

E.g. when people "without artistic talent" learned to draw, they suddenly began to rule better by word, to deal better with numbers and their creativity improved overall. Similarly, if someone had trouble making numbers and began training numbers, his imagination and musicality increased.

Obviously, cerebral hemispheres interconnect information and add it to their intellectual and creative capacity. It can be said that harmonious use of both halves of our brain increases our overall intelligence and creativity. According to Horalíková and Zuzák (2005), intelligence also grows on a scale from cognitive knowledge to self-motivating creativity.

4 Conclusions

For today's globalizing knowledge-based economy and Industry 4.0, creative and innovative approaches are needed to develop the creative potential of individuals. In practice, this in our sample of EF JU students in Č. Budějovice can be related to the support of the development of the right hemisphere of students which has intuitive and creative abilities. These are the abilities that can extend the innovative potential and performance of the students in their future jobs. As the development of these abilities enables a person to more skillfully and efectively work with tacit knowledge as one of the most important sources of innovation.

Harmonization of both hemispheres and their interconnection can lead individuals to self-realization. Self-realization is a natural human need, to achieve it, it is necessary to motivate the individual internally and thus in the long term, preferably by his own internal self-motivation. To this end, it is necessary to start the path of self-learning leading to the development of the whole human personality, in the case of EF JU and its branches to develop the personality of the manager.

References

Buzan, T. (1996). The Mind Map Book: How to Use Radiant Thinking to Maximize Your Brain's Untapped Potential. New York: Penguine Books.

Hartman, S., & Hylton, J. (1997). Estimates of validity and reliability for the Hemispheric Mode Indicator. Perceptural and Motor Skills, s. 1355-1364.

Kordjazi, Z., & Ghonsooly, B. (2015). Brain Dominance and Test Format: A Case of Vocabulary. Journal of Language Teaching and Research, s. 695-703.

Armstrong, M. (2010). Essential Human Resources Management Practice: A Guide to People Management. London: Kogan Page.

Armstrong, M., & Taylor, S. (2014). Armstrong's Handbook of Human Resource Management Practice. London: Kogan Pag.

Horalíková, M., & Zuzák, R. Talenty v podnikové praxi. (Monografie). První vydání. Praha: ČZU, 2005. 88 s. ISBN 80-213-1229-0.

Gluckman, M. (2018). Anthropological problems arising from the African industrial revolution. In Social change in modern Africa (pp. 68-82). Routledge.

Gibson, R. (2000). Nový obraz budoucnosti: přední osobnosti světového managementu a sociálního myšlení o budoucnosti podnikání, konkurence, řízení a trhu. Praha: Management Press.

Kislingerová, E. a kol. (2011). Nová ekonomika. Nové příležitosti? Praha: C. H. Beck.

Mikuláštík, M. Manažerská psychologie. Praha: Grada Publishing, 2015. 384 s. ISBN 978-80-247-1349-6.

Mikuláštík, M. Tvořivost a inovace v práci manažera. Praha: Grada, 2013. 208 s. ISBN 978-80-247-2016-6.

Nakonečný, M. (1997) Motivace lidského chování. Praha: Academia, 270 s. ISBN 80-200-0592-7.

Krninská. R. (2012). Motivace a stimulace pracovního jednání. České Budějovice: Jihočeská univerzita, Ekonomická fakulta.

Satti, S., & Nour, O. M. (2015). Overview of Knowledge Economy in the Arab Region. Journal of Knowledge Economy, 6 (2015): 870 – 904.

Dvořáková, Z. a kol. (2004). Slovník pojmů k řízení lidských zdrojů. Praha: C. H. Beck.

Pribram, R. (1992). Mozek, mýtus: do 21. století. IN Přednášky z 12. mezinárodní transpersonální konference. Praha: Radost, s. 113 – 124.

Plamínek, J. (2013). Sebepoznání, sebeřízení a stres. Praha: Grada.

Pavlíčková, H. (1992). Sociální psychologie. Brno: Vysoká škola zemědělská.

Komárková, R., & Provazník, V. (2004). Motivace pracovního jednání. Praha: Oeconomica.

Sperry, R. W. (1961). Cerebral Organization and Behavior: The split brain behaves in many respects like two separate brains, providing new research possibilities. Science [online]. 1961, 133(3466), 1749-1757 [cit. 2019-01-04]. DOI: 10.1126/science.133.3466.1749. ISSN 0036-8075. Dostupné z: http://www.sciencemag.org/cgi/doi/10.1126/science.133.3466.1749

Duties and Options of Employer During Employee´s Temporary Incapacity for Work

Jana Martiníková

Abstract: *Temporary incapacity for work is a topic involving legal, economic, social and medical aspects. The paper deals with a Czech legal regulation of this topic aiming at pointing to its social aspects. If the law is generally understood as one of the tools to realize social policy of the state, then legal regulation of some labour-law institutes is the tool to realize social policy at the level of employer in the frame of his personnel agenda. When analysing selected duties and options given to employer by the law (as it comes to employee´s temporary incapacity for work) and pointing out some problems in practical application, such hypothesis can be proved that legal regulation of this topic has social aspects. Based on this paper elaboration, the following results have occurred: 1) employers have to respect given duties determined by the law, 2) emplyoers can use options given them by the law, and 3) employers can also use an absence of some questions being not regulated by the law and arrange their own social benefits for the employees. The legal regulation thus significantly influences employer´s decision-making in both the question of temporary incapacity for work and his entire social policy concept.*

.

Keywords: Temporary incapacity for work · Compensatory wage · Protection period · Sick days

JEL Classification: K31 · J89

1 Introduction

Temporary incapacity for work is the topic involving more aspects. It can be seen from different points of view. Legal, economic, social and health questions are connected with it. Temporary incapacity for work (Neščaková and Jakubka, 2012) is defined as the state when the employee cannot do his usual work because of health disability and doctor confirmed this fact. It is traditional obstacle to work, existence of which creates the duty of employer to accept employer´s absence at work.

The aim of this contribution is to present the Czech legal regulation of selected questions referring to the duties and options the employer has when the employee is temporarily incapable for work and to point out some concrete problems when applying it in practice. By elaboration of the paper, the hypothesis should be proved that legal regulation of temporary incapacity for work has social aspects and impacts employer´s decision-making in fundamental way when considering own social policy. Employers are players of social policy (Krebs, 2015). When solving temporary incapacity for work of employees, they have to respect both duties given by legislation and they can use the options given them by legislation (among others also by not solving some questions).

The paper is focused concretely on the employer´s duties, which have to be fulfilled in connection with absence of his employee from work during a period when the employee is temporarily unfit to work. The employer has to pay the employee compensatory wage for temporary absence, has to obey the ban of employment termination during a trial period and has to accept a protection period at notice of termination. (Kocourek and Dobřichovský, 2016) Further, there are options mentioned, which the legal regulation provides with referring to above-standard provision with compensatory wage during temporary incapacity for work and to the control, whether the regime of temporary incapacity is complied by the employee. (Bělina et al. 2017; Andraščíková et al., 2013) Typical social benefit – so called sick days – are being paid attention to as well. (Landwehrmann, 2018; Šubrt, 2016) Regulation of mentioned questions is included in the crusial act dealing with labour-law topic - the Labour Code (Act No. 262/2006 Coll. as amended). The sick days create the only exception, which is not regulated by the law at all.

2 Methods

JUDr. Jana Martiníková, Ph.D., VSB-TUO, Faculty of Economics, Department of Law, Sokolská třída 33, Ostrava, e-mail: jana.martinikova@vsb.cz

This contribution is elaborated based on literature review and interpretation of legal regulation using relevant judicature. Knowledge gained by their analysis is applied on some problems in practice. Methods of analysis and deduction are used to verify above mentioned hypothesis.

3 Research results

In the following text, there are selected duties and options of employer during employee´s temporary incapacity of work analysed as well as the questions connected with them are solved.

3.1 Compensatory wage during temporary incapacity for work

Temporary incapacity for work of employee is obstacle to work recognized by the law, which makes employee unable to work. The care of employee´s health is the basis of it because incapacity for work is caused by sickness, injury or quarantine. Typical aspect referring to this obstacle is (Nesčáková and Jakubka, 2012) that employee does not ask the employer for days off because proved existence of temporary incapacity for work itself creates employer´s duty to excuse employee's absence at work.

If the employee proves temporary incapacity for work by doctor´s confirmation (so called sick note), the employer is obligated to accept employee´s absence at work and at the same time has to follow another rule: he has to pay the compensatory wage to the employee within the first 14 calendar day of temporary incapacity for work. However, it has to be said that only working days are compensated. In case of longer sickness, financial provision is solved by an allowance paid out of sickness insurance.

Compensatory wage paid by the employer is determined out of employee's average wage and is paid since the fourth working day of sickness (except quarantine – this is paid since the first working day). The first three working days are called the waiting time, during which temporary incapacity for work is accepted obstacle to work at employee´s side and is not compensated. Waiting time is strictly given period, which has to expire in order to provide with compensatory wage. Compensatory wage is determined by the law at the level of 60 % of reduced average wage of employee. The Figure 1 just for illustration shows how the compensatory wage is calculated within temporary incapacity for work in 2018.

Figure 1 Calculation of compensatory wage

Calculation of COMPENSATORY WAGE*)
by the Act No. 262/2006 Coll.
within temporary incapactiy for work or quarantine in period since 1st January 2018

Number of hours of incapactiy for work (sicknes) for calculation of compensatory wage **)							**56**
Number of hours of quarantine (since the first day)							**0**
Average hourly wage - AHV (the same for sickness and quarantine)							**145,06 CZK (5,59 €)**
AHV reduction							
		up to	175,00 CZK (6,75 €)	reduction to	90%	i.e. to	130,5540 CZK (5,03 €)
above	175,00 CZK (6,75 €)	up to	262,33 CZK (10,12 €)	reduction to	60%	i.e. to	0,0000 CZK
above	262,33 CZK (10,12 €)	up to	524,65 CZK (20,23 €)	reduction to	30%	i.e. to	0,0000 CZK
above	524,65 CZK (20,23 €)	not conside-red					
			Reduced AHV				130,554 (5,03 €)
Compensatory wage (sickness)							4 386,6144 (169,14 €) CZK
Quarantine since 1st day							0,0000 CZK
Compensation in total 56 hours							
COMPENSATORY WAGE							**4 387 CZK (169,2 €)**

*) is provided within the first 14 calendar days for only working days and paid holiday
durign temporary incapacity for work is paid since 4th working day, up to 25th not worked hour
**) number of hours without waiting time, is not filled in for quarantine

Source: Ministry of Labour and Social Affairs of the Czech Republic; www.mpsv.cz/cs/11584

The law enables to provide with higher compensatory wage (maximally and logically up to average wage) as well as to pay it also during waiting time. The usage of those options represents above-standard social fulfilment from the side of employer. The provision of sick days is the similar option, which is not regulated by the law though (see further).

In connection with the waiting time it has to be said that at present time (time of this paper elaboration), the Parliament of the Czech Republic is negotiating the proposal for its cancelling. New adjustment is supposed to come into force since the 1st July 2019. All employers will be obligated to pay the compensatory wage since the first day of employee´s temporary incapacity for work. Constitution of new duty for employers and the loss of an option to provide with compensatory wage within waiting time as the special benefit for employees are the consequence of this legal regulation change.

3.2 Trial period and temporary incapacity for work

Trial period and its arrangement is not obligatory clause but it is very often used when concluding employment contract. It is period, within which both parties of employment check whether working relationship suits them. At the same time, it is the period of some uncertainty as it comes to stability of working position and it is harder for employee, of course. The length of this period is thus limited to up to 3 months since the day the employment has started (this period is up to 6 months for managers). Within trial period, employment can be finished by either of both parties without any reasons.

The legislation says that employer is not allowed to cancel employment within the first 14 days of temporary incapacity for work of employee. In case such ban would not exist and employment would be terminated, the employee would lose the right to compensatory wage because of temporary incapacity for work (see above).

Trial period is not being extended because of all-day obstacles to work (when employee does not work) neither because of temporary incapacity for work. It means that after the first 14 days of temporary incapacity for work the employer can terminate employment in trial period even the employee is still incapable to work. (Pospíšil, 2015)

It is necessary to mention that this ban limits the employer "only" in option to act by the law. Kocourek and Dobřichovský (2016) mention this example. If the employer terminates employment and there is said in the written termination that employment finishes by e.g. the third day after termination is received, and temporary incapacity for work of employee occurs within the period from decision on termination to the day, in which employment finishes, employment duration is not considered and employment is terminated by the determined day. So, this regulation is not similar or variation of so called protection period when notice of termination is concerned (see further).

When considering the fact whether duty of employer is fulfilled as it comes to above mentioned ban, one thing has to be pointed out. In case further temporary incapacity for work occurs immediately after the previous temporary incapacity for work finished, it is thought a continuation of previous temporary incapacity for work. The result of above said is that the number of days of temporary incapacity for work, during which employment cannot be terminated, is the sum of several sequenced temporary incapacities for work while the reason for them is not decisive. (Kocourek and Dobřichovský, 2016)

3.3 Temporary incapacity for work – prohibition of notice by the employer

Employer´s duty referring to temporary incapacity for work and employment termination is to respect protection period as it comes to notice of termination. The employer is not allowed to terminate employment during the period when the employee is temporary unfit for work because temporary incapacity for work is the period related to prohibition of notice. As Andraščíková et al. (2013) says, the ban of notice of termination submitted within the protection period is the specific protection by the Czech law in particular situations when (by lawmakers´ opinion) such fact (being given notice of termination) would be unreasonably hard. In other words, would be socially undesirable.

It has to be said that the ban of notice of termination is not valid absolutely. The protection period is not applied, when temporary incapacity for work is being caused in purpose or it is consequence of employee´s drunkenness or intoxication. Notice being submitted by the employer due to further mentioned reasons is not prohibited as well. Those reasons are closing down or relocating of udertaking, breach of working discipline and breach of temporary incapacity for work regime (referring to the duty to pay compensatory wage during that period).

Breach of the ban of notice of termination by the employer within the temporary incapacity for work would cause invalidity of such termination.

Finally, it has to be said that the reason for ban of notice of termination - temporary incapacity for work – is considered up to the day of termination delivery. For example, the employee received the notice of termination because of redundancy (his/her working position has been cancelled) and next day after termination delivery becomes sick (confirmed by the doctor). Termination has not been delivered within the protection period. Even not in case, the doctor finds the employee sick retrospectively i.e., before sick note issuing. This is confirmed by the Supreme Court of the Czech Republic of 20. 8. 2001 No. 21 Cdo 1954/2000, which says that protection period referring to temporary incapacity for work of employee begins with the day when the doctor decides that the employee is not able to work. The fact that the doctor has used his right to find the employee sick earlier (on the earlier date) does not change the date when it was decided on temporary incapacity for work.

In practice, such situation can occur that employee becomes sick after he received notice of termination and notice period has started. The law determines the rule for such cases. If the notice of termination was given before the beginning of protection period and notice period would finish during this time, protection period is not considered the part of notice period. Employment finishes after the rest of notice period once protection period is ended unless the employee informs the employer he/she does not insist on employment extension. In case the protection period would not intervene notice period, then temporary incapacity for work period does not influence the employment termination.

3.4 Control of regimen of an employee being temporary unfit for work and breach of other duties

In connection with employer´s duty to pay compensatory wage to employee within the first 14 calendar days of temporary incapacity for work there is other duty for employee adjusted in the legislation. The employer can sanction its breach. By this duty, determined regime of temporary incapacity for work being observed by the employee is meant. Within this period, the employee has to stay in the place of his/her residential address and to comply with the time and range of allowed walks.

The employer is entitled to check this duty. In case it is breached, the employer can lower or take at all compensatory wage or the employee can be given the notice of termination. It depends on seriousness of the breach. Notice of termination can be given to the employee though only if there is special gross violation of other obligation. For the purpose of such control (Hruška, 2007), it is suitable to arrange the way or system of control in internal regulations or in collective agreement. When providing such control, human rights and freedom has to be followed.

From the point of law theory view, determination of other duty is considered controversial because this is not duty violation referring to the work (i.e., working duty according to the Labour Code). This duty is regulated by other legal rules (from the field of sickness insurance). Above that, it is duty, which the employee fulfills within the period, when his/her absence at work is excused due to work barrier.(Andraščíková et al., 2013) Bělina et al. (2017) argues that the act tries to create "other employee´s duty" artificially. This is the typical example of conceptually improper sanctioning of duty breach in one legal field by the methods of other legal field. The consequences of public-law system´s "incompetence" (providing with sickness benefits) to see to the system abuse and the increase of temporary incapacity for work the state transferred to the employer first (compensatory wage for the first 14 calendar days) and later the state gave the employer the tool against the employees leading up to the option to terminate the employment.

The sanction used in the form of notice of termination in case the employee violates other duties in especially gross way can become tough in practice. The law does not define strictly when other duty is violated especially grossly. It is legal regulation with relatively indefinite hypothesis because intensity of the breach has to be always assessed by the employer concretely in each case and by the court if dispute between employer and employee occurs as it comes to termination invalidity (because of not adequate assessment of intensity of duty breach). (Andraščíková et al., 2013) Nevertheless, by the decision of the Constitutional Court of 23. 5. 2017 No. Pl. ÚS 10/12, if the employee violates his/her duties within the period of temporary incapacity for work, he/she harms the employer. The employee does not work, does not undergo treatment and still demands compensatory wage by his/her employer. He/she de facto is unfaithful to the employer. Above that, by his/her unreasonable absence, the employee can also cause economic problems. Especially gross duties violation can fundamentally disrupt a trust between employee and employer. By the Constitutional Court of the Czech Republic, employer cannot be asked to employ such employee who cheated, tried to deprive him of money or harmed him seriously in any other way.

As said above, employer can sanction employee for breach of other duty also by lowering or not providing with compensatory wage – especially in case this breach does not achieve intensity of especially gross violation. The decision of the Supreme Court of the CR of 15.10.2015 No. 21 Cdo 5126/2014 says that the fact that the employee has not provided the employer with the location of his/her stay during the first 14 calendar days of sickness (in order to be controlled by the employer whether he/she follows the given conditions) cannot be considered the reason for giving the notice of termination. It means that in such case this is not the breach of the duty to stay at the place of residence within the incapacity for work and keep the time and range of walks. Thus, the mere fact that when controlling, the employer has not reached the employee at home because of e.g. he has visited the doctor urgently or has not come home from walk on time cannot be thought especially gross duty violation. Those reasons have to be taken into consideration by the employer. He always has to prove that employee has breached his/her duties in purpose e.g. he has worked somewhere else within the period of temporary incapacity for work. As it comes to control at employee´s home, it can become problematic as well in terms of constitutionally guaranteed freedom. The employee is not obligated to invite the employer to his flat or house. However, he is obligated to prove his stay by e.g. waving at employer from the window or open door.

It also has to be pointed out that in case the employer sanctions the employee for the breach of other duty by lowering or taking away the compensatory wage, he cannot at the same time give the employee notice of termination and vice versa. Those sanctions cannot be cumulated.

Periods, in which the employment termination can be given for another duty violation, other limitations are (besides reason, violation intensity). Notice of termination can be submitted up to one month since the day the employer learned about other duty violation and no later than one year since the day the reason occurred. Those periods can be extended in cases when duty violation being the reason for termination become the subject of investigation by other authority (e.g. in

the frame of offence process). Then, the period for notice of termination lasts 1 month since the day when the employer has learned about the results of such process.

As resulting from above said, legal regulation of the option of employer to control the other duties being followed by the employee and to sanction its breach by notice of termination is little questionable (in terms of its controversy). Despite that, the authority of the employer to control employee within temporary incapacity for work is logical because it is connected with the employer´s measures in the social and economic area. During this period, the employer provides with compensatory wage and the aim of the control is to prevent its abuse. The control is also connected with the care of employee's health by adequate use of this time to undergo treatment.

3.5 Sick days

Above-standard social benefit provided by the employer, paid sick days are. Landwehrmann (2018) defines sick days as health days off – not working days, which can be used by employee to solve his/her short time health indisposition without the doctor´s confirmation.

Sick days have no support in legislation. In practice, employers adjust this benefit by their own decision. Therefore in this paper, different variants of sick day's regulation cannot be discussed in detail just in term of the fact that legal regulation does not exist. Only some important questions are mentioned here, which the employer has to take into consideration.

Employers can provide with this benefit and adjust its conditions or they do not have to provide with them in case there are not proper circumstances in the company or company culture would not suit it. Absence of the law in this area is positive aspect as it comes to reactions of employers to it. They can react very flexibly based on actual situation in the company, according to their or employees ' needs. And last but not least to stabilize working relationships. It has to be mentioned though that in practice, this employee´s benefit is being more often provided by companies with foreign participation because such companies have experiences from foreign partners. Others especially smaller companies do not usually provide with sick days so much. However, it can be assumed that if considering the labour market, significance of this benefit will increase because it is undoubtedly competitive advantage.

To realize sick days, it is necessary to determine their conditions, e.g. in internal regulations. In such way, it would be very easy to change those conditions in case of some need. Adjustment of sick days is possible to be made also in collective agreement or employment contract; however, to make changes would demand the agreement of other contract party, which, in author´s opinion, is not the most suitable way to do so.

Sick days are considered the obstacle to work, adjustment of which should solve the number of days, in what period they could be taken, reporting and giving consent to them, the process when maximum number of them would not be taken, wage or compensatory wage, the employer´s reaction in case this benefit would become violated. (Landwehrmann, 2018).

In practice, the length of sick days is usually 3 – 5 days and reflects the fact that short health indisposition may be "healed" within few days. Taking sick days is much better solution for both parties – employer and employees, because in case the employee would take temporary incapacity for work, it would mean his/her longer absence at work. By providing the sick days, such situations can be avoided when employees leave the sickness untreated and still come to work; it can cause other and even longer health complications and makes the situation worse for employer.

From above mentioned (obligation to pay compensatory wage to the employee) results that employer is obligated to provide with compensatory wage from 4th to 14th day of sickness duration. The first 3 days are not paid. With provision of sick days, this period can be bridged. Sick days are being provided with just within 3 days. Considering the expected canceling of waiting time (see above), such way of sick days use would loose its sense.

In practice, such problem can occur that the employee has not started his/her employment on 1st January. The number of available sick days is usually determined for calendar year. Therefore, it would be good to register sick days individually for each employee (e.g. from 1.4. to 31.3. of each year). This issue would bring administrative burden to the employer. There is possible solution – within the first employment year, the employer would provide with sick days proportionally and gradually up to particular dates. For example, employees starting the employment up to 2nd January would be given 3 sick days, starting after 2nd January up to 30th April would have 2 days and those starting between 1st many and 31th August would be given only once sick day. (Landwehrmann, 2018)

When applied in practice, procedure has to be taken into consideration in case sick days are not used at all. Different variants can be thought - transferring those days into next year (or its part), financial compensation or no compensation. Regarding the fact that this benefit is considered above-standard, the most suitable and the easiest way would be not provide with compensation.

Another difficult question is how to pay sick days as paid health days off. Sick days are undoubtedly barrier for work at the employee side. Even though, in practice, employers solve this situation by paying the wage instead of compensatory wage. Argumentation that the absence of legal regulation enables the employers to make any adjustment, would fail (in author´s opinion) because if the employee does not work, he/she cannot be paid the wage, which, by the law, is given to

the employee for done work. Similarly, e.g. Šubrt (2016) says that indisposition days off (sick days) are barrier for work and thus those cannot be paid by the wage but only as the compensatory wage. Also Chládková (2010) assumes that if the employee does not work, he/she cannot be given the wage but the employer can determine the compensatory wage, which would be equal to the wage in case he/she would work. Contrary to this opinion, Landwehrmann (2018) admits the option to provide with the wage during sick days even she also says that this benefit is more suitable to be considered the barrier for work with compensatory wage.

Some employees can tempt to abuse this benefit. To avoid such behaviour, the employer should determine strict conditions. He should list the examples of health indisposition, under which sick days can be taken; further, he should clearly say that sick days cannot be taken at the beginning or after holiday.

The issue of sick days and options of their legal regulation and adjustment of conditions, under which sick days will be provided with (voluntarily or obligatorily), is being discussed by professional public as well as by politicians. Author of this contribution perceives the absence of sick day's legal regulation as positive aspect. Strict legal regulation of benefits provided by employers denies its core and limits the room for above-standard competitive advantages. Absence of legal regulation of sick days does not really mean that those would not be realized in practice. As Epstein (2010) argues, complex legal regulation and state intervention bring consequences being not always expected and favourable.

4 Conclusion

Temporary incapacity for work is the topic, which can be discussed from legal, economic, social and health points of view. The aim of this contribution was to outline the Czech legal regulation of some questions related to temporary incapacity for work of employee, determine the principles of legal regulation of the selected duties and options of employer and present some problems when those are practically applied. By elaboration of this topic, hypothesis was to be proved that the legal regulation of employee´s temporary incapacity for work has social aspects and influences the employer in his social policy.

Such questions have been chosen for this paper showing how the legal regulation influences employers while solving employee´s temporary incapacity for work. The legal regulation determines duties, which have to be fulfilled by the employer. The legal regulation gives options, which can be used by the employer especially depend on his economic and organizational conditions. Further question from this paper can be seen as well namely employers can use non-existence of legal regulation of some issues in favour of employees, here concretely sick days. Their adjustment is provided adequately by the possibilities and needs of employer in case he decides to provide his employees with such benefit.

The analysis of selected questions clearly documents the adjustment of social standards in the Czech legal regulation of temporary incapacity for work and reflects the level of social policy in this field. The mentioned hypothesis has been proved though.

References

Andraščíková, M., & al. (2013). *Zákoník práce s komentářem.* Praha: ANAG. ISBN 978-80-7263-796-6.

Bělina, M., & al. (2017). *Pracovní právo.* Praha: C. H. Beck. ISBN 978-80-7400-667-8.

Epstein, A. R. (2010). *Právo, ekonomie a politika.* Praha: Wolters Kluwer. ISBN 978-80-7357-529-8.

Hruška, V. (2007). *Kolektivní smlouvy a vnitřní předpisy.* Praha: GRADA. ISBN 978-80-247-1987-0.

Chládková, A. (2010). Zdravotní volno a otázky související. *Práce a mzda,* (6)12, 16.

Kocourek, J., & Dobřichovský, T. (2016). *Pracovní právo pro praxi.* Praha: C. H. Beck. ISBN 978-80-7400-616-6.

Krebs, V. (2015). *Sociální politika.* Praha: Wolters Kluwer. ISBN 978-80-7478-921-2.

Landwehrmann, T. (2018). Sick days – zajímavý i záludný zaměstnanecký benefit. *Praktická personalistika,* 5(1-2), 29-37.

Neščáková, L., & Jakubka, J. (2012). *Zákonik práce v praxi.* Praha: GRADA. ISBN 978-80-247-4037-9.

Pospíšil, R. (2015). Zkušební doba a skončení pracovního poměru. *Práce a mzda,* (11)3, 8.

Šubrt, B. (2016). Indispoziční volno. *Práce a mzda,* (12)11, 4.

Supreme Court of the Czech Republic: 21 Cdo 1954/2000. www.nsoud.cz/judikatura.

Supreme Court of the Czech Republic: 21 Cdo 5126/2014. www.nsoud.cz/judikatura.

Constitutional Court of the Czech Republic: Pl. ÚS 10/12. www.usoud.cz.

Labour productivity of SME confectionary manufacturers as a financial performance influencing factor

Jan Vavřina, Josef Polák

Abstract: *Food manufacturing industry is considered to be a labour intensive industry. The way for increasing competitive advantage of food processing companies is then interconnected with both intensive and extensive growth of labour productivity based on rising export potential, mainly within the single European market. This paper aims at identification of factors influencing labour productivity of small and medium–sized food processors and consequently their overall economic performance within the industry Manufacture of other food products - cocoa, chocolate and sugar confectionery (NACE category 10.8). It was explored period of years 2007 – 2015 using financial secondary data of SME food processing businesses, active in the aforementioned industry and settled in Visegrad four member countries.*

Key words: Labour productivity · Food processing industry · Competitiveness

JEL Classification: M21

1 Introduction

The agri-food industry is considered to be the second biggest economic branch in the EU and it is also a substantive one from the employment point of view. The EU food and safety policy is focused on securing safety and quality food for inhabitants, while considering the needs for creating the best practise conditions regarding to entrepreneurial conditions for food processors settled in the EU member states (European Commission, 2014). The food processing industry can be regarded as intensively interconnected system with broader scale of mutual interrelationships (Lee, Van Hout, 2009). Agri-food chains cope with a broader range of requirements for the products than it was mentioned. From the trade point of view the most important assessor of goods is the final consumer (Hron, Macák, 2010).

Food processing enterprises running their business in the Visegrad 4 group member countries have had similar conditions to sustain and develop their business activities since they entered the Single European market in 2004. It could be named instruments of the Common Agricultural Policy within the context of negative impacts´ diminish of outer sectorial environment in relation with the economic status of businesses, specifically small and medium ones. The policy equalization instruments were focused mainly on co-financing investments to meet the hygienic and food safety of EU law and order requirements as this industry is regarded as a labour intensive one, specifically then manufacture of a confectionary production (e. g. Dai, 2013).

Food industry in the Czech Republic as the whole lags behind the EU average mainly in the economic performance. The data from corporate statistics 2010 state lower gross added value per employee in the Czech Republic, namely about 50 % lower labour productivity (Ministry of agriculture, 2014). The period after the Czech Republic´s entering the EU can be described as the period of increasing amount of food processing business entity.

Török and Jámbor (2013) discusses that food-processing industries in foreign hands, working in the globalised world of specialisation, can force their transportation, logistics, labour or other costs into the minimum, while dividing their investment costs, thereby better using the advantages residing in concentration, specialisation and regionalisation. Regarding to the previous facts, economic efficiency and competitiveness of food processing businesses at the single EU market has to be discussed in the area of exporting ability as well. According to Wisniewska (2010), there were two net exporters of foodstuffs in the Visegrad member countries (V4) in the period of years 2004-2007. Poland, as the biggest exporter of food, had export surpluses of 3504 million USD in 2007 and the trade grown by 236 %, since 2004. The Poland's export surpluses significantly exceeded the Hungarian one (628 million USD), where the food trade declined by 20 % in comparison with 2004. The other V4 member countries had food trade balance deficits (1189 million USD in the case of the Czech Republic). On the other hand, small and medium enterprises (SME) employing less people are suffering

Ing. Jan Vavřina, Ph. D., Mendel University in Brno, Faculty of Business and Economics, Department of Business Economics, Zemědělská 1, 613 00 Brno, e-mail: jan.vavrina@mendelu.cz

Ing. Josef Polák, Ph. D., Ambis - University, Department of Finance and Economics, Nárožní 2600/9, 158 00 Praha, e-mail: josef.polak@ambis.cz

more from the problems mentioned above, their debts are increasing, investments are missing and their economic viability is weakening. It is also clear that the competitiveness of the new EU member countries´ agriculture and the whole agri-food industry should be enhanced (for instance, by targeted investments, by increasing the technological efficiency, by rationalising economic size of businesses, by reducing taxes, etc.) (Török and Jámbor, 2013)

This paper focuses on identification of similarities and dissimilarities within main factors, which influenced the performance of small and medium–sized food processors in the industry Manufacture of cocoa, chocolate and sugar confectionery (NACE category 10.82) in the observed period of years 2007 – 2015. So, this article aims at identification of financial and non-financial factors, influencing performance of small and medium –sized food processors performance in comparison with economically largest entities within the industry Manufacture of other food products - cocoa, chocolate and sugar confectionery (NACE category 10.8) using labour force productivity as an ultimate aggregated indicator of the economic efficiency.

2 Methods

The secondary corporate financial data of food processing industry were gathered from the Amadeus Database of Bureau van Dijk. The food processing businesses are identified via NACE industry classification. Namely, there were employed data of corporates, which were active in NACE industry category 10.8 – Manufacture of other food products - - cocoa, chocolate and sugar confectionery in the period of years 2007 – 2015. Economic efficiency of food processing business entities was measured by indicator labour productivity. This indicator measures effects of the workforce consumption. We consider the growth trend of the labour productivity indicator in the aforementioned observed period as the evidence of positive development of economic performance of a business entity, on the other hand the decreasing trend as the evidence of a negative development in that area. Labour productivity indicator (LP) is enumerated based on corporate financial statements as follows:

$$LP = Added\ Value\ /\ Total\ Employees\ count \tag{1}$$

The aggregated profitability indicator LP was then decomposed to its respective analytical components to provide more insight into factors, which influence year-on-year development of the aggregated indicator LP, namely efficiency of fixed assets and equipment with fixed assets as follows:

$$LP = Added\ Value/\ Fixed\ Assets\ x\ Fixed\ Assets/Total\ Employees\ count \tag{2}$$

where:
Added Value/ Fixed Assets represents efficiency of fixed assets, $\tag{3}$
Fixed Assets/Total Employees count represents equipment with fixed assets. $\tag{4}$

In order to obtain a sample of business entities the following searching strategy was employed. It was analysed the trend of labour productivity indicator within the period of years 2007 – 2015 among population of food processing businesses in the Visegrad 4 countries, which are covered in the Database Amadeus of Bureau van Dijk. The whole identified population of food-processing companies within industry NACE 10.8 settled in V4 countries counts 3,015 entities. The sample of food producing businesses involved in the exploration analysis counts for all V4 countries in industry NACE 10.8 totally 150 businesses, which were identified as those with unconsolidated financial data.

The explorative technique for subjective mapping of similarities among businesses in respective countries based on corporate financial data is the multiple-correspondence analysis (MCA). This technique allows extended analysis of indicators´ matrixes with cases as rows and categories of variables as columns. So, there is analysed the inner product of the respective matrix with selected indicator that is called the burt table. The respective burt table consists of contingency tables with respective measure of correspondence between rows and columns. The results of the multiple-correspondence analysis will be visualised by a three dimensional space, using enumerated column coordinates. Here and after is set this notation of respective factors (F1 – F5) regarding to outputs of MCA:

- *SME, L&VL* – economic size of businesses, i.e. small and medium, respectively large and very large ones (F1),

- *CZ, H, PL, SK* – observed V4 member countries: Czech Republic, Hungary, Poland and Slovakia (F2),

- *LP_ AV/empl_OA; LP_ AV/empl_BA* – over average labour productivity per employ, respectively below average ones, measured as median of labout productivity in the observed time period (F3),

- *Eff_FA_AV/empl_incr, Eff_FA_AV/empl_decr* – increasing trend of fixed assets efficiency, respectively its decreasing trend (F4),

- *EQP_FA_AV/empl_incr, EQP_FA_AV/empl_decr* – increasing trend of equipment with fixed assets, respectively its decreasing trend (F5).

Software Statistica 13 was utilised for the multiple-correspondence analysis enumeration procedures to reveal similarities and dissimilarities among observations as common factors within their economic performance.

3 Research results

Respective similarities and dissimilarities of the observed sample of food processing companies, focusing on the productivity of labour were identified by the subjective mapping technique – multiple correspondence analysis. The visualization in three dimensional space was employed to identify associations between the labour productivity measured by added value per employee, its decomposition elements, economic size and settlement of business entity in V4 countries. Specifically the analysis was conducted both with increasing and decreasing trend of this labour productivity indicator in the observed period of years 2007 - 2015. The following Tab. 1 provides outputs of conducted MCA for column profiles and respective contribution to inertia for observed food processing companies´ sample both with increasing and decreasing labour productivity in V4 countries in the given time period, according to their economic size within industry NACE 10.8 - Manufacture of other food products - confectionary.

Table 1 Contributions to MCA inertia within increasing and decreasing trend of food processing companies´ profitability in V4 countries in the time period of years 2007 – 2015 according to the economic size being active within the selected industry branch in NACE 10.8

Factors	Mass	Quality	Relative Inertia	Cosine sq. Dim. 1	Cosine sq. Dim. 2	Cosine sq. Dim. 3
F1: SME	0.13	0.34	0.05	**0.22**	0.08	0.04
F1: L&VL	0.07	0.34	0.09	**0.22**	0.08	0.04
F2:CZ	0.05	0.31	0.11	0.04	0.01	**0.26**
F2:H	0.04	0.68	0.11	0.08	**0.56**	0.04
F2:PL	0.08	0.65	0.09	0.30	0.03	**0.33**
F2:SK	0.03	0.63	0.12	**0.41**	0.22	0.00
F3: LP_ AV/empl_OA	0.11	0.72	0.06	**0.40**	0.32	0.01
F3: LP_ AV/empl_BA	0.09	0.72	0.08	**0.40**	0.32	0.01
F4: Eff_FA_AV/empl_incr	0.08	0.48	0.08	0.08	0.01	**0.39**
F4: Eff_FA_AV/empl_decr	0.12	0.48	0.06	0.08	0.01	**0.39**
F5: EQP_FA_AV/empl_incr	0.13	0.67	0.05	0.13	0.24	**0.29**
F5: EQP_FA_AV/empl_decr	0.07	0.67	0.09	0.13	0.24	**0.29**

Source: Own processing

The cumulative percentage of inertia within a chosen tree-dimensional space is exceeding 50 percent (56.1 %), so it indicates a well visualisation ability of chosen group of 5 factors, based on observed frequencies in the MCA burt table of food-processing business entities settled in V4 member countries, being active in the industry Manufacture of other food products - confectionary.

Figure 1 3D MCA outputs visualisation of labour productivity among sample of confectionary manufacturers in V4
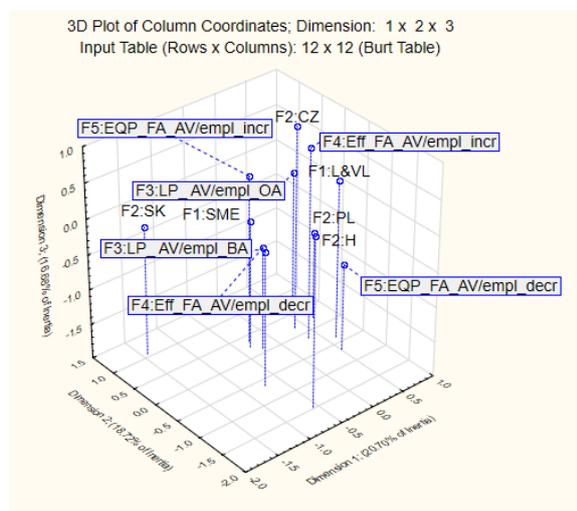
Source: Own processing

A relative importance of three employed visualised dimensions in the aforementioned graph is declared by respective inertia values for respective dimensions, which are representing its amount of significant information in 3D space – in the case of Fig. 1 then dimension one 20,7 %, dimension two 18,72 % and dimension three 16,68 %.

The identified business entities, settled in V4 member countries as a whole, which were active within the industry Manufacture of other food products - confectionary in time period of years 2007 – 2015 were identified as those with prevailing above average mean value of labour productivity, as it can be seen via respective visualisation of coordinates at dimension 1 (see Fig. 1).

The identified dissimilarities among observed economic size categories of food-processing business in industry NACE 10.8 can be also depicted via dimension 1. It can be stated that the prevailing size category of businesses with identified above average labour productivity are the observed economically largest enterprises. The influence of the factor country of settlement on the similarity of the respective column profiles can be described as following. Profiles of observed businesses settled in the Czech Republic and Poland can be well visualised via dimension 3. Food processors settled in Slovakia are well visualised at dimension 1, observed businesses settled in Hungary than at dimension 2. Firstly mentioned group of businesses settled in the Czech Republic and Poland is representing the observations of food producers with prevailingly above average labour productivity in the observed period. So, in the case of observed businesses settled in the Czech Republic more than 63 % of entities reported in the period of years 2007 - 2015 a mean yearly labour productivity per employee higher than 10 618 EUR that was calculated as V4 member countries median value for the analysed food processing industry. In the case of companies settled in Poland even more than 70 % of observed entities were identified as those with over average labour productivity per employee. On the other hand, the case of observed companies settled in Slovakia revealed more than 53 % of businesses with labour productivity lower than V4 member countries´ average and in the case of observed businesses settled in Hungary even more than 75 % with below average labour productivity.

On the other hand observed businesses settled in Hungary and Slovakia are representing entities with prevailingly below average labour productivity in the given time period. Despite the fact of worse observed labour productivity among businesses settled in Slovakia, it was identified the highest proportion of businesses with increasing trend of fixed assets equipment.

Contrarily, the observed efficiency of fixed assets among businesses settled in Slovakia belongs to the worst one in comparison with other V4 countries. Conversely to this finding, it can be stated an equal proportion of observed businesses with on one hand increasing and on the other decreasing trend of fixed assets´ efficiency in the Czech Republic and Hungary.

4 Discussion and Conclusions

The food processing industry and specifically the confectionary branch is both capital and labour demanding business activity, and it is also facing price sensitive demand. So, there is a continuous need for managing cost and rationalization of production processes. These needs for an increasing economic efficiency of production can be seen e. g. according to Abrhám (2014) also in the process of cooperation among businesses in the food processing industry. This cooperation is mainly identified via clustering and these initiatives are supported by European Commission´s financial encouragements. Effects of cooperation among economically self-standing food producing companies are anchored mainly in economies of scale or reduction of limits of small businesses, respectively. They also accelerate the innovation potential of the companies through the information and technology transfer among cooperating business entities and it also affects their willingness to invest into production capacities, especially regarding to economically smaller businesses.

Food processing industry in V4 member countries is still considered to suffer from an increasing trend of agricultural raw materials and energy prices (Jámbor, 2015). In addition to the obligatory EU standards for food productions it can be stated an increasing pressure on the economic efficiency of respective business processes.

Results of this article prove the aforementioned general statements validity via an empirical evidence of sample of confectionary producers settled in V4 member countries. The highest labour productivity was identified in V4 member countries among economically largest confectionary producers. Subsequently, observed businesses settled in the Czech Republic and Poland are then identified as those with an prevailing increasing trend of labour productivity in the period of years 2007 – 2015. On the other hand, sample of businesses settled in Slovakia and Hungary legs behind, so it was identified a lower labour productivity in SME observed period for that sample. It can be stated additionally to the previous findings, that confectionary producers in Slovakia were identified as those with the highest positive development trend in their equipment with fixed assets, but with the worst identified efficiency of these fixed assets among all other observed businesses from V4 member countries.

It can be concluded based on the provided empirical evidence that investments are regarded as a crucial factor for economic efficiency of confectionary food producers in spite of the fact that this industry branch is regarded as one of the most labour demanding one. Further increasing of labour productivity and economic performance, especially among small and medium sized food producers, is then inevitably connected with the need for economically effective investments in to the production capacities, i. e. investments to fixed assets.

References

Abrhám J. (2014). Clusters in tourism, agriculture and food processing within the Visegrad Group. *Agri. Econ. – Czech* 60 (5), 493–499.

Dai J. S. (2013). Robotics and automation for packaging in the confectionery industry. *Woodhead Publishing Series in Food Science, Technology and Nutrition 2013*, 401–419. doi: 10.1533/9780857095763.2.401

European Commission (2014). *Food safety – Ensuring a high level of protection of human health and consumers´ interests*. Luxembourg: Publications Office of the European Union, 2014. ISBN 978-92-79-42439-7.

Hron, J., & Macák, T. (2010). Forecast of demand through the differential description of their effects. *Agricultural Economics* 56 (4), 149 – 158.

Jámbor, A. (2015). Country- and industry-specific determinants of intra-industry trade in agri-food products in the Visegrad countries. *Studies in Agricultural Economics* 117(2), 93-101.

Lee, H. S., & Van Hout, D. (2009). Quantification of Sensory and Food Quality: The R-Index Analysis. *Journal of Food Science* 74 (6), R57 – R64.

Ministry of Agriculture of the Czech Republic (2014). *Rural development programme 2014 – 2020*. [On-line]. Cited [2018-08-28]. Available at: http://eagri.cz/public/web/file/321101/PRV_do_vlady.pdf.

Török, A., & Jámbor, A. (2013). Agri-food trade of the New Member States since the EU accession. *Agricultural Economics* – CZECH 59 (3), 101–112.

Wisniewska J. (2010). Internationalization of agro-food trade in the Visegrad Group countries after their entering into the European Union. *Scientific Journal Warsaw University of Life Sciences - SGGW. Problems of World Agriculture* 10 (25), 124–133.

Ethics in Human Resources Management

Darja Holátová, Miroslav Němec

Abstract: *Ethics is an indispensable part of managerial practice which influences the human resources management, business climate, corporate culture and good reputation of a controlled object. In decision-making processes managers often encounter conflicting interests of different groups in a company or different values and ambiguous rules. Ethics is often underestimated by some individuals because unethical behaviour may bring a short-time advantage. In a long-term perspective, unethical behaviour may damage the company´s reputation. The price companies pay for unethical behaviour is considerable. This phenomenon relates to occupational health and safety issues, costs and effectiveness of the company. An enterprise has a necessary prerequisite to participate in the development of entrepreneurial environment.*

1 Introduction

Ethics is a scientific discipline dealing with moral decisions and methods of their justification. It is a theoretical reflection of moral. We can say that ethics deals with theory while moral represents its practical aspect. Ethics evaluates human activities in terms of what is morally good and bad and what is morally right and wrong. The meaning of "ethics in management" is used when we need to stress or soften certain statements or to explain unpopular measures we encounter in company management, management of institutions or state economy. Uncultured behaviour in management and wild market must be regulated by ethical attitudes of managers.

The recent awareness about the contents and position of ethics in management and economy is insufficient. Behaviour of individual companies and their ethical principles may be judged by the society, i.e. communication with customers is what matters and so do guarantees and responsibility demonstrated in realization of their products and services and also their relationship to environment and particular measures of its protection. Charity and social responsibility and involvement are in question. The scope of a company´s ethical behaviour may become a competitive advantage in the market.

Contrary to moral - which is closer to particular rules - ethics aims at finding common and general principles forming its background, or seeks justification of moral behaviour. Ethics describes reality while adding what things and procedures should look like. Ethics deals with human action in terms of the good and bad, happiness and purpose of life, it is a discipline dealing with morally relevant human behaviour (Thompson, 2004).

Ethics is often discussed but it is hard to imagine what its exact meaning is. By means of ethics we can differentiate the good and the bad, the ethical and unethical. Ethics is something that each of us has to continuously develop because it represents internal rules and values of an individual. We often think of ethics as of a set of rules, since each group, society and organization that we become members of in the course of life, has its internal regulations. We must not forget that ethics is a kind of a personal compass directing our ways of action (Pasztor, 2016). Ethics is a set of rules and standards expressing opinions of a group of people about behaviour and action of the others in terms of the good and the bad, the right and the wrong. It is a discipline dealing with moral, the origin and with the purpose of moral awareness and behaviour. Cakirpaloglu (2012) says that ethics is a branch of philosophy which researches morally relevant behaviour in view of moral standards, principles and values mostly in situations when we can choose between the good and the bad.

Not always ethics gives us the right answers to moral problems. More and more people are convinced that more than just one right answer exists for many ethical questions. However, we would like to have the one right solution because people wish to act correctly. The right answer often does not exist. We can have more correct answers or just the fewest of the bad answers for us to choose from (BBC, 2014).

---

doc. Ing. Darja Holátová, CSc. University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: holatova@ef.jcu.cz

Ing. Miroslav Němec. University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: miroslav.nemec@suspk.cz

SekniČka & Putnová (2017) wrote that the role of ethics in modern management is indispensable. Basic values of the entrepreneurial ethics are justice and fairness. "Justice is based on the principle of equal treatment. It does not mean that all people are treated equally. This can only happen on the condition that fixed rules have been determined for certain issues and procedures that have to be followed" (Šroněk, 1995). It is important to avoid unrealistic hope and unjustified expectations because this can result in the feeling that entrepreneurship as such is not fair. Another principle to follow is a voluntary compliance with the law, keeping confidentiality, avoiding conflict of interests, acting in good will, etc.

Development of global business involves, among other, the need for standardized rules for controlling, bookkeeping and other everyday operations, plus the development of rules of behaviour in an organization and its employees. Therefore a professional framework of action is required which is often defined in an Ethical Code. This is particularly important in a situation when many international and multinational companies enter the market who bring their norms of behaviour and culture (Branson, Chen & Anderson, 2015). This is why standards are most important for the right relationships between employees within the company and externally.

Ethical action at a workplace is essential. Managers state that relationships to employees are most important for the right operation of each business. Unethical behaviour becomes a standard in some companies. The fact that the atmosphere of fear and intrigue prevails is mostly recognized by the management as late as when the best employees leave since they are too sensitive to scheming. A psychological survey revealed that numerous Czech companies function in an atmosphere which is far from being ethical (Sovová, 2012).

Relationship problems at a workplace can have many forms starting from a slander, intrigues and denunciation to attacking, harassment and psychological terror. These problems are known as mobbing, bullying or bossing – a topic not much officially spoken about in companies (Barták, 2006). Should they be revealed, it is usually the remarkable "iceberg top", which has to be addressed at any circumstances.

The term bullying is pursued especially in Britain; it is derived from the word bully (a brutal and rude person, a tyrant, etc.). Bullying translates as frightening and using terror at a workplace. It is initiated and controlled by colleagues or by a supervisor with the aim to abuse a person by active and persistent long time pressure or to cause damage to them. Bullying often causes the aggrieved person to fall ill or even to commit suicide. Symptoms are regular and last long. Mobbing and bullying have a similar nature (Tehrani, 2001).

Mobbing is a phenomenon representing a long-term diminishing communication acts done by co-employees individually or as a group (for a minimum of six months), and repeated (a minimum once a week) towards a certain person. Mobbing occurs in businesses more often that we would expect (Barták, 2006). Mobbing is a term used for psychological terror at a workplace; bullying among colleagues. Typically it is a situation when a group of employees try to make an individual´s working life uncomfortable by unfriendly behaviour. Participants to mobbing may be colleagues, supervisors or even supervised employees. Such unfavourable behaviour may influence workers in all size companies, including small-size firms (Gresham, 2017). This behaviour often happens at frequent intervals in a long period. Its consequences involve mental and social anguish of the victim. Kratz (2005) defined mobbing as follows: „Mobbing is a number of negative communication situations committed by an individual or a group of individuals against a certain person for a minimum of half a year and at least once a week."

Mobbing occurs especially due to the following reasons (Kocábek, 2008):

- envy (a happy family and family background, work ideas, performance and success, reliable friends, sports image, clothing, hobbies, money, etc.),

- desire to control others,

- showing off in front of people one knows,

- sexual motivation,

- bad moral and insufficient legal awareness, etc.

Bossing is another form of bullying at work – a systematic bullying by a supervisor. In many cases it is a manager towards a supervised person who is enforced to be overly flexible and obedient or to leave his/her working position. Bossing is also called a top-down mobbing.   If the concerned employee fails to act according to the bossing orders, s/he faces sanctions that the manager disposes of within his/her position. Following are examples of such sanctions (Oade, 2009):

- salary reduction,

- demotivation of employees,

- refused application for holidays,

- bad evaluation report,

- reduced or cancelled perks,

- making an employee redundant,

- assigning boring or routine work,

- making an employee to cooperate with a person he cannot get along with.

Staffing is a form of a bottom up bullying involving unfair attacks against an individual in a managerial position with the aim to ruin him/her or his team or a company.

Consequences for the company

Organizations keep looking for ways to reduce stress at workplaces with the aim to improve their employees´ productiveness. This effort should reveal possible reasons for work stress. Bullying is a relatively new concept among co-workers in the form of unfriendly behaviour at work. The above indicated study discovered different reasons for bullying and its relations to the victim´s behaviour. The study used an analysis of the factors identifying reasons for mobbing and structural modelling of equations to test relationships among employees (Qureshi, Rasli & Zaman, 2014). Empiric findings demonstrated that the course of mobbing has a positive relation to stress and leads to negative behaviour of employees at workplaces.

Aggression, violence, conflict and various discrepancies at workplaces have always existed. The growing stress, competitiveness, constant pressure to increase work performance and reduce operating expenses at any cost result in deterioration of the working relationships. Individualism supported by the above described situation makes the working environment even worse and contributes to the adverse working conditions. Different requirements and expectations of each individual are a frequent source of pathological relationships. However, not every conflict is mobbing (Svobodová, 2008). Reasons for this phenomenon not only are in the personality of the mobbing person, but also in a wrong setup of the company culture which prefers competitive relationship, where envy exists and ethics is lacking. Further, incorrect work organization, inconsistent check of the employees work and especially in the style of management. Managers should be aware of the fact that this pathological phenomenon negatively influences both the victims and the whole company.

Occurrence of mobbing is in principle proportional to discomfort at work, bad social climate and usually happens at the low level ethic workplaces. Mobbing typically originates from competitive pressure, from fight for better position and more advantages, existential insecurity and from fear of losing work. Relationships among employees in such environment are weak and intolerant (Svobodová, 2008).

Consequences of the above listed factors lead to a bad atmosphere at a workplace, hostile and dysfunctional environment, lack of team spirit, reduction of work performance and quality. Employees are less creative and productive while fluctuation increases. The moral of the whole company is declining. All of this results in the increased operating costs of the company (Svobodová, 2008). Such adverse conditions cause lack of concentration of the workers, which can result in a high risk of failures, errors or injuries. Sickness rate and inability to work increase, since these are ways of escape from the adverse working situation. Dědičová (2017) adds:

- decreased productiveness, effectiveness and profitability,

- increased absence and fluctuation of employees,

- reduced moral and loyalty,

- increased cost due to hiring employees and re-qualification,

- indirect cost due to dealing with bullying,

- negative impact on company´s image,

- potential fines for failing to keep health and safety regulations,

- legal costs for litigation of those who sue the mobbing persons,

- potential increase of insurance premiums.

Positive atmosphere at a workplace, good company culture based on the firm moral background does not support pathological relationships. Employees must not have the feeling that their managers follow different rules and standards.

A company should pursue clear and understandable regulations, and all employees should know what behaviour is expected and what will not be tolerated. Behavioural patterns of supervisors are deliberately or unconsciously taken over by supervised employees (Svobodová, 2008).

2 Methodology and Data, Results

Research into ethics and unethical behaviour and acting at workplaces was made in a selected organization in 2017 as a pilot survey for a project planned for the year 2019.

A hypothesis was proposed that an organization aiming at ethical relationships in human resources management will be positively evaluated by its employees and this fact will correspond with the economic results of the monitored company.

The data was collected by means of a questionnaire containing 34 items structured in 2 thematic blocks. The first part of the questionnaire consisted of 7 items focusing on social and demographic characteristics of the respondents (gender, age, number of years in employment, number of years in the current position and questions about superiority).

The following part contained 22 items taken over from the NAQ-R questionnaire based on the behavioural measurement strategy. For this purpose was selected a reviewed version of the Negative Action Questionnaire, NAQ-R (Einarsen, Hoel, Notegaers, 2009).

We distributed 383 questionnaires; the survey was participated by 208 employees, i.e. 54,31 % of the workforce. Results - table 1.

Table 1 Negative Action Questionnaire in %.

No.	Questions	Never in %
1.	Did someone withhold from you information that influence your work quality or your deadlines?	78,4
3.	Have you been asked to perform work that is below your competences and qualifications or abilities?	77,9
5.	Has anyone use slander and libel against you?	72,6
8.	Has anyone shout at you or have you been a target of unprovoked anger?	79,8
11.	Have you been repeatedly reminded of your mistakes and failures?	77,9
13.	Have your work results and work performance been criticized?	65,4
14.	Have your ideas and opinions been ignored?	72,1
16.	Have you been assigned tasks with unreasonable requirements or deadlines?	78,8
18.	Has your work been overly checked and monitored?	79,8

Source: Own processing

The monitored organization is actively involved in the quality of human resources management and social responsibility. The survey demonstrated that the employees evaluate the work relationships positively. This finding corresponds with the company´s economic results that show a long-term prosperity of the monitored company.

Working environment closely relates to managers. They concentrate a high degree of power. Management styles, communication setup with supervised employees and behaviour of managers substantially influence each workplace (Březinová, Slabá, 2017).

The person responsible is mainly the manager who creates the working environment. If s/he lacks the basic moral and the required legal awareness, s/he triggers mobbing at a workplace. Such manager typically lacks self-confidence and has a strong need to control and manipulate others (Kocábek, 2008). S/he is usually surrounded by a servile group of poor-character acquaintances to whom s/he offers various benefits (e.g. perks, the feeling of power, rewards). For this, s/he requires an absolute subordination, including denouncing

Mobbing exists at places where managers do not care for team spirit, refuse to speak about the existing problems, nor want they solve them; where managers are not sufficiently qualified, ignore conflicts and respond to mistakes with prejudice (Svobodová, 2008).

3 Discussion

On the condition that management ignore unethical behaviour, they in fact approve of it, and as a consequence, it becomes a common standard. An employer can step in against those who damage the company - intrigue, spread sensitive information – by termination of their employment due to serious violations of the work duties.

Management style plays an important role. The most suitable is democratic style. Autocratic, authoritarian or extensively liberal management raise the atmosphere that supports mobbing. Liberal style and extensive freedom result in anarchy and chaos. Directive management raises irritation, discomfort and aggressiveness. (Svobodová, 2008).

A good manager must be able to understand feelings of others and to reasonably control his/her emotions (Svobodová, 2008). Dysfunctional communication between a manager and employees, absence of information about the supervised workers raises the feeling of ignorance and derogation. A basic tool of in-company communication should be clear rules, strictly determined rights, duties and responsibility of all the players. Rules clarify relationship and prevent useless misunderstandings and derogations.

Workplaces vastly endangered by mobbing exist at companies with bureaucratic organizational structure, in large companies with a complex organizational structure and where intellectual work prevails (education, healthcare and state administration bodies) (Zábrodská, & Květoň, 2012).

The author (Barták, 2006) quotes the risk we often see in bad managers. Human resources should not be mistaken by the so called "snakes in suits" – according to Babiak, Hare (2014) or „psychobosses". At first sight, they positively impress their environment, they are enchanting, communicative, energetic and seem to be an ideal personality until we discover what hides under the surface. We can find lies, fraud, cheating, manipulation, self-centredness, misuse of the supervised, psychopathic action, hidden absence of self-confidence compensated by psychological pressure against employees, cold and calculative injuring of others without feeling any reproach, sometimes even with one´s satisfaction (Barták, 2006).

If human resources neglect the roots of conflict and fail to solve problems, the situation can develop into open psychological pressure.

4 Conclusions

Ethics should be an integral part of a company strategy, while its implementation is based on results of economic results ethical analyses (Krymláková, 2009).

Sources of conflict are numerous. The author (Barták, 2006) lists different personality types, variety of interests, disproportion between objectives and means to achieve them, insufficient opportunities, organizational problems, different sources of information, different information processing, controversial objectives, values and standards

Stress caused by mobbing adds to the standard working stress. Mobbing is psychologically demanding, as well as economically contra-productive. Negative results of a systemic "liquidation" of a selected victim influence much more than the victim itself. Major damage may affect the whole business since mobbing has a great negative impact on its activities. If some employees are deliberately prevented from receiving information and from making decisions, or if they are intentionally given wrong information, the productiveness decreases and transparency of the working process declines (Kallwass, 2007).

In a long-term perspective, it is essential to start at the stage of selection the manager and pay attention to a balanced relationship of the candidates to business tasks and to people. It is recommended to invest the required time, energy and finance to a thorough diagnostics of both special and (perhaps more importantly) personal and social characteristics (Barták, 2006). Managers must be an example for others and must enforce ethical principles in all employees and in their economic environment. They must criticize outdated or incorrect norms and require their change.

A useful tool to prevent consequences of bad behaviour damaging the company, certain mechanisms are formed that try to eliminate undesirable behaviour – ethical code is accepted and an ombudsman appointed, boxes for employees complaints are in place, etc., as Babiak (2014) states. Working atmosphere can be cleared by setting a style of management, company visions, mission, rules, cooperation and collective agreement principles which prevent or at least reduce mobbing (Barták, 2006).

Ethical Code is an essential tool for ethical management. It contains the basic lead-in principles of ethical standards in the company and concerns all the interest groups (Armstrong, 2017). Ethical Code is a guideline to help the organization provide for its everyday activities and behaviour of its members in compliance with the regulations in place. Ethical Code is not legally binding; however, its violation can be addressed in terms of the accepted disciplinary measures.

References

Armstrong, M. (2017). *Armstrong´s Handbook of Human Resources Management Practise*. London: Kogan Page.

Babiak, P., & Hare, R.D. (2014). *Hadi v oblecích, aneb, Psychopat jde do práce*. Praha: Academia.

Barták, J. (2016). *Patologie vztahů – mobbing přijde draho*. Retrieved from http://www.bozpinfo.cz/win/knihovna- bozp/cita-rna/clanky/ochrana_zdravi/mobb_boss_bull.html

BBC. (2014). *Ethics guide*. Retrieved from http://www.bbc.co.uk/ethics/introduction/intro_1.shtml

Bláha, J., & Dytrt, Z. (2003). *Manažerská etika*. Praha: Management Press.

Branson, L., Chen, L., & Anderson, L. (2015). *The Implementation of International Codes of Ethics among professional Accountants: Do National Cultural Differences Matter?* Retrieved from http://web.a.ebscohost.com/ehost/pdfviewer/pdfvie-wer?vid=9&sid=f4cecd66-33b7-4ade-a713-ea9076c96dd5%40sessionmgr4003&hid=4109

Březinová, M., & Slabá, M. (2017). External communication of small and medium-sized enterprises in the region of South Bohemia, *Mladá věda* 3/2017.

Cakirpaloglu, P. (2012). *Úvod do psychologie osobnosti*. Praha: Grada Publishing.

Dědičová, D. (2017). Jak předejít šikaně ve vaší firmě. In: *EDU GURU*. Retrieved from http://www.edu-guru.cz/index.php/89-leade-rship/301-mobbing-5-zasad-jak-predejit-sikane-ve-vasi-firme

Einarsen, S., Hoel, H., & Notegaers, G. (2009). *Measuring exposure to bullying and harassment at work*. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/02678370902815673

Gresham, T. (2017). *Smallbusiness: What is mobbing at the Workplace?* Retrieved from http://smallbusiness.chron.com/mobbing-workplace-43426.html

Kalwas, A. (2007). *Syndrom vyhoření v práci a osobním životě*. Praha : Portál.

Kocábek, P. (2008). *Jak „přežít" šikanu aneb mobbing na pracovišti*. Retrieved from http://www.mpsv.cz/cs/5162

Kratz, H-J. (2005). *Mobbing : Jak ho rozpoznat a jak mu čelit*. Praha: Management Press.

Krymlkáková, H. (2009). *Etika a odpovědnost organizace*. Ostrava: VŠB-TU Ostrava

Oade, A. (2009). *Managing workplace bullying: how to identify, respond to and manage bullying behavior in the workplace*. New York: Palgrave Macmillan.

Pasztor, J. (2016). *Ethics and the Nonfinancial Side of Retiremen*t. Retrieved from http://web.a.ebscohost.com/ehost/pdfviewer/pdfvie-wer?vid=3&sid=f4cecd66-33b7-4ade-a713-ea9076c96dd5%40sessionmgr4003&hid=4109

Qureshi, M. I., Rasli, A.M., & Zaman, K. (2014). A New Trilogy to Understand the Relationship among Organizational Climate, Workplace Bullying and Employee Health, *Arab Economic and Business Journal*, Volume 9, Issue 2. Retrieved from https://www.sciencedirect.com/science/article/pii/S2214462514000176

Seknička, P., & Putnová, A. (2017). *Etika v podnikání a hodnoty trhu*. Praha: Expert.

Svobodová, L. (2008). *Nenechte se šikanovat kolegou: mobbing - skrytá hrozba*. Praha: Grada,

Šroněk I. (1995). *Etiketa a etika v podnikání*. Praha: Management Press.

Tehrani, N. (2001) *Building a culture of respect Managing Bullying at Work*. New York: Taylor and Francis

Thompson M. (2004). *Ethical Theory*. Hodder Murray.

Zábrodská, K., & Květoň, P. (2012). Šikana na pracovišti v prostředí českých univerzit. *Czech Sociological Review*, 2012, Vol. 48, No. 4. [online]. Retrieved from http://sreview.soc.cas.cz/uploads/c3bafe9254bc171db5fc4fc938cbf52cd51a3f03_641-668.pdf

New Economy

Markéta Adamová, Nikola Soukupová, Růžena Krninská

Abstract: *The concept of New economy is really broad and covers rapidly changes. These changes are related to the processes of globalization and the deep uses of information and communication technologies in all sectors. Last decades different adjectives cam be added to the term economy, they should highlight changes within economy - for example new, knowledge-based, innovative, digital. The aim of the paper is the review of New economy and finding out possible benefit from it. New economy can help with facing recession and create new jobs. To conclude scientists, businesses and nations will have to face many challenges within New economy - especially those related to energy security and the limited fossil fuels, to the impact of robotization and transformation into Industry 4.0, which will be associated with extensive digitalization in enterprises, but certainly also in the public sphere.*

Key words: New economy · Knowledge-based economy · Innovation · Knowledge · Digital economy

JEL Classification: O10 · O30 · O49

1 Introduction

The turbulence of the changes was enormous between 1995 and 2005 up to the present. It can be said that the implementation of computer and communication technologies was an offer shock at the end of the 20th century. Thus, this period can be understood as a communication and computer revolution (Kislingerova, 2008). The world economy is witnessing a fundamental structural change that is driven by globalization and the revolution in Information and Communication Technologies (ICT), leading to a new economic system. The new economic system can be characterized by increasing the importance of knowledge, increasing labor productivity and enhancing competition and globalization. Current literature has prompted a discussion of the interaction between elements, influences and opportunities that are created in the new economy for development of countries (Satti & Nour, 2 015). Vesely (2004) adds that today's world is completely different and full of changes. As a result a lot of theoretical concepts within economics was found in the second half of the 20th century - many of them with the prefix "post" or "neo", possibly with the attribute new or late. It is no simple to define essential features of today's society only a few words.

According to Kislingerova (2011), a number of adjectives have emerged in recent years and are attributed to the notion of the economy. It is likely to emphasize the changes that have occurred. The term "new" economy is just one of the possible links. In addition to the adjective "new" it could be used adjective knowledge for the economy. Incorporating the concept of the knowledge economy into practical policies over the last two decades has led to institutionalization of the concept within the main development agenda (Hvidt, 2015). According to Vojtovič (2015), significant changes in economic production, labor market and employment lead to the consolidation of the company at the end of the 20th century. These changes might be named such as the innovative economy, the knowledge economy, the internet economy, the network economy, the digital economy or the new economy.

Current state is mainly called as digital economy within Industry 4.0 related robotics issues not only in production but also in services. The new economy has been described in some way in the media as the so-called Age of the Internet, the Revolution of Information Technologies, the Digital Economy (Landefeld & Fraumeni, 2001). According to Gluckman (2018), the current digital revolution is unstoppable. The speed and scope of digital technology is irreversible. Like any other technology change, it has benefits and challenges. Businesses and countries will have to deal with with new features

---

Ing. Marketa Adamova, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 37005 Ceske Budejovice, e-mail: adamom01@ef.jcu.cz

Ing. Nikola Soukupová, University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: zidovn00@ef.jcu.cz

doc. Ing. Růžena Krninská, CSc., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 370 05, České Budějovice, e-mail: krninska@ef.jcu.cz@ef.jcu.cz

of the economy and ideally to use them effectively to increase their competitiveness. So it is crucial do not perceive change as a threat, but rather as an opportunity.

According to Parcero & Ryan (2016), the knowledge economy is more widespread than just high technology or a new economy. And even more widespread than the often-used term information society. Its basics are creation, dissemination, and use of knowledge. A knowledge economy emphasis knowledge instead of capital and workforce.

The environment of the economy should be what encourages investment growth and innovation - as a key factor in maintaining a knowledge-based economy (Skyrme in Mortazavi & Bahrami, 2012).

2 Methods

The aim of the paper is analysis of the literature framework dealing with the issues of the new economy and to look at its potential benefits at national levels. The paper will examine both Czech and foreign publications, including researches dealing with this issue. Comparison with other research and authors was also important.

The new economy and the knowledge economy in this paper will be understood as very similar systems (Kislingerova, 2011; Vojtovič, 2015). The knowledge economy and the new economy have many things in common:

They explore similar processes, but from a different point of view.

Emphasis on education, knowledge and ICT (Kislingerova, 2011).

The knowledge economy is historically older category than a new economy, and the extension of this term is associated with Peter Drucker and his books (The Effective Executive and The Age of Discountinuity). The idea of the knowledge economy emphasizes the importance of knowledge and technological and information prerequisites for the development of the economy. Know - how is more important than production factors (Kislingerova, 2011).

3 New economy

There are many definitions, in which play a key role innovation and knowledge as part of the necessary resources for growth and defining features of this paradigm. A new economy is an economy of knowledge and ideas. It can even be said that information becomes a new input factor and this information is used in a new way than in industrial production. Creativity becomes industrial capital and lies at the heart of the new economy (Vojtovič, 2015). Soukup & Hejdukova (2008) agree with this, adding that while in the past economic growth was based on increasing capital, labor and natural resources; within new economy it is based on the the knowledge and innovation.

Ability to create knowledge and absorb it together with their efficient use is the way to create innovation and to maintain a competitive advantage and achieve economic success (Strozek, 2014). A dynamic comparative advantage illustrates that it is not just the presence of resources that is important, but also how these resources are used to create outputs to enable the region to be competitive and to adapt and continue in the future (Huggins, Luo & Thompson, 2013).

To describe of The New Economy According to Lelek (2009), the New economy can be described in Fig. 1. This figure is the simplest expression of new economy, there is no dynamics captured and serves mainly to emphasize the importance of knowledge in the new economy. Within the new economy, however, there are a number of models. According to Leydesdorff (2006), there is a so-called Triple Helix model that defines its main institutions. They are universities, industry and governments. According to Bennewortha (2016), there is also a new Quadruple Helix model, which also adds civil society. According to Dworak in Strozek (2014), the scheme of a new economy is based mainly on research, ideas, invention and innovation.

Figure 1 The scheme of the New economy
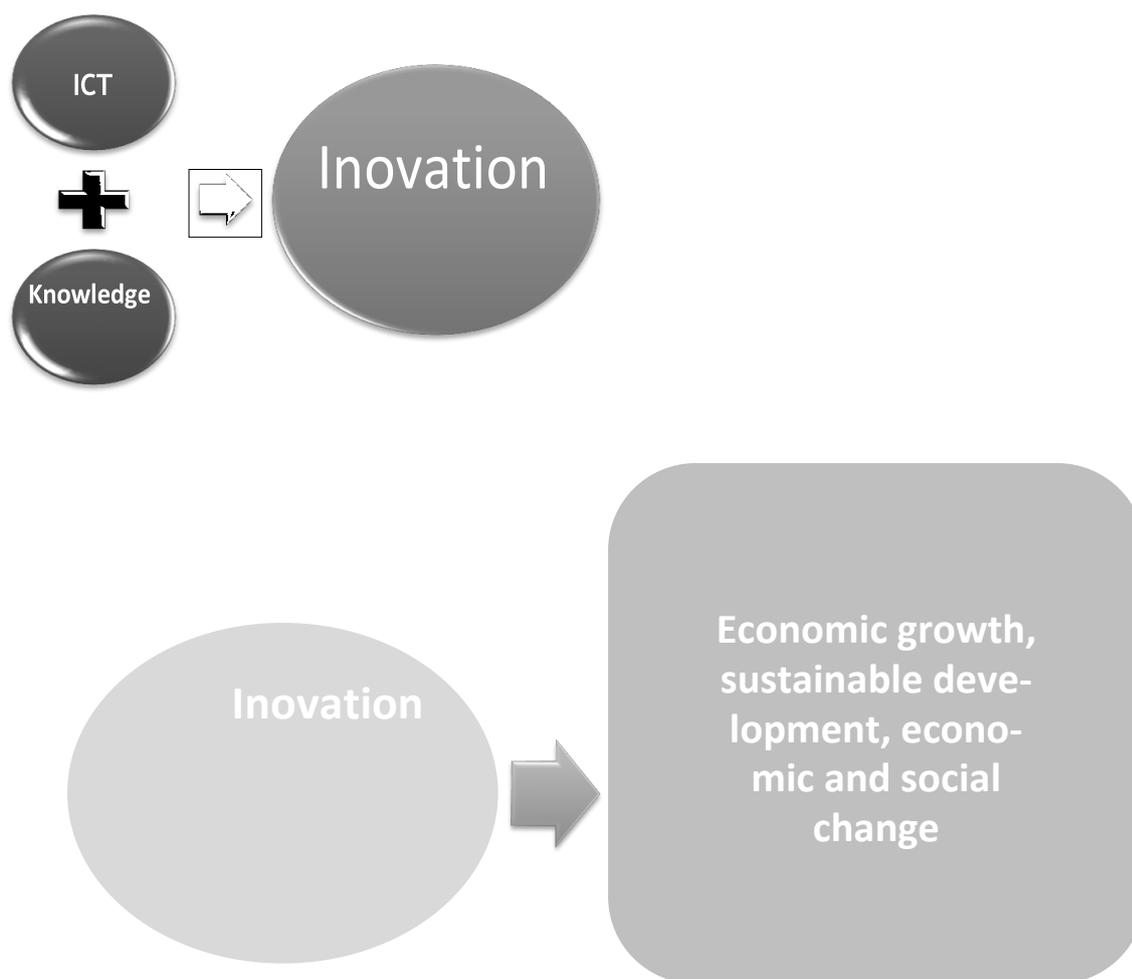
Source: Lelek, 2009

The new economy is about new sources of competitive advantage, the ability to innovate, the creation of products and the discovery of new markets (Leadbeater & Demos, 1999). However, it does not only affect the product and growth, but also, for example, investment, export and trade (Landefeld & Fraumeni, 2001).

Knowledge generation, accumulation and increasing of scientific and technological progress have always been the core of economic growth. The ability to invent, innovate and create new knowledge and new ideas that are either contained in machines, products, processes and organizations or are only codified (plans and manuals), motivate successful technology transfer and better economic development (Satti & Nour, 2015). However, technologies can be used for good or bad purposes. Unfortunately, knowledge can be ignored, manipulated, misused for personal interests instead of public interest (Nguyen, 2010).

3.1 Features of New economy

- There is a high added value that brings goods and services that are closely related to education and knowledge.

- Significant restrictions of intermediaries and their services.

- Communication and information technologies have reduced the problem of geographical distances.

- Increased a space for agile businesses.

- Industry is heavily dependent on knowledge, research and development.

- Cheap workforce is not an advantage.

- Highly specialized, flexible and creative workforce.

- Strong non-inflationary growth.

- Improving productivity.

- The introduction of automatization, cybernetics and computer use in various industries; industrialization of agriculture, the modernization of transport.

- Public research laboratories and higher education institutions perform key functions in a knowledge-based economy.

- Economic activities related to the production and using of information and knowledge have become the engine of economic growth.

- For companies, intangible assets, such as brand, know-how, intellectual property,etc., are becoming more and more important.

- Less and less economic activities involve the manipulation of physical commodities, and more and more involve processing and analyzing information, making judgments.

- Science deals with new industries - such as nanotechnology and biotechnology.

- Growing sharing of what we produce and consume is non-material (intangible): information, judgments, analyzes, services, entertainment, counseling. We are increasingly relying on IT, software and personal skills. Less and less what we value as customers or investors can be stored in ports, warehouses, and given weight.

- Application of knowledge becomes critical for businesses, regions and economies and develops and maitains competitive advantage. But the new economy is not only a product of technology and science, it is also a product of open liberal markets. It is an economy driven by knowledge.

- The role of production has been reduced and gives space to a growing service sector, particularly in the area of information and communication technologies.

- The importance of education and lifelong learning is increasing.

- More investment in intangible assets.

- Due to knowledge, countries can find more efficient ways of producing goods and services and deliver them more efficiently with a lower cost.

- Typical is cooperation between businesses and universities or research institutions (Edwards, Comisari & Johnson, 2002; Krisčiunas & Daugeliene, 2006; Kislingerova, 2011; Mortazavi & Bahrami, 2012; Mazilu & Ispas, 2011; Leadbeater & Demos, 1999; Parcero & Ryan, 2016; Satti & Nour, 2015).

- Benneworth (2016) says in this century humanity faces many challenges - energy security, urbanistic inclusion, improved health care and water for all, etc. These problems are multidisciplinary - therefore have a dimension of social, technical, scientific, etc. But only neccesary knwledge and skills help to face thes problems.

- Measuring of the new economy can also be perceived as limitations. Knowledge and information can not be codified nad simply handled.

3.2 Measuring of New economy

There are so-called indexes of the new economy. According to Soukupova & Hejduk (2008), the new economy presents a multi-ductile phenomenon and it is therefore very difficult to describe it with only a few quantitative features. That is why the institutions create indicators systems to describe this economy. One of them is the Progressive Policy Institute Index (PPI), or The State New Economy Index, which was first published in 1999, also mentioned by Kislingerova (2011). Another indicator is the result of the European NESIS - New Economic Information System . And the World Bank system (Hvidt, 2015). In addition, the Global Competitiveness Index (GCR), which is published annually, includes 12 pillars containing both hard and soft data (Zprava o globalni konkurenceschopnosti 2016-2017, 2017).

State of New economy in the Czech Republic (GCR)

Within the Competitiveness Index (GCR), we are stable at 31st place (Zprava o globalni konkurenceschopnosti 2016-2017, 2017).

According to the OECD report (2018), the Czech economy is in a state of prosperity and growth but "in order to increase labor productivity, maintain price competitiveness and shift the economy in value chains upwards, it is necessary to improve the appropriate qualification structure of the workforce and intensify innovation". It exist different types of policies and incentives to support the positive features of the new economy, including the strengthening of a skilled workforce. Within the Czech Republic, it is crucial to establish a policy of cooperation between universities and the

private sphere, which works mainly in the technical field and in other scientific disciplines, and to encourage investments and incentives to transfer hi- tech enterprises to our territory

Figure 1 GCR index in the Czech Republic
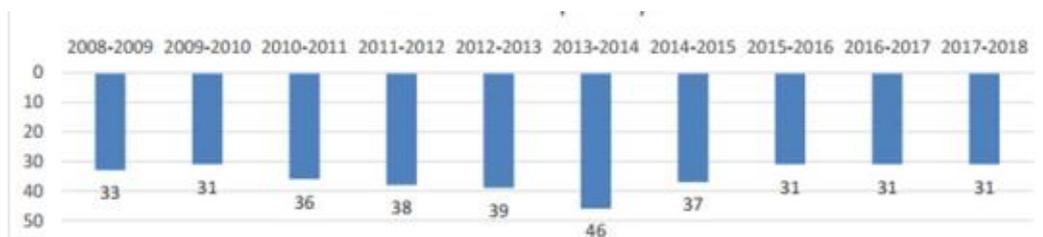
Source: Zprava o globalni konkurenceschopnosti 2016-2017, 2017

The government approved iniciative Industry 4.0 in 2016, the long-term goal of which is to maintain and strengthen the competitiveness of the Czech Republic at the time of the so-called Fourth Industrial Revolution. Unfortunately, however, there is an increasing concern that inovations based on robot could lead to widespread job losses despite the fact that robotic innovation would contribute to productivity increasing. The results of empirical analysis suggest that robotizing increases with rising employment. Labor costs that are staffing capacity have been controlled and can therefore be considered a net effect of employment. This, of course, means that there is a possibility to add another increased part of human work with robotization (Dopady Prumyslu 4.0 na trh prace v CR, Narodni observator zamestnanosti a vzdelavani Narodni vzdelávací fond, o.p.s., 2017).

3.3 Benefits and importance of the New economy

In general, the top 10 states of the new economy have several things in common:

- there are high-tech companies,

- high concentration of managers, professionals,

- many universities educated people working in "knowledge work" (work that requires at least two years of education),

- their companies tend to be more focused on world markets (export and foreign direct investment),

- enterprises are at the forefront of the IT revolution,

- businesses have a good innovation infrastructure,

- many attract high levels of domestic and foreign immigrants - highly skilled workers looking for opportunities and high quality of life (Atkinson & Nager, 2014).

For example, in an american research (2014), the state that is the best (Massachusetts - a state that can boast of the concentration of software, hardware and biotechnology companies that support first-class universities such as MIT and Harvard) has mastered the period the major recession better in terms of job growth and rising per capita income (Atkinson & Nager, 2014). Innovations are mainly generated in urban areas (Strozek, 2014).

Top states of the new economy tend to be richer (there is a strong correlation between rank and total income per capita) (Atkinson & Nager, 2014). Due to the collaboration of universities, businesses and local authorities (business and university cooperation is one of the key features and modern trends) competitiveness is increasing and it has impact on increasing standards of living and welfare of the population in the region (Chirodea, 2015).

For example, between 1995 and 2005, knowledge-based sectors produced 2 times more new jobs in the USA and even 4 times more in Europe than those sectors that do not require knowledge (Parcero & Ryan, 2016). According to Davis & Rubin (2016), the concentration of high-tech industry brings benefits connected with employment. According to other author as Shapiro, this concentration is associated with growth, quality of opportunities and a high level of education, a so-called "smart" cities. However, the new economy does not always have the positive benefits but also the weaknesses to be faced. For example, technical knowledge requirements may have a negative impact on certain working groups of the population, such as elderly workers. Another weak point is that the positive effects of life and work in the new economy are unequally distributed among workers (Davis & Rubin, 2016).

4 Conclusions

The paper has summarized definitions of new economy and its different perspectives and further outlined the possibilities of its measurement including the specific measurement systems (indexes) that have been created by international institutions such as the World Bank, etc. There was a comparison of the knowledge and new economy . In addition, possible impacts and appropriate policies and support were briefly described.

The concept of new economy is really widespread and covers many changes. These changes are related to the processes of globalization and the increasing use of information and communication technologies in all sectors of the econom. It is not easy to define the new economy, but it can be characterized by its features, on which many authors agree.

In today's economy after a recession, politicians and scientists see the best defense against a wave of decline in education that is linked to creativity, knowledge and innovation in the context of the new economy (Davis & Rubin, 2016). Top states of the knowledge economy are richer (there is a strong correlation between rank and total earnings per head) (Atkinson & Nager, 2014). The collaboration of universities, businesses and local authorities (business and university cooperation is one of the key features and modern trends) provides a competitive advantage (Chirodea, 2015).

Not only is the current economy different, but also different from the practice of economic development. An important change was the increased interest in technology-driven development by various nations and their governments. With the rise of ICT, regions across the globe can now learn from each other quickly and also choose from policies and programs, the best they can put into practice after adapting them to local conditions (Atkinson & Nager, 2014).

In conclusion, scientists, businesses and public are facing many challenges in the new economy, barriers (especially with energy security and a limited supply of fossil fuels), but certainly many opportunities, including the impact of robotization and transformation on Industry 4.0 , which will be associated with extensive digitalization in enterprises, but certainly also in the state sphere.

References

Atkinson, R. D., & Nager, A. B. (2014). THE 2014 STATE NEW ECONOMY INDEX: Benchmarking Economic Transformation in the States Information. Washington: Technology and Innovation Foundation. Dostupné z: http://www2.itif.org/2014-state-new-economy-index.pdf (17. 4. 2015).

Benneworth, P. (2016). Strategies for the New economy. Available: http://doc.utwente.nl/100138/1/benneworth%20ARC%20SEM%202016.pdf (17. 5. 2017).

Davis, D. J., & Rubin, B. A. (2016). Displacement in new economy labor markets: Post- displacement wage loss in high tech versus low tech cities. Social Science Research, 60 (11): 29-44.

Edwards, R., Comisari, P., & Johnson, T. (2002). Beyond 1993: The System of National Accounts and the New Economy. In IAOS Conference on the New Economy. Londýn. Dostupné z: www.oecd.org/std/na/1958139.doc (17. 5. 2017).

Gluckman, P. (2018). The digital economy and society: a preliminary commentary. Policy Quarterly, 14(1): 3- 9.

Huggins, R., Luo, S., & Thompson, P. (2013). The Competitiveness Of China's Leading Regions: Benchmarking Their Knowledge-Based Economies. Tijdschrift voor Economische en Sociale Geografie, 105 (3): 241 – 267.

Hvidt, M. (2015). The State and the Knowledge Economy in the Gulf: Structural and Motivational Challenges. The muslim world, 105: 24 – 45.

Chirodea, F. (2015). The role of Universities from the North-Western Romania in the development of Regional knowledge-Based Economies. Annals of University of Oradea International Relations and European Studies Series, 2015 (19): 167 – 181.

Kislingerová, E. (2011). Nová ekonomika: nové příležitosti? Praha: C. H. Beck.

Kislingerová, E. (2008). Nová doba nové ekonomiky. Ekonomika a management. 2 (3): 1 – 2.

Krisčiunas, K, & D augeliene, R. (2006). The Assesment Models of Knowledge-Based Economy Penetration. Engineering Economics, 5 (50): 36 – 46.

Landefeld, J. S., & Fraumeni, B. M. (2001). Measuring the new economy. Survey of current business. 81 (3): 23-40.

Leadbeater, Ch., & Demos, L. (1999). New measures for the new economy. In International Symposium: Measuring and Reporting Intellectual Capital: Experience, Issues, and Prospects. Amsterdam.

Lelek, T. (2009). Dynamický model nové ekonomiky. Scientific papers of the University of Pardubice. Series D, Faculty of Economics and Administration. 142-147. Dostupné z: https://dk.upce.cz/handle/10195/35640?show=full (20. 6. 2018).

Leydesdorff, L. (2006). The Knowledge-Based Economy and the Triple Helix Model. In Annual Review of Information Science and Technology. 367 – 417.

Mazilu, M., & Ispas, R. (2011). The New Economy and the Economy of Tourism. Annals of the University of Petroşani, Economics, 11(2): 185-192.

Mortazavi, S. H., & Bahrami, M. (2012). Integrated Approach to Entrepreneurship– Knowledge based Economy: A Conceptual Model. Procedia - Social and Behavioral Sciences, 41: 281-287.

Národní observatoř zaměstnanosti a vzdělávání (2017). Dopady Průmyslu 4.0 na trh práce v ČR. Dostupné z http://www.nvf.cz/dopady-prumyslu-4-0-na-trh-prace-v-cr (1. 6. 2018).

Nguyen, T. T. (2010). Knowledge economy and sustainable economic development: a critical review. Berlin: Walter de Gruyer Gmbll.

OECD (2018). Hospodářské přehledy OECD Česká republika. Dostupné z: https://www.mfcr.cz/cs/zahranicni-sektor/mezinarodni-spoluprace/aktuality/2018/oecd-zverejnilo-hospodarsky-prehled-cr-2-32426 (1. 8. 2018).

OECD (2018). Hospodářské přehledy OECD Česká republika. Dostupné z: https://www.mfcr.cz/cs/zahranicni-sektor/mezinarodni-spoluprace/aktuality/2018/oecd- zverejnilo-hospodarsky-prehled-cr-2-32426 (1. 8. 2018).

Parcero, O. J., & Ryan, J. Ch. (2016). Becoming a Knowledge Economy: the Case of Qatar, UAE, and 17 Benchmark Countries. Journal Knowledge Economy, Springer Science.

Satti, S., & Nour, O. M. (2015). Overview of Knowledge Economy in the Arab Region. Journal Knowledge Economy, 6 (2015): 870 – 904.

Soukup, J., & Hejduková, D. (2008). Index nové ekonomiky v ČR. In KRAUSE, J. (ed.). Nová teorie ekonomiky a managementu organizací. Svět v pohybu. Praha: Oeconomica.

Strozek, P. (2014). A Spatial Analysis of the Knowledge-Based Economy in Poland. Comparative Economic Research, 17 (4): 221 - 263.

Veselý, A. (2004). Společnost vědění jako teoretický koncept. In: Sociologický časopis, 40 (4): 433–446.

Vojtovič, S. (2015). CREATIVE INDUSTRY AS A SECTOR OF THE NEW ECONOMY. Scientific journal «ECONOMICS AND FINANCE»

Zpráva o globální konkurenceschopnosti 2016-2017. (2017). Retrieved from: https://www.cma.cz/wp-content/uploads/2016/09/GCR2c-manazerske-shrnuti.pdf.

Alternatives of the ABC analysis application for warehouse optimization

Radek Toušek

Abstract: *This article focuses on the specifics of the ABC analysis for logistic purposes explained on an example of a wholesale warehouse which focuses on the distribution of medical material on the market in the Czech Republic. The business belongs to the segment of small and medium-sized companies. The article is based on the results of applied research that was conducted at the particular entity in 2017 and 2018 aiming to optimize inventory storage in order to increase storage capacity.*

Key words: Logistics · ABC analysis · Warehouse optimization

JEL Classification: M11

1 Introduction

The ABC method is traditionally used in logistics as a method of differentiated inventory management. It is based on the fact that it is difficult and ineffective to devote the same attention to all items of a given type of inventory and to follow and manage them in the same way. Therefore, an ABC analysis is applied that allows to differentiate inventories and differentiate the approach to these groups (Emmett, 2008).

The ABC analysis is based on the regularity defined by the Italian economist and sociologist Vilfredo Frederico Damaso Pareto at the turn of the 20th century. This rule, according to Pernica (2004), says that very often 80% of the consequences result only from 20% of all of the possible causes (the so-called 80/20 rule). This method can be used, for example, to optimize the frequency of delivery and the delivery method with regard to the potential for reducing the tied-in capital in stock. However, the application possibilities of this method are not completely exhausted, since inventory differentiation makes it possible to optimize the inventory system itself, thereby offering further cost-cutting options (Toušek, 2016).

2 Methods

The aim of the applied research was to find solutions in the area of storage technology setting in the central warehouse of the researched entity, which will maximize the usable storage capacity of the existing warehouse space, allow position storage, minimize picking routes, respect the key limiting factors (e.g. expiratory conditions, service level of provided logistics to customers, etc.), and, finally, respect the condition of minimizing the total time requirements of the solution implementation. The amount of planned investments will not exceed CZK 500,000.

The research was carried out in the following steps:

1. First, we performed the categorization of stock items into basic segments. We created three standard groups: A, B and C, depending on the share of the total turnover of the warehouse over the last 12 months. The cumulative limit for group A was 80%, for group B 95% and other items included in group C. Items which account for 80% of the company's turnover were further analyzed in terms of demand stability according to the variation coefficient. We then validated the stock items in the individual categories according to the specific characters that are relevant to the warehouse process setting.

2. Subsequently, we analyzed the layout of the warehouse space in detail and then identified all potential limiting factors that have a significant impact on the way the stock is stored.

3. With regard to the spatial possibilities of the given object and with respect to the limiting factors, we assessed the available technological options and found a suitable solution for the inventory positional storage, which meets the capacity and cost parameters of the contracting authority. Furthermore, we proposed the structure of

Ing. Radek Toušek, Ph.D., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 37005 Ceske Budejovice, e-mail: tousek@ef.jcu.cz

the active elements, which are suitable for the selected technology for handling the stored supplies and the service of the used rack systems.

3 Research results

3.1 Segmentation of stock items

A total of 1 217 active stock items were analyzed, 79 of which fall into category A, 234 belong to category B and 904 belong to category C.

After the ABC input analysis, we created specific assortment groups that display similar logistical features and should be placed into identical storage zones. The main attention was paid to Type A items, which, in the case of the surveyed entity, atypically represent only 6.49% of the total traded product range. Let us now look at the resulting groups.

Assortment Group 1 comprises a total of 8 key heavy rotation A type items with stable consumption, accounting for 47.63% of the total annual turnover of the warehouse, accounting for 36.81% of the total annual volume of warehousing operations, with a disposable supply of 10 and more pallets.

Assortment Group 2 comprises a total of 28 significant A type heavy rotation items with a stable consumption of 20.68% of the total annual turnover of the warehouse. Their share of the total annual volume of pick-up operations is 30.13% and their available inventory is from 2 to 4 pallets.

Assortment Group 3 includes a total of 22 other high-turnover items, mainly Type A and B, accounting for 4.68% of the total annual turnover of the warehouse. Their share of the total annual volume of pick-up operations is 11.64% and their disposable stock is usually held in the amount of one pallet.

Assortment Group 4 comprises a total of 116 items, mostly type B with high demand variability, accounting for 8.61% of the total annual turnover of the warehouse, with a very low occurrence of pick-up operations (6.49% in total) and the items are usually stocked in a one pallet volume.

Assortment Group 5 consists of mainly C type items, which are suitable for storage in rack shelves due to lower storage volume and very low frequency of orders.

The Assortment Group 6 is made up of a special medical items segment, which includes predominantly low-volume items with a high purchase price. The goods require special care during pick-up operations. Due to their nature it is inappropriate to store these items in combination with other traded products. Therefore, in our proposal for the restructuring of the warehouse space, we allocated special shelf racks that will be used exclusively for this product range, but at the same time they will also work with the partial sorting of these stored items according to the Pareto analysis so that high turnover items are positioned in the immediate vicinity of the expedition zone.

3.2 Default parameters of warehouse space and warehouse technology

The warehouse of the researched subject is managed as a flow warehouse. The building openings in Hall 2 do not have a handling ramp, which is only available at the entrance to Hall 1. However, due to the width of the access road, loading operations at the entrance to Hall 1 can only be carried out from the cargo space of road vehicles only from the side of the vehicles. Both warehouses have a specially allocated intake and expedition area for specific assortment. Both halls are separated by a wall and are connected only by a single passage of sufficient size to handle goods on pallets but the passage is not wide enough for a forklift truck to pass through.

Hall 1 is equipped with shelf racks for storing small size goods. The shelves are constructed so that the handling lanes are 1,430 mm wide, which is sufficient to handle the hand pallet truck. Other goods are stored in rows on pallets with longitudinal and transverse orientation and with different widths of handling lanes. There is a packing line and shelf racks designed to store finished items and pick up goods for inspection and packaging in the receiving and dispatching area. In the existing solution Hall 1 accommodates a total of 140 pallets with a base of 1200 x 800 mm.

Hall 2 is designed for block storage of goods on pallets, where the original pallet height of the manufacturer is up to 2, 200 mm. Hall 2 in this layout holds a total of 220 pallets with a base of 1200 x 800 mm. In the expedition area there is a semi-automatic packaging machine for wrapping pallets with a shrink film and an administrative center for printing labels and for packing small packages.

Hand pallet trucks are used in both warehouse halls for handling passive elements. Furthermore, one electricity powered hand pallet truck which requires handling aisle width of at least 2 013 mm is employed for operations within the warehouse. Loading operations are performed by a duplex high-lift pallet truck due to the absence of a handling ramp. Small four-wheel platforms with a length of 600 mm and a width of 400 mm are used to pick up small items.

Based on a detailed analysis of the warehouse space layout, we have identified limiting factors for our storage optimization and the design of a new warehouse technology. Primarily it is the low base height of both warehouse halls foundations, the usable area of the individual storage areas with respect to the structural elements of the building (layout of the supporting columns, building entrances, etc.) as well as the distribution of electricity, heat and the location of fire hydrants. Another limiting factor is the need to use the FIFO (or FEFO) mode for items with a minimum date of use depending on the order of picking.

3.3 Design of warehouse technology for storage of partial assortment groups

In order to store the assortment groups 1, 2 and 3 up to the maximum capacity, Hall 2 was chosen because it allows to create a separate head warehouse with one building opening for receiving the goods and one building opening for the expedition, which fully covers the warehouse requirements with regard to the volume of dispatched orders. It also respects the fact that it is possible to minimize the logistics routes for the 58 most important items, which account for only 4.77% of the traded portfolio representing almost 73% of the turnover of the contracting authority and almost 79% of the picking operations. This resulted in the maximum shortening of pick-up routes and the elimination of unproductive times required for post-warehousing.

For the storage of palletized type A items in Hall 2 it is possible to use either conventional pallet stacking racks or pallet block storage in order to meet the conditions of increased storage capacity with low implementation time and low investment costs.

The present layout of the warehouse allows the Hall 2 to be fitted with a conventional pallet rack only in the central part, which is 5,100 mm high. However, due to the saddle roof and the 2 200 mm height of the pallets, the storage capacity could increase by only 38 pallet spaces, which represents 17.27%, which is not sufficient for us. From the logistics operations point of view, this solution would increase handling operations with a forklift truck and, given the high turnover of this assortment, could result in a reduction in labor productivity while increasing operating costs. If the researched company used an existing forklift, it would have to allocate more space for the handling system to the rack operator than it is at present, and this would reduce the available storage capacity. A manual forklift with lower demands on the width of the handling lanes would have to be purchased with an investment cost of approximately CZK 150,000. Putting the goods into conventional pallet racks would also bring higher demands on health and safety at work, as well as higher risk of damage to the merchandise, including the need to carry out periodic reviews of the rack systems. In view of the facts stated above, this solution was not recommended for implementation.

Block storage uses loose paved areas without the need for using rack systems. It is a low-cost option that does not require investment in racking, it is highly flexible in terms of customizing to the changing assortment and makes maximum use of the available storage area. That is because we need only 1,750 mm wide handling lanes when handling low-lift pallet trucks. In the warehouse it is necessary to mark the individual positions that identify the item for fixed storage at predefined locations. In view of the above, this solution has been further developed into customized solutions. We created and analyzed a total of 12 standalone variants for the block storage of assortment groups 1, 2 and 3 in Hall 2. In view of the stated objectives, the nature of the assortment and the limiting factors we recommended to implement the following distribution of assortment groups into warehouse zones:

- The storage zone for assortment group 1 should be conceived in eight to nine separate block channels, with a total of 10 pallets per store item in each channel and a total of 80-90 pallet spaces. The zone should be located longitudinally from the receiving part of the warehouse to the dispatch. When delivering goods through the revenue ramp, individual warehouse channels will be stocked directly. At the end of each channel, that is in the immediate vicinity of the expedition, individual items will be taken away by warehouse workers in FIFO mode. Alternatively, it is also possible to extend all 8-9 block channels by one pallet space to obtain the total capacity for storing high-speed items in the range of 88 to 99 pallets. However, this way the beginning of the picking path for the first 8 or 9 most exposed items will partially cross the route of the dispatched goods. Although, in view of the consignment frequency, it is possible to undertake this risk without any further complications and thus to obtain additional 10% of storage capacity for assortment group 1.

- The storage zone for Assortment Group 2 should be designed into 21 channels at 4 pallet locations. These channels will be placed perpendicular to the previous storage zone, and there will be a handling aisle of at least 2 013 mm between the two zones so that they can be served by a hand-held electric low-lift pallet truck. In this zone it will be possible to store up to 4 pallets of one item, but it can also be divided into 2 + 2 pallets or 3 + 1 palette, the second storage item being served from the opposite side of the channel, where it will be accessible from a lane at least 2 013 mm wide.

- The storage zone for assortment group 3 should be located parallel to the warehouse zone for assortment group 2 and should be separated by a lane at least 2 013 mm wide and at the same time should contain a maximum of 1 palette for one stored item. Storage of 22 separate items is expected in this area. If warehouse zone 1 is made up of only eight block channels (e.g. in a situation where a high-speed item is not currently represented in the assortment structure to fully utilize the warehouse capacity of the entire 10-pallet channel), the gained area can be used to expand the storage zone 3 a further 16 comparable items in terms of parameters. The storage of these items should be carried out on pallets perpendicular to the block channels and should be systemically connected to the storage zone 2. In this case, the warehouse keepers could simultaneously carry out the picking operations from the storage zone 2 and the part of the storage zone 3 in one handling aisle.

- Hall 2 should be further subdivided into two block storage supply zones organized in the following way. The first supply zone should be linked to the storage zone for assortment group 1 by nine supply channels with a capacity of 8 pallet locations per channel for items from assortment group 1. Each supply channel should always be designated to one item and optimally to one batch of the item (otherwise it is necessary to mark the first palette in the channel towards the aisle with information that there are multiple batches of the same product in the channel). The second supply zone should immediately link to the first supply zone with twelve channels but with the difference that there will be only three pallets in one channel, optimally one channel for one storage item. Otherwise it is necessary to mark the first pallet in the aisle to indicate that the supply channel contains different stock items. The capacity of the first and second supply zones is sufficient as for the normal supply size of the assortment.

The individual channels for high-turnover items need to be fitted either with roller-guards with manual pallet handling or with roller-gauge racks (paths) to facilitate the movement of the pallets. However, those take up more space and require the use of a fork-lift truck with a width up to 800 mm in order to operate in the supply zone to refill the main storage zones. The cost of roller lanes in the 8-channel option with a capacity of 11 pallet points is based on the transport and assembly costs of approximately CZK 400,000.

The warehouse and supply zones will, in the implementation of our proposal, have a storage capacity of up to 304 pallets in Hall 2, which represents an increase of the current warehouse capacity by 84 pallets. That represents an increase of 38.18%. In the maximal alternative of eight channels by eleven pallet locations and an expansion of the storage zone 3 by 16 pallet places, the total storage capacity of the hall 2 is up to 318 pallet spaces, which represents an increase in the current warehouse capacity by 98 pallet spaces, that is 44.55%.

The shipping space should be located in Hall 2 with a total capacity of up to 63 pallet spaces. There would be a single 700 mm wide path between each shipping channel in order to ensure the labeling of the consignments with shipping labels and other necessary information. Immediately following the expedition space, there should be a packing line for packing smaller consignments. This packing line will be provided with a dispatch and shipping label printer. The remaining space between the supporting pillars next to the expedition should then be used to store the packaging material. It is advisable to leave one rack shelf for smaller dimensions of cardboard boxes and use the other space to store packages placed on pallets or in roller containers.

The solution also envisages the placement of assortment groups 4, 5 and 6 in hall 1 in the following structure:

- Assortment Group 4 should be placed in up to 192 palette places in seven rows of 27 pallet locations. The first two rows should be joined to create supply channels with a capacity of 2 pallets for one stock item and expanded by 4 pallets. These 4 pallet positions are in the space of the unused longitudinal handling aisle between the rows, but narrowed by 2 pallet spaces (or 1 pallet space) in the direction away from the traffic lane to ensure access to the wiring. Pallet rows should be separated by handling aisles with a minimum width of 2 100 mm so that the warehouse workers can use a hand-operated electric pallet truck.

- Assortment Group 5 should be located in two rows of truss racks with 14 racks of 1,500 mm in length, 2,500 mm in height and 630 mm in depth. The shelf rows should be separated by a 1400-meter handling aisle to handle with a low-lift pallet truck.

- Assortment Group 6 should be separated in Hall 1 by a traffic lane that runs from the passage between Hall 2 and Hall 1 to the ramp in Hall 1. This group should be placed in twelve rows. The last twelfth row should be simultaneously doubled on the side of the traffic lane by two 1 500 mm racks to accommodate items with higher spatial requirements. The handling lanes between truss racks for assortment group 6 should have a width of 940

mm as this assortment is dispatched only by platform trucks or by hand manipulation and this dimension of the handling aisle is sufficient in terms of CSN 26 9010.

By implementing the proposed solution, storage capacity should increase from the original 140 pallet spaces to 192 pallet spaces in Hall 1, which represents an increase in the current capacity by 37.14%.

Alternatively, it is only possible to store goods in Hall 1 with a maximum of one palette, and the space obtained by removing duplicates of the first row can be used to store items with a lower turnover and higher space requirements in the standard roller containers in the last row in front of the truss racks at the rear of Hall 1.

The space adjacent to the shelf field for assortment group 6 will be used for the reception of goods stored in Hall 1 and will be used for marking the goods according to the valid legislation prior to its placement at the designated positions. For dispatching items stored in Hall 1, a common expedition space will be used in Hall 2.

Picture 1 Visualization of storage facility restructuring by the ABC method

Source: Own processing

4 Conclusions

Through the specific use of the ABC analysis, the researched warehouse has gained a highly efficient solution that works with warehouse zone creation by segmenting warehouse groups and fully respects the limiting factors of existing warehouse layout including other limiting factors.

The recommended solution brings very low investment requirements for implementation and it increases storage capacity from existing 360 pallet positions up to a total of 510 pallet points. Thus, the storage capacity increases by a total of 41.67%. The solution eliminates confusion of traded items by applying position storing. It shortens the picking routes of high-turnover items on stock and has very low implementation and operational demands, as it does not require significant structural modifications of the warehouse and the purchase of new handling equipment.

Carrying out this applied research to the subject of our interest thus confirmed the usefulness of the ABC analysis as a key parameter for the optimization of warehouse space with the potential to increase storage capacity and improve warehouse processes.

References

Emmett, S. (2008). *Řízení zásob.* Brno: Computer Press.

Christopher, M. (2011). *Logistics & supply chain management.* London: Financial Times Prentice Hall.

Pernica, P. (2008). *Arts logistics.* Praha: Vysoká škola ekonomická v Praze.

Pernica, P. (2004). *Logisika pro 21. století.* Praha: Radix.

Sixta, J., & Žižka, M. (2009). *Logistika. Metody používané pro řešení logistických projektů.* Brno: Computer Press.

Štůsek, J. (2007). *Řízení provozu v logistických řetězcích.* Praha: C. H. Beck.

Toušek, R. (2016). *Logistika – vybrané kapitoly.* České Budějovice: Jihočeská univerzita v Českých Budějovicích.

Analysis of Remuneration in Small and Medium-sized Enterprises in the Form of Intangible Benefits from the Employees' Point of View Regarding Their Work Position

Petr Řehoř, Marek Šulista, Klára Vocetková, Jaroslav Vrchota

Abstract: *This paper presents results of an analysis focused on a comparison of remuneration in the form of intangible benefits such as extra days off, lunch vouchers, laptops etc., from the employees' points of view regarding their work position in their company. The research is based on the analysis of the data obtained from questionnaires distributed among 97 employers and 272 employees working in small and medium-sized enterprises in several economic sectors in the Czech Republic*

Key words: Remuneration · Intangible benefits · SMEs

JEL Classification: M1 · M5

1 Introduction

The aim of this paper is to compare employees' perceptions of intangible benefits regarding their age and position in small and medium-sized enterprises in the Czech Republic. The conducted analysis and the conclusions should enable the managers of the companies better motivate their employees and consequently to increase their satisfaction and production performance.

Every organization should have an individual system of compensation developed that would meet all specific conditions in which a concrete organization works; the need of both organizational and individual needs of its employees. Strategic systems of employees' compensation in organizations should be developed on the basis of the so-called new or total reward approach. This approach emphasizes the importance of all elements of the total reward. Modern systems of compensation include both tangible and intangible rewards.

The tangible rewards consist of the element of wage the employee is entitled to receive, which is a basic wage or salary, and the element of wage the employee is not necessarily entitled to receive, which consists of various forms of bonuses, performance bonuses, gratuities, premium allowances, benefits etc. Among intangible rewards are recognition, praise, responsibility, career opportunities, autonomy, quality of working life and others. Employees' total reward, in itself, includes both tangible and intangible elements of rewarding. (Snapka & Copikova, 2011).

A well-established reward and recognition system is necessary to produce the desired level of motivation in employees. Both tangible and intangible rewards help an organization to enhance the motivational level of its employees. But a balance between tangible and intangible rewards should be made by the organizations as per the demands of the employees, as out dated, unrealistic, less meaningful, complicated, and irrelevant items will result in demotivation of employees. (Daniel & Metcalf, 2005).

There are a number of models (Gneezy, 2011; Barron, 2001; Higgins, 2000) that focus on the right incentives to distribute benefits, their usability, division and profitability. The contribution will be based on the basic division of benefits to financial and non-financial (Garbers, 2014, Ederer, 2013; Jenkins, 1998).

doc. Ing. Petr Řehoř, Ph.D., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 37005 České Budejovice, e-mail: rehor@ef.jcu.cz

PhDr. Marek Šulista, Ph.D., University of South Bohemia, Faculty of Economics, Department of Applied Mathematics and Informatics/ Department of Languages , Studentská 13, 370 05, České Budějovice, e-mail: sulista@ef.jcu.cz

Mgr. Klára Vocetková, University of South Bohemia, Faculty of Economics, Department of Applied Mathematics and Informatics, Studentská 13, 370 05, České Budějovice, e-mail: kvocetkova@ef.jcu.cz

Ing. Jaroslav Vrchota, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Management, Studentská 13, České Budějovice, Czech Republic, e-mail: vrchota@ef.jcu.cz

2 Materials and Methods

To analyse the benefit preferences of employers and employees working in in several economic sectors, a questionnaire was distributed among 97 companies to 272 respondents. The sample of the respondents covers various classes such as education, sex, marital status. More specifically, the structure of the respondents is as follows:

- Gender: 131 women and 141 men;

- Age: 90 respondents aged up to 30, 64 aged 31–40, 83 aged 41–50, 35 older than 50;

- Position: 144 clerks, 32 managers, and 96 workers;

- Marital status: 131 single and 141 married;

- Education: 2 elementary level, 37 apprenticeship, 168 complete secondary level, 65 university;

- Work experience: 131 up to 5 years, 99 with 6-15 years, 38 with 16-30 years, 41 with more than 30 years.

The respondents indicated their preferences regarding intangible benefits in the questionnaires using the ordinal scale from 1 to the number of the items in each of the benefit category. The respondents were asked to order the particular items using the order scale so that the higher the number, the less preferable the benefit (i. e. number 1 indicates the most preferable benefit). There were 18 intangible benefits in total divided into two groups:

- *financial*: holiday, team building, parties, language courses, sick days, business trips, study days off, after school childcare, self-development courses, catering;
- *non-financial*: social responsibility, home office, promotion, personification, appraisal, team work, flexible working hours.

The obtained data from the questionnaires were processed using MS Excel and Statistica software. MS Excel was used mainly for stating orders of the preferred benefits, determining average values and for conducting Pearson's Chi-squared test using contingency tables to determine possible significant priority differences between various respondent groups on the particular benefits.

3 Research results

The statistical analysis of the preferences of employees at various positions regarding the intangible financial benefit using Pearson's Chi-squared test shows there is a significant statistical difference (p-value = 0,0000000). The conducted analysis shows (see Table 1), that workers rather prefer accommodation of the physiological needs (the need to eat and celebrate), the employees at higher positions rather prefer accommodation of higher order needs (self-development and self-realisation).

Regarding the work positions of the employees, the most preferable intangible financial benefit is, for all three categories, holidays with the average order equal to 2.5. The blue-collar workers also prefer catering, organising parties and sick days. The sick days (usually 3-5 days per year) are more and more popular among employees, are used mainly in case of a cold, sore throat or a sudden indisposition, and were evaluated by managers and administrative officers to be the second preferable. The managers prefer also team-building events and educational courses (primarily language courses) which are preferred also by administrative workers. On the other hand, the less preferable benefits are study days off for blue-collar workers and contributions to after school childcare for managers and administrative officers.

The statistical analysis of the preferences of employees at various work positions regarding the intangible, non-financial benefits using Pearson's Chi-squared test also shows there is a significant statistical difference (p-value = 0,0000000). The employees at all three types of work positions evaluate most, see Table 2, the benefit of flexible working hours (average order 3). Also team work is perceived positively by works and managers. The administrative workers prefer as the top non-financial tangible benefits promotion, team work, and appraisal.

Table 1: Preference of intangible financial benefits

	worker	manager	administrative worker
holiday	2.6	3	2.5
team building	5.2	5.3	5.8
parties	5	5.7	5.9
language courses	6.3	5	5.2

sick days	5.1	4.9	4.7
business trips	6.4	6	6.5
study days off	6.8	6.3	6.4
after school childcare	6.7	6.9	7.2
self-development courses	5.9	5.5	5.3
catering	5	6.3	5.4

Source: Own processing

Social responsibility (see Table 2) is the least preferable for all employees participating in the survey. This is a rather new phenomenon and many respondents do not even know what this means. Social responsibility is an ethical framework and suggests that an entity, be it an organization or individual, has an obligation to act for the benefit of society at large. Companies with social responsibility very often focus also on company culture and better working climate.

Table 2: Preference of intangible non-financial benefits

	worker	manager	administrative worker
social responsibility	5.6	5.9	6.1
home office more than 5 days	5.5	4.4	4.6
home office up to 5 days	5.5	4.8	4.9
promotion	3.9	4.1	4
personification	4.7	5.2	5
appraisal	3.8	4.3	4.3
team work	3.8	3.9	4.3
flexible working hours	3.2	3.3	2.9

Source: Own processing

4 Conclusion

Every company is as effective as their employees are able and motivated to create values for society. The better and more sophisticated the remuneration method, the better results the company usually may reach in a shorter time. The benefits, which may be offered by companies differ. It is not enough to reward the employees only with time or task wages, it is necessary to complement those with various bonuses and benefits. The right motivation for employees is one of the key areas of the right functioning of the company and it is crucial to bear this fact in mind. Satisfied and motivated employees will do their maximum performance.

This research showed that all employees prefer holidays as on intangible financial benefit. The importance of free-time is growing significantly. Extra holidays are one of the more costly benefits. Unionists argue that an extra week of holiday could serve as sick days. However, in the USA, there are 23% of employees with no paid days off. Some European countries, such as France, Austria, Sweden and Italy, even have 25 days of paid holiday.

From the intangible non-financial benefits, the employees require flexible working hours which is understood as a part time job (less than 40 hours per week) or as a with a flexible start or end of work or a shared job which may be performed from home. The benefit of a part-time job is most importantly evaluated by parents with small children, by students and also, to a certain extent, by retired people. The most common reason for a part-time job is the care for children or disabled relatives and it is required mostly by women. The Pearson's chi-square test verified that there is a significant difference regarding the three work positions and their preference of these intangible benefits.

To conclude, we may say there is no ideal way of remuneration and the ideas about right benefits differ in every company. For this reason, it is important to create remuneration systems which reflect the needs and wishes of the employees regarding their work behaviour and work results. Every company may improve their remuneration systems and consequently its performance and reach higher profits and their values.

References

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. *Journal of Personality and Social Psychology*, 80(5), 706–722. https://doi.org/10.1037//0022-3514.80.5.706

Daniel, T.A., & Metcalf, G.S. (2005). The Fundamentals of Employee Recognition. Society of Human Resource Management. Scientific Research.

Ederer, F., & Manso, G. (2013). Is Pay for Performance Detrimental to Innovation? *Management Science*, 59(7), 1496–1513. https://doi.org/10.1287/mnsc.1120.1683

Garbers, Y., & Konradt, U. (2014). The effect of financial incentives on performance: A quantitative review of individual and team-based financial incentives. *Journal of Occupational and Organizational Psychology*, 87(1), 102–137. https://doi.org/10.1111/joop.12039

Gneezy, U., Meier, S., & Rey-Biel, P. (2011). When and Why Incentives (Don't) Work to Modify Behavior. *Journal of Economic Perspectives*, 25(4), 191–209. https://doi.org/10.1257/jep.25.4.191

Higgins, E. T. (2000). Making a good decision: Value from fit. *American Psychologist*, 55(11), 1217–1230. https://doi.org/10.1037/0003-066X.55.11.1217

Janský, P., & Rohryova, L. (2016). The Distributional Impacts of Meal Voucher in the Czech Republic. *Economic Papers*, 25(6), 706-722.

Jenkins, G. D., Mitra, A., Gupta, N., & Shaw, J. D. (1998). Are financial incentives related to performance? A meta-analytic review of empirical research. *Journal of Applied Psychology*, 83(5), 777–787. https://doi.org/10.1037/0021-9010.83.5.777

Krbečková. M., & Plesníková. J. (2010). *FKSP. Sociální fondy. benefity a jiná plnění*. Olomouc: ANAG.

Lovewell-Tuck. D. (2017). Main attraction: Benefits are still seen as a highly effective tool for the recruitment and retention of employees. *Employee Benefits*, 12-14.

Murphy T. E. (2010). *Benefits and Beyond: A Comprehensive and Strategic Approach To Retirement, Health Care, And More*. California: SAGE Publications.

Schlechter, A., Thompson, N. C., & Bussin, M. (2015). Attractiveness of non-financial rewards for prospective knowledge workers an experimental investigation. *Employee Relations*, 37(3), 274-295.

Snapka, P., & Copiková, A. (2011). *Balanced Scorecard and Compensation*. Available from 2011 International Conference on Business and Economics Research.

Vidal-Salazar, M.D., Cordón-Pozo, E., & de la Torre-Ruiz, J. M. (2015). The impact of Flexible Benefit Systems on the attraction and retention of talent. *Universia Business Review*, 46,14-37.

Zimermanová. K. (2010). Selected actual aspects of employes remuneration in small and medium-sized companies. *E+M*, 3, 33-44.

Drivers and Barriers of Entrepreneurship of Students

Monika Maříková, Martina Novotná, Antonín Šmejkal, Dagmar Bednářová

Abstract: *The decision to start a business is influenced by a number of factors both economic and personal ideas of future life. The best business ideas come naturally and the time of study can be very favourable for coming up of an original entrepreneurial idea. The paper focuses on the identification of the factors directly influencing the students of economic fields of study in starting their entrepreneurial activities and what are the limits of doing business.*

The results show that about 40% of the students in the survey they are really thinking about running a business or already doing so. Based on the statistical test, the hypothesis was confirmed that respondents with at least one of the parents being an entrepreneur are more interested in doing business (the parents are motivators). The students, on the contrary, are limited in starting a business by insufficient funds and lack of knowledge and experience. The most common barriers are seen in foreign languages (27%) and accounting and finance (18%). The students of a part-time study see different barriers, such as technical knowledge (19%) and legislation knowledge (17%).

Key words: Entrepreneurship · Barriers · Skills · Start of business

JEL Classification: L26 · D91 · A22

1 Introduction

The decision to start a business is influenced by a number of factors both economic and personal ideas of future life. The family background and the state of health of the entrepreneur is also important. There is also a need to think about the scope of the business. Everyone should choose such a business that will entertain them, which will give them a sense of life. An entrepreneur who is not happy in the business should not start such business. To begin with, it is important to understand the difference between business and employment and to clarify the reasons for running a business. Starting a business is possible at any age. Entrepreneurship can also be sort of a part-time job, that is, it can be done while working or studying. Doing a business together with studying is considered to be a secondary activity. If the field of study becomes a subject of business, there is the possibility to get professional support in the study and help in finding a business idea and its realization. Best ideas, including business ones, are naturally created. And study time can be very favourable for the coming up with an original business idea. Therefore, it is necessary not to be afraid, to try a business and, after studying, to decide whether to pursue this activity fully, or rather to become an employee, with some certainty, but with little prospect of further development and creative activity. The advantage of starting a business at the time of study is that students have the opportunity to consult their ideas with educators, they often have support from their university and college (business-related subjects, etc.), they can use the collective benefits of generating and validating their ideas, and last but not least a number of benefits related to levies and taxes. It is also a period when students live only on their own, they have no obligations arising from family life and they do not have to pay loans and mortgages.

Ing. Monika Maříková, Ph.D., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 37005 České Budejovice, e-mail: marikova@ef.jcu.cz

Ing. Martina Novotná, Ph.D., University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, 37005 České Budejovice, e-mail: novotna@ef.jcu.cz

Ing. Antonín Šmejkal, Ph.D., University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, 37005 České Budejovice, e-mail: asmejkal@ef.jcu.cz

Ing. Dagmar Bednářová, CSc., University of South Bohemia, Faculty of Economics, Department of Management, Studentská 13, 37005 České Budejovice, e-mail: bednar@ef.jcu.cz

2 Literature review

Motivation is important for starting a business. There are several reasons, defining the decision to start a business. One of the most important motivational incentives is an original idea, and a plan. Attempting to become independent and to establish an enterprise is particularly evident in those who are employed as professionals in a particular field. Usually, this incentive is combined with a feeling of underestimation at work. Another reason is that people do not want to be inferior to or they have negative experience with employment. Another reason is taking over family run business. Starting a business also solves the problem of unemployment (Štainer, 2008). In starting-up a business, information available is alos importnt. The final IPSOS research report (2017) has shown that start-up information is gained by young people from their family and acquaintances if they have such experience, and mostly the Internet.

As reported by Jirovská (2003), there are two reasons for running a business, known as Push and Pull theory. Push-theory arises from the fact that a person is pushed into business activities by the negative events and dissatisfaction with employment, risk of unemployment and lack of growth opportunities. On the other hand, pull-theory is based on the idea that future entrepreneurs are attracted by the existing attractive, success promising economic opportunities. By Jirkovská, the pull view is more common in the Czech Republic, and the majority of entrepreneurs were motivated by the existence of a market chance at the time of their start-up ideas. A key factor in business support is the development of business competencies. Competencies are very often discussed when selecting employees. For example, Dušek (2014), in his dissertation thesis, deals with the development of a competency model of a graduate of the University of Economics based on the requirements of HR managers and the managers from the region of South Bohemia.

The entrepreneurial competences and their evaluation were dealt with by the participants of the international conference "Business Competences" (2008). Baert (2008) presents five competencies which were rated as the most important by successful entrepreneurs:

- Endurance.

- Understanding efficiency.

- Decisiveness.

- Independence.

- Persuasiveness.

Before starting a business, each person has to decide, if they have personal prerequisites for doing business, a good and feasible business idea, with a competitive advantage and the necessary amount of initial capital. It is appropriate to ask the following questions:

- Why do I want to start business?

- What are my personal goals?

- What are the real goals of my business (long-term, short-term)?

- How do my personal and business goals match?

- Have I tried to do business before?

- What were the results of my previous efforts?

- What is family support (Srpová, Řehoř, 2010)?

Businesses based on an initial idea, with an inexperienced team trying to have a fast start-up with a low start-up cost, are often called start-ups. Financing for development is sought through angel investors and funds. Investment in such start-ups is rather risky.

Innovative incubators are used to prevent start-up enterprises bankrupt before they started. Business Incubators offer start-up entrepreneurs the background and technical assistance at an early stage of their development. Business incubators are being developed in the Czech Republic mostly as the initiative of different regions and towns and at associate departments of universities. Their operation is partly financed by public money (www.ipodnikatel).

Martinez et al (2018) confirm that (1) entrepreneur's perception concerning thei ncubator's performance directly and positively affects the desirability, self-efficacy and the facilitating conditions, (2) the perceived desirability and feasibility in entrepreneurship, as well as the firs stones, self-efficacy and facilitating conditions, positively influence the entrepreneurial intentions. Furthermore, contrary to the traditional mind-set that supports risk is a barrier, results

suggest that (3) the risk perceived by pre-incubated entrepreneurs positively influences entrepreneurial intentions and the desirability that is attributed to that behaviour.

A potential entrepreneur does not only deal with the motivation and the competencies they must have in order to do their business and to be successful. Entrepreneurs also often deal with obstacles that prevent them from starting in business itself. Most often these are barriers of an economic and legislative nature, but there may also be psychological barriers, which should also be paid attention to.

The psychological barriers are considered such barriers that are tied to the personality of the entrepreneur and their personal and family background. The problem may be a poor understanding of business activity as an easily manageable task, poor decisiveness of the entrepreneur, unwillingness to rely solely on one's own strength, uncritical encounter with possible initial success, endeavour to get rich as quickly as possible, which can lead to fraud (Mayerová et al., 1996). Lukeš, Stephan (2012); Lukeš et al. (2013) emphasize entrepreneurial self-confidence as a personality trait that is most related to the subsequent business activity. People who do not believe in themselves will not start business even though they have the necessary skills and knowledge. Van Gelderen et al. (2006) state that there are a few studies aimed at starting entrepreneurs. One reason is the lack of a representative sample. The people who are not currently registered are difficult to be included into the sample. It is important to understand these individuals and the factors that influence their entry into business, especially for those who want to start a business.

The results point to the importance of perceived risk of the market as a predictor of getting started versus abandoning the start up effort.

3 Methods

The aim of the article was to find out which factors directly influenced the students of economics when deciding on realization of an entrepreneurial activity. At the same time, the barriers perceived by students as the main obstacles to the start of entrepreneurial activity were surveyed.

The paper is based on the research among 316 students of the university of South Bohemia, the Faculty of Economics, regardless their field of study. There were 87 men and 229 women in the sample, due to the gender-quota representativeness in relation to the Faculty of Economics. The research took place at the end of 2018.

When analyzing the results of the questionnaires, common statistical methods such as contingency tables, graphical representation, and statistical hypothesis testing were used. A hypothesis test of the relative frequency was used. This paper extends results to the case of two independent populations.

The relative frequencies of units with certain properties are tested. Inferences will be based on two random samples of sizes n_1 and n_2. We consider hypothesis testing on the difference of the relative frequencies. We test if the relative frequencies in both samples (π_1, π_2) differ or not. Obviously, we are testing $H_0 : \pi_1 - \pi_2 = 0$. This test statistics would have a standard normal distribution under H_0. Suppose that the alternative hypothesis is $H_1 : U \rangle u_{1-\alpha}$.

Two cases are tested. Case 1 (p_1) is the relative frequency of the students if at least one of their parent is an entrepreneur and case 2 (p_2) is the relative frequency of the students if none one of their parent is an entrepreneur, using $\alpha = 0,05$.

Test statistics:

$$U = \frac{(p_1 - p_2)\sqrt{n_1 n_2}}{\sqrt{\bar{p}(1 - \bar{p})(n_1 + n_2)}} \tag{1}$$

$$\bar{p} = \frac{p_1 n_1 + p_2 n_2}{n_1 + n_2} \tag{2}$$

Statistic U has a standard normal distribution (Montgomery, D.C.,2006).

4 Results

The students responded to the questions about entrepreneurship, motivation for doing business, and the barriers that prevent them from doing business.

Figure 1 reports the answers to the question: "I am really thinking about starting a business." In total, there were 316 answers. As revealed by the results, 183 of the students (40%) are actually thinking about starting a business or they run a business.

Figure 1 I am really thinking about starting a business
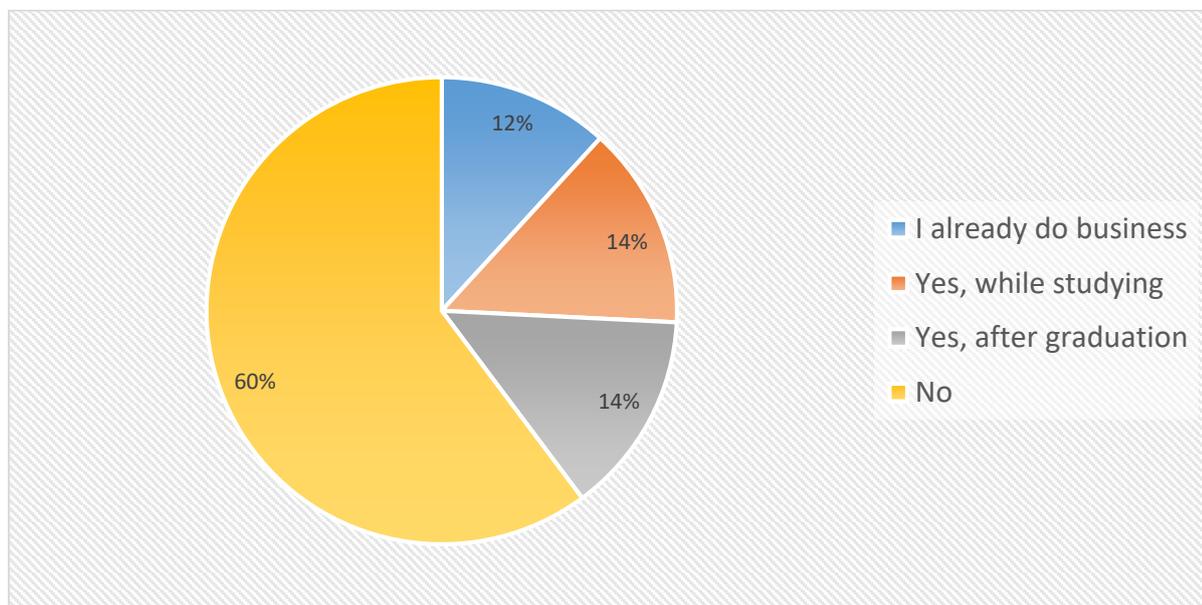
Source: questionnaire survey

Table 1 shows the frequency of students and their interest in doing business, depending on their parents' business activities. It can be assumed that if at least one of their parents is an entrepreneur are better motivated for doing business. This assumption was justified by the fact that 14% of the group of students having entrepreneurs' as their parents already run a business and 60% is going to do so. Compared to the group of students, whose parents are not entrepreneurs, 5% run a business and about 44% are going to do so.

Table 1 Frequency of the students and their interest in business regarding the business of their parents

Real interest in business	None of the parents is an entrepreneur		At least one of the parents is an entrepreneur	
	freq.	%	freq.	%
No	107	50.71	26	24.76
Yes, while studying	16	7.58	15	14.29
Yes, after graduation	77	36.49	49	46.67
I run a business	11	5.21	15	14.29
Total	211	100.00	105	100.00

Source: questionnaire survey

The statement that the students whose at least one of the parents is an entrepreneur are more likely to do business was subsequently verified by a statistical testing of the hypothesis of the relative frequency of two samples. The first sample is the group of students who do not have any of the parents an entrepreneur. The second set consists of the group of students in which at least one of the parents works as an entrepreneur.

$$p_1 = \frac{79}{105} = 0.7524; \ p_2 = \frac{104}{211} = 0.4929$$

$$U = \frac{(p_1 - p_2)\sqrt{n_1 n_2}}{\sqrt{\overline{p}(1 - \overline{p})(n_1 + n_2)}} = \frac{(0.7524 - 0.4929) * \sqrt{105 * 211}}{\sqrt{0.5791 * (1 - 0.5791) * (105 + 211)}} = 4.4011$$

$$\overline{p} = \frac{p_1 n_1 + p_2 n_2}{n_1 + n_2} = 0.5791$$

$$4.4011 > 1.645$$

The test showed at the level of significance of 95% that students with one of the parents being an entrepreneur have a greater tendency to run a business. The question, however, is whether this group of students will actually start doing business (either during or after graduation, as stated) or they only take over business from their parents as part of the continuation of tradition.

The following question was related to skills that would make business easier. As revealed by figure 2, the most common skill is leadership and communication (25 %), followed by creativity and new ideas and accounting and business finance.

Figure 2 Skill which make business easier
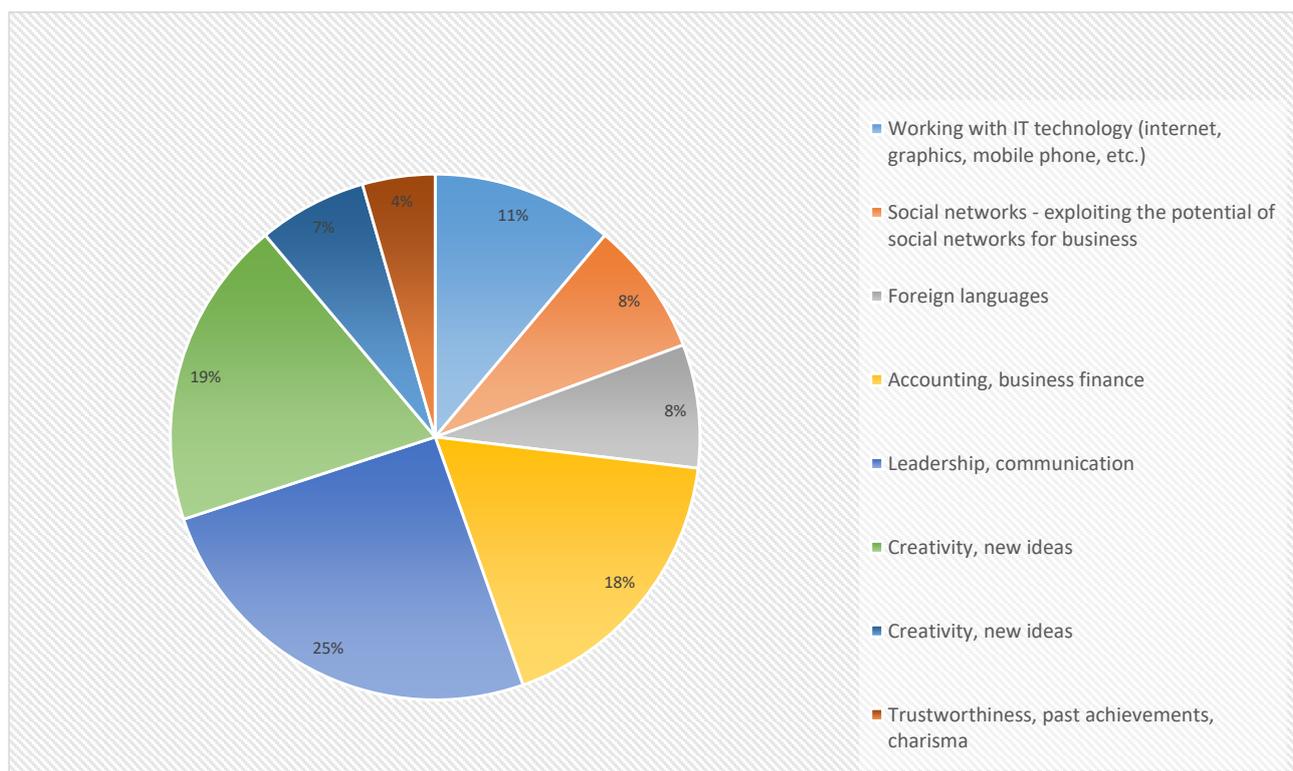
Source: questionnaire survey

Next part of the research was aimed at the barriers related to starting a business activity as seen by the students

(Table 2).

Attention was focused on students who are not entrepreneurs (either they do not even think about doing business, or they are going to run a business). Almost one third of such students perceive the lack of funding as the biggest barrier to business (Table 2). The second place is the lack of knowledge and experience, especially the knowledge of foreign languages (see Figure 3).

Table 2 Frequency of students (non-entrepreneurs) related to the barriers to doing business

	absolutely	in %
Lack of finance	95	32.76
Lack of knowledge, experience	53	18.28
I do not have an idea, a plan	46	15.86
Fear of the failure/risk	37	12.76
Lack of motivation	25	8.62
I am to busy	19	6.55
Other	14	4.83
Non-fulfilment of the conditions for establishing	1	0.34

a business		
Total	290	100.00

Source: questionnaire survey

Figure 3 reports the questions to the following answer: "If you wanted to run a business what are the biggest drawbacks related to education?" The students see foreign languages (27%), followed by accounting and finance (18%) as their biggest drawbacks.

Figure 3 What are the biggest drawbacks related to education?
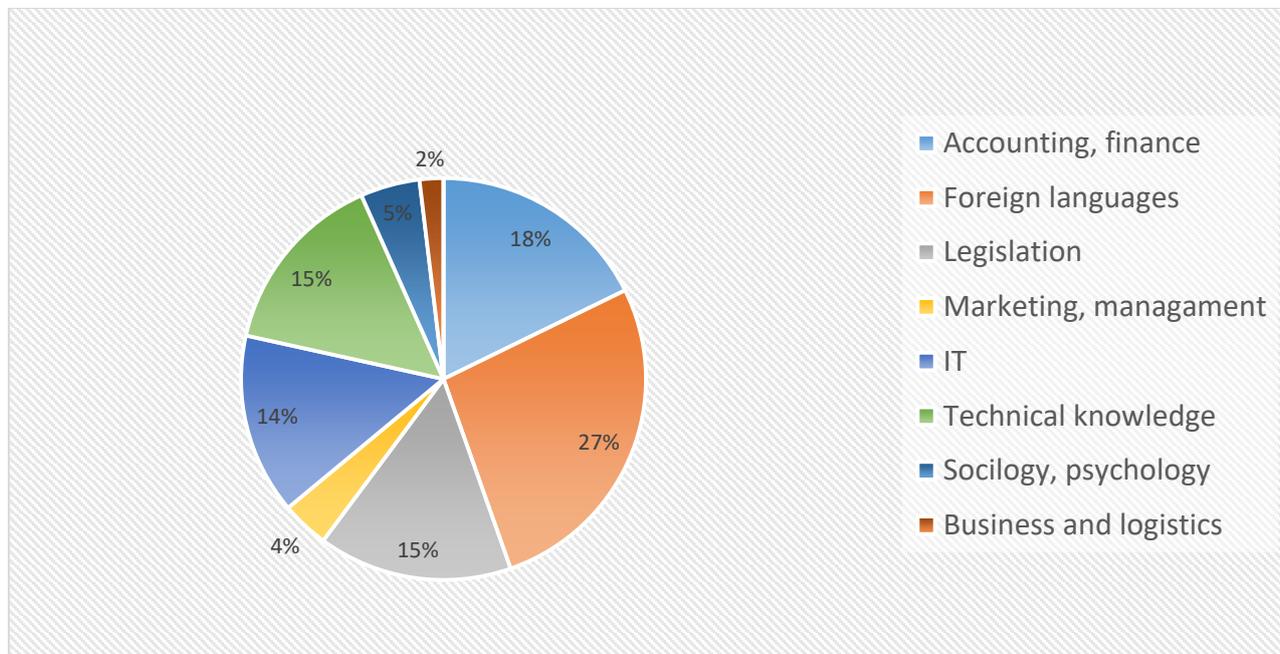
Source: questionnaire survey

Interestingly, the students of a part-time study, supposed to have some working experience, see their drawbacks in a different way. Together with the full-time study students, they see foreign languages as the biggest drawback, however the lack of technical knowledge (19%) and legislation knowledge (17%) are the second most common, compared to accounting and finance (about 19%) and IT skills (17%) as the second most common in full-time students.

Table 3 The biggest drawbacks in education as the barriers to business (Frequency of the students)

Part time study (frequency of the students)			Full-time study (frequency of the students)		
Area of education	absolutely	in %	Area of education	absolutely	in %
Foreign languages	27	27.00	Foreign languages	58	26.85
Technical knowledge	19	19.00	Accounting and finance	41	18.98
Legislation	17	17.00	IT	38	17.59
Accounting and finance	15	15.00	Legislation	32	14.81
IT	8	8.00	Technical knowledge	28	12.96
Marketing, management	8	8.00	Socilogy, psychology	11	5.09

Source: questionnaire survey

5 Conclusions

The paper discussed the incentives and barriers as seen by the students of economics when thinking about starting a business activity. There were students of all years and fields of study in the sample.

The research revealed that the students whose parents (or at least one of them) are entrepreneurs are better motivated to such activity.

Further findings proved that the most common barrier to starting a business is the lack of finance and the lack of knowledge and experience. The students with some working experience (i.e. the students of part-time study) mostly lack the knowledge of foreign languages and technology.

On the other hand, full-time study students see foreign languages and accounting and finance as the most common barriers.

According to the study Kourilsky, M. L., &Ucla W. B. (2002), education in school was the third highest factor identified as providing the most preparation for starting the respondent's current business.

It is a question if the students questioned, who intend to do business, have a clear business plan. The present study of Rath et al. (2018) (based on the Theory of Planned Behaviour with additional personality trait and contextual variables) indicates that although some people (the sample of 1,200 students of economics and business) in four South-East European countries: Bosnia and Herzegovina, Croatia, Macedonia and Serbia hold a positive attitude towards entrepreneurship, they do not show a clear entrepreneurial intent.

There are a number of young entrepreneurs who might enrich the market with something new and might even initiate the development of, for example, the entire industry, do not start business at all due to the barriers as mentioned above. In order to break through such barriers, business incubators might be used.

References

Baert, H. (2008). *Sestavení nástroje pro řízené sebehodnocení podnikatelských kompetencí*. Podnikatelské kompetence – sborník z mezinárodní konference. Olomouc: EDUKOL vzdělávací a poradenské sdružení, 2008, s. 41-52.

Dušek, R. (2014). *Kompetence v řízení lidských zdrojů malých a středních podniků*. Disertační práce. Jihočeská univerzita v Českých Budějovicích, Ekonomická fakulta.

Jirovská, E. (2003). *Analýza pozitivních a negativních faktorů působících na zakladatelskou aktivitu v ČR a její krajské odlišnosti*. 1. vyd. Praha: Česká zemědělská univerzita, 112 s.

Kourilsky, M. L., & Ucla W. B. (2002). The Early Environment and Schooling Experiences of High-Technology Entrepreneurs: Insights for Entrepreneurship Education. *International Journal of Entrepreneurship Education* 1(1). Senate Hall Academic Publishing. Walstad University of Nebraska-Lincoln.

Lukes, M., & Stephan, U. (2012). Nonprofit leaders and for-profit entrepreneurs: Similar people with different motivation. *Ceskoslovenska Psychologie*, 56(1), 41-55.

Lukes, M., Zouhar, J., Jakl, M., & Ocko, P. (2013). Factors influencing entrepreneurial entry: Early-stage entrepreneurs in the Czech Republic. *Politická ekonomie*, 61(2), 229-247. doi: 10.18267/j.polek.896

Martinez, K. R. G., Fernandez-Laviada, A., & Crespo, A. H. (2018). Influence of Business Incubators Performance on Entrepreneurial Intentions and Its Antecedents duringt the Pre-incubation Stage. *Entrepreneurship Research Journal*, 8(2). doi: 10.1515/erj-2016-0095

Mayerová, M., Bureš, Z., & Růžička, J. (1996). *Psychologie v ekonomické praxi*. 1. vyd. Plzeň: Západočeská univerzita, 1996, 187 s.

Podnikatelé v inkubátoru.[on-line], 2018. [Cited 5.10.2018]. Available online:<http://www.ipodnikatel.cz/O-podnikani/podnikatele-v-inkubatoru.html>

Rajh, E., Apasieva, T. J., Budak, J., Ateljevic, J., Davcev, L., & Ognjenovic, K. (2018). Youth and Entrepreneurial Intentions in Four South-East European Countries. *International Review of Entrepreneurship*, 16(3), 355-382.

Srpová, J., & Řehoř, V. (2010). *Základy podnikání*. Praha: Grada.

Štainer, M. (2008). Podnikatelské kompetence tady a teď. In: Sborník z mezinárodní konference 2008 „Podnikatelské kompetence", Praha

van Gelderen, M., Thurik, R., & Bosma, N. (2006). Success and risk factors in thepre-startupphase. *Small Business Economics*, 26(4), 319-335. doi: 10.1007/s11187-004-6837-5

Postoj mladých k podnikání (2017). *Závěrečná zpráva z výzkumuIPSOS pro AMSP_Young Business*. [on-line]. [Cited 5.11.2018]. Available online:<http://amsp.cz/uploads/dokumenty_2017/TZ/Vysledky_pruzkumu_Young_Business_komplet_TK.pdf>

SESSION

REGIONAL AND GLOBAL ASPECTS OF SUSTAINABILITY, BIOECONOMY

Is a low carbon emission agriculture possible?

Jiří Sedlák, Nikola Sagapova

Abstract: *We have been currently experiencing significant increase in global average temperatures which are very likely linked to increases of anthropogenic greenhouse gas emissions. Such increases and continuing global warming poses fundamental threat to global natural systems. Although agriculture is usually perceived as relatively „clean sector" in comparison with other industries, often perceived as the victim of global climate change, it is the agriculture sector, that accounts for almost one third of anthropogenic greenhouse gases emissions, and therefore an important contributor to global warming. The agricultural greenhouse gases emissions are related both to the crop production and livestock breeding. The need for transition towards low-carbon economy is presented as the driver for future choices within economic development, and transition towards low-carbon agriculture is inherently a part of this shift. However, the question is if a low carbon emission agriculture is possible.*

Key words: Agriculture · Greenhouse gases · Emissions · Climate change · Low carbon

JEL Classification: O13· Q15 · Q54

1 Introduction

Planet Earth is a source of infra-red radiation, while it receives ultra-violet and visible radiation from the Sun. Actually, our planet has hospitable average temperature due to greenhouse effect, which happens when greenhouse gases molecules in atmosphere, mostly CO_2, O_3, CH_4 and H_2O, absorb some of the emitted infra-red radiation and re-radiate it back towards the Planet´s surface. This is called the primary greenhouse effect, the dominant greenhouse gas in this case is H_2O, and this effect help the planet to maintain higher average temperature than it would have without this phenomena. However, the temperature rises we are experiencing now are caused by changes in the concentrations of greenhouse gases with also newer anthropogenic gases since the start of the Industrial Revolution, this is called the secondary greenhouse effect. In comparison with the primary greenhouse effect, the dominant greenhouse gas in the case of secondary greenhouse effect is not H_2O, but CO_2 and CH_4. The apparent correlation between rises of CO_2 concentration and temperature over the last 50 years is striking (Tuckett, 2018).

Worldwide, the temperature has risen by about 0.8° C over the last 150 years and is expected to grow further (ÚZEI, 2014). Tuckett (2018) claims the temperature has risen by 1°C. The UN Framework Convention on Climate Change has defined the objective of limiting the global average temperature increases to less than 2°C above the temperature pre-Industrial level. The increasing temperature level more than 2°C could poses a fundamental risk of dangerous changes in global natural systems (ÚZEI, 2014). However, as the current emissions trend continues tracking highest emission scenarios, it makes global warming less likely to be maintained bellow 2°C (Peters et al., 2012). Climate change is already having impact on agriculture through weather variability, increased frequency of extreme events etc., but on the other hand, agricultural sector itself accounts aproximatelly for 1/3 of global anthropogenic greenhouse gases emissions and therefore triggers the ongoing climate change (Moran & Knook, 2017).

Agriculture depends directly on resources exploitation, mostly land, water and energy, to produce its outputs. With growing population and growing demand, the need for resources rises as well as the emissions rise during agricultural activities (Zhao et al., 2018). The intensification of the agriculture in terms of inputs and outputs leads to concerns regarding its impact on the environment (Miller et al., 2007). Growing population and consumption drives the agricultural production to produce more from the same limited resource base, and together within the framework of climate change, the pathways for reducing agricultural environmental impacts are sought (Khan et al., 2009). Organic farming has a significant, though not always the greatest, impact on reduction N_2O because the number of livestock is limited in it (Weiske, et al., 2006; Olesen, et al., 2006).Another positive difference between ecological and conventional livestock breeding is

Ing. Jiří Sedlák, University of South Bohemia, Faculty of Economics, Department of Regional Management, Studentská 787/13, České Budějovice 370 05

Ing. Nikola Sagapova, University of South Bohemia, Faculty of Economics, Department of Regional Management, Studentská 787/13, České Budějovice 370 05, e-mail: sagapova@ef.jcu.cz

that eco-makers strive for longevity (Kotschi and Müller-Sämann, 2004). Some authors (Beauchemin and McGinn, 2005) recommend high-energy feed for livestock to reduce methane emissions, but then they would not exploit the unique ability of ruminants to consume bulk feed from pastures.

The aim of this paper is to explore the factors behind agricultural emissions, discuss possible improving and the requirements needed for better agricultural systems with emphasis on greenhouse gases emission. The research question is if thee exist any realistic possibility of real low carbon agriculture.

2 Methods

The material for the present paper was collected from different scientific journals, reports and review papers. These materials were reviewed and sorted into sections to be examined from the perspective of agricultural emissions, crop production, livestock-related greenhouse gas emissions. The major topics and findings form the present paper.

3 Factors affecting agricultural emissions

There are many factors affecting agricultural emissions. Although we might recognize direct carbon inputs into agriculture such as fuel for tractors, harvesters, energy for milking machinery, crop drying etc., it is not only the agricultural carbon dioxide emissions, but also nitrogen and methane emissions, that powerfully contribute to greenhouse effect (Norse, 2012).

Other factors affecting agricultural emissions are the fundamental effects of economic growth, urbanization, industrialization and financial capacity (Lin & Xu, 2018), intensified fertilizer aplication, land-use change, that is also a key driver for deforestation process (Moran & Knook, 2017), livestock production (Lesschen et al., 2011), cultivation and harvesting itself, production and transport of inputs (Wood & Cowie, 2004), but also production and transport of outputs (Meisterling, Samaras & Schweizer, 2009).

There exist many agricultural practices might potentially mitigate greenhouse gases emissions (Smith et al., 2008), however the mitigation potential potential is hindered by biophysical complexicity of agricultural systems, institutional, but also behavioral barriers (Moran & Knook, 2017). Meanwhile consumers may tend to purchase organic products because less synthetic fertilizers is being used, and because of their attitude to behave more environmentally friendly, they might lack credible information about environmental impacts associated with production and transport of their food still resulting in greenhouse gas emissions (Nilsson, Tuncer & Thidell, 2004).

3.1 Crop production and migitation of greenhouse gases

Except for the greenhouse gases emissions connected to crop production as written above, there are also highly natural releases of greenhouse gases related to agricultural crop production. Carbon dioxide releases from microbial decay or burning of the plant litter and soil organic matter (Janzen, 2014), methane releases when organic materials decompose in oxygen-deprived conditions, notably by digestion by ruminant livestock, fermentation of stored manure, or rice grown under flooded conditions (Mosier et al., 1998), and nitrous oxide is generated by the microbial transformation of nitrogen in soils and manures, very often when nitrogen exceeds crop requirements and especially under wet conditions (Smith & Conen, 2004).

As for the migitation, some practices of active management seems legit, although the impacts are often controversial. That supports the question if a low carbon emission agriculture is really possible. Smith et al. (2008) includes:

- Improved agronomic practices: improved crop varieties, less intensive cropping systems, extending crop rotations, involving legume crops, although this might result in higher yield it could also end up with higher N_2O emissions from soil and CO_2 from fertilizer manufacture.

- Improved nutrient management: slow-release fertilizer forms with N inhibitors, improved timing of N application, for more efficient use by the crops,

- Reduced or no-till agriculture: advanced methods and machinery allows minimal or no tillage, however the effect differs depending on areas and somewhere it has no influence at all,

- Improved water management: expending supply of water, but it usually means more CO_2 emissions to deliver it,

- Agroforestry: crops planted together with trees, the effect on N_2O and CH_4 emissions are not well known,

- Land use change: similar to native vegetation, e.g. grasslands, wetlands, depends on emissions from energy used and other related activities on the land,

- Livestock management: reduce animal numbers, improve feeding practices with specific dietary additives: ionophores, halogenated compounds, nevertheless the effect of additives is transitory.

4 Livestock-related greenhouse emissions?

Methane accounts for about 14% of all greenhouse gas emissions (Barker, et al., 2007). According to researchers, the date show that livestock account for a significant proportion of greenhouse gas (GHG) emissions and global consumption of livestock products is growing rapidly. The life cycle analysis (LCA) approach to quantifying these emissions and argues that, given the dynamic complexity of our food system, it offers a limited understanding of livestock's GHG impacts. It is possible to substantially reduce livestock emissions through technological measures alone, or whether reductions in livestock? Everyone should consider how far people need livestock products at all (Garnett, 2009).

The following chart shows that in the number of cattle the highest figures are France and Germany, especially farmers in France have a large share of European Union agriculture. The amount of cattle remains almost unchanged between 2006 and 2017.

Figure 1 The numbers of cattle in Europe
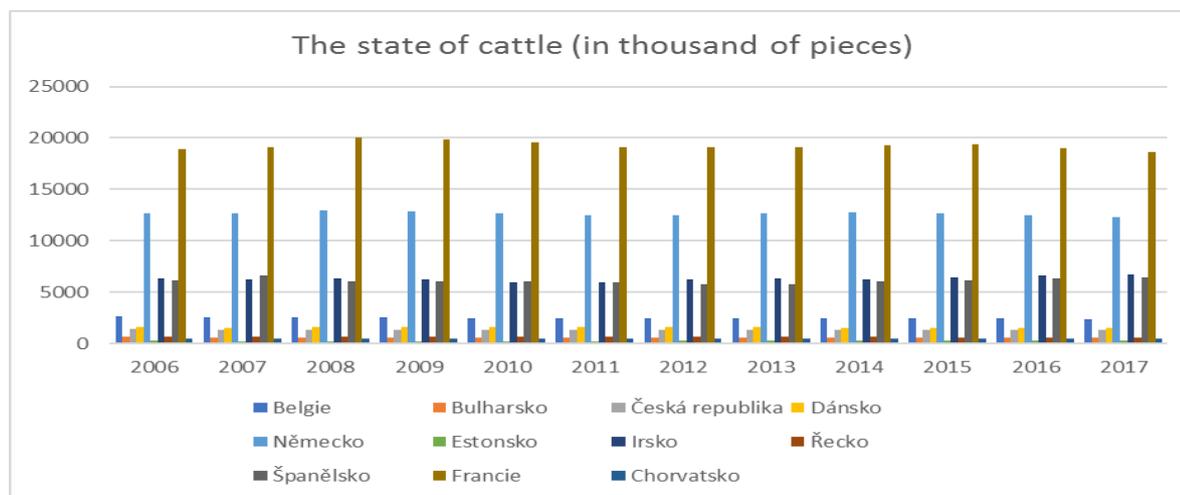
Source: Český statistický úřad, Database of Eurostat, 2018

Group of researches presented a unique, biologically consistent, spatially disaggregated global livestock dataset containing information on biomass use, production, feed efficiency, excretion, and greenhouse gas emissions for 28 regions, 8 livestock production systems, 4 animal species (cattle, small ruminants, pigs, and poultry), and 3 livestock products (milk, meat, and eggs). The dataset contains over 50 new global maps containing high-resolution information for understanding the multiple roles (biophysical, economic, social) that livestock can play in different parts of the world. The dataset highlights: (i) feed efficiency as a key driver of productivity, resource use, and greenhouse gas emission intensities, with vast differences between production systems and animal products; (ii) the importance of grasslands as a global resource, supplying almost 50% of biomass for animals while continuing to be at the epicentre of land conversion processes; and (iii) the importance of mixed crop–livestock systems, producing the greater part of animal production (over 60%) in both the developed and the developing world. These data provide critical information for developing targeted, sustainable solutions for the livestock sector and its widely ranging contribution to the global food system. The study has shown that there are large differences in feed efficiency and emission intensities in livestock systems. These findings vary because of type of livestock product, the production of pork and poultry being most efficient, followed by milk production and red meat production from cattle and small ruminants. The production of meat is associated with lower feed efficiency and higher emission intensities in comparison with a product such as milk. All systems in the developed world have lower emission intensities than those in the developing regions. Insufficient attention has been paid to the generation of livestock data at the level of detail required for elucidating their future role in attaining key global sustainability goals. Some of these goals are poverty reduction, food and nutritional security, ecosystem protection, mitigation of greenhouse gases (GHG), and adaptation to climate change, for example. (Herrero, Havlík, Notenbaert, Rufino, Thornton, Blümmel, Weiss, Grace, Obersteinerc, 2013).

5 Conclusions

So, the question was: „Is a low carbon emission agriculture possible?" First of all, it is important to realize, that even the best practices possible such as improved agronomic practices, improve nutrient management, reduced or no-till agriculture systems, improved water management, managing agroforestry, land use change, improved livestock management, may not lead to noticeable better-off depending on other activities and practices of agriculturists.

The potential for the future has certainly organic farming, which focuses more on crop production than traditional conventional farming. However, everyone always has to take into account the nature of the agricultural landscape. It is obvious, that there will be different solutions for mountain landscapes and intensively farmed areas.

It is clear that the highest emissions from farming will be produced by states such as Germany or France, these countries are among the richest countries in the world, so they should seek new agricultural techniques and practices that will release less emissions into our atmosphere.

Acknowledgement

References

Ahmad, E., & Searle, B. (2006). On the Implementation of Transfers to Subnational Governments. In E. Ahmad & G. Brosio (Eds.), *Handbook of Fiscal Federalism* (pp. 381-404). Cheltenham, UK: Edward Elgar.

Alessandrini, P., Presbitero, A. F., & Zazzaro, A. (2009). Banks, Distances and Firms' Financing Constraints. *Review of Finance*, 13(2), 261-307. doi: 10.1093/rof/rfn010

Barker T., I. Bashmakov, L. Bernstein, J. E. Bogner, P. R. Bosch, R. Dave, O. R. Davidson, B. S. Fisher, S. Gupta, K. Halsnæs, G.J. Heij, S. Kahn Ribeiro, S. Kobayashi, M. D. Levine, D. L. Martino, O. Masera, B. Metz, L. A. Meyer, G.-J. Nabuurs, A. Najam, N. Nakicenovic, H.-H. Rogner, J. Roy, J. Sathaye, R. Schock, P. Shukla, R. E. H. Sims, P. Smith, D. A. Tirpak, D. Urge-Vorsatz, D. Zhou (2007): Technical Summary. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available at www.mnp.nl/ipcc/pages_media/FAR4docs/fi nal_pdfs_ar4/TS.pdf

Barro, R. J. (1996). *Getting it right: markets and choices in a free society*. Cambridge, MA: MIT Press.

Beauchemin, K.A., & McGinn, S.M. (2005): Methane emissions from feedlot cattle fed barley or corn diets. *Journal of Animal Science* 83, p. 653–661.

Besley, T., & Case, A. (1995). Incumbent Behavior: Vote-Seeking, Tax-Setting, and Yardstick Competition. *American Economic Review*, 85(1), 25-45.

Boadway, R., & Shah, A. (2009). *Fiscal Federalism. Principles and Practice of Multiorder Governance*. New York: Cambrige University Press.

Český statistický úřad. (2018). *Database of Eurostat*. Available at http://apl.czso.cz/pll/eutab/html.h

Garnett, T. (2009). Livestock-related greenhouse gas emissions: impacts and options for policy makers. *Environmental science & policy* 12 (20 0 9) 4 9 1 – 5 0 3 Food Climate Research Network, Centre for Environmental Strategy University of Surrey, UK

Herrero, M. , Havlík, P. , Valin, H. , Notenbaert, A., , Rufino,C.M., Thornton, K.P., Blümmel,M., Weiss, F. , Grace,D., & Obersteinerc, M. (2013). Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems. Dostupné z: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3876224/Kotschi J and Müller-Sämann K (2004): Th e Role of Organic Agriculture in Mitigating Climate Change – a Scoping Study. IFOAM. Bonn, 64 p.

Janzen, H. H. (2004). Carbon cycling in earth systems – a soil science perspective. *Agriculture, Ecosystems & Environment*, 104 (3), 399-417.

Khan, S., Khan, M. A., Hanjra, M. A., & Mu, J. (2009). Pathways to reduce the environmental footprints of water and energy inputs in food production. *Food Policy*, 34 (2), 141-149.

Kotler, P., & Keller, K. L. (2006). *Marketing Management*. 12.ed. New Jersey: Pearson Education, 2006. ISBN 978-0-13-145757-7.

Kotschi, J. & Müller-Sämann, K. (2004): *The Role of Organic Agriculture in Mitigating Climate Change – a Scoping Study*. IFAM. Bonn, 64 p.

Lin, B. & Xu. B. (2018). Factors affecting CO2 emissions in China's agriculture sector: A quantile regression. *Science direct*. Volume 94, Pages 15-27.

Meisterling, K., Samaras, C. & Schweizer, V. (2009). Decisions to reduce greenhouse gases from agriculture and product transport: LCA case study of organic and conventional wheat. *Journal of Cleaner Production*, 17, 222-230.

Miller, S. A., Landis, A. E., & Theis, T. L. (2007). Environmental tradeofs of biobased production. *Environmental Science Technology*, 41, 5176-5182.

Moran, D., & Knook, J. (2017). Economics of Low Carbon Agriculture. *Oxford Research Encyclopedia od Envrionmental Science*. doi: 10.1093/acrefore/9780199389414.013.517

Mosier A. R, Halvorson A.D, Peterson G. A, Robertson G. P, & Sherrod L. (2005). Measurement of net global warming potential in three agroecosystems. Nutr. Cycl. *Agroecosyst.*, 72:67–76. doi:10.1007/s10705-004-7356-0

Mosier, A., Kroeze, C., Nevison, C., Oenema, O., Seitzinger, S. & van Cleemput, O. (1998). Closing the global N2O budget: nitrous oxide emissions through the agricultural nitrogen cycle. *Nutrient Cycling in Agroecosystems*, 52, 225-248.

Mundell, R. A. (1968). *International economics*. New York : Macmillan.

Nilsson, H., Tuncer, B. & Thidell, A. (2004). The use of eco-labelling like initiatives on food products to promote quality assurance – is there enough credibility? *Journal of Cleaner Production*, 12 (5), 517-526.

Norse, D. (2012). Low carbon agriculture: Objectives and policy pathways. *Environmental Development*, 1(1), 25–39. doi:10.1016/j.envdev.2011.12.004

O´Reilly, K., & Marx, S. (2011). How young, technical consumers assess online WOM credibility. Qualitative Market Research: *An International Journal*, 14(4), 330-359. doi: 10.1108/13522751111163191

Oates, W. E. (2004). Taxation in a Federal System: The Tax-Assignment Problem. In W. E. Oates (Ed.), Environmental policy and fiscal federalism: Selected essays of Wallace E. Oates (pp. 351-376): Cheltenham, U.K. and Northampton, Mass.: Elgar. (Reprinted from: [1996]).

Peters, G. P., Andrew, R. M., Boden, T., Canadell, J. G., Ciais, P., le Quéré, C., Marland. G., Raupach, M. R. & Wilson, C. (2012). The challenge to keep global warming below 2° C. *Nature Climate Change*, 3 (1), 4-6.

Samuelson, P. A. (1954). The Pure Theory of Public Expenditure. *Review of Economics and Statistics* 36, 387–389.

Samuelson, P. A. (1955). Diagrammatic Exposition of a Theory of Public Expenditure. *Review of Economics and Statistics* 37, 350–356.

Smith, K. A. & Conen, F. (2004). Impacts of land management on fluxes of trace greenhouse gases. *Soil Use and Management*, 20 (2), 255-263.

Smith, K. A., & Valderrama, D. (2009). The composition of capital inflows when emerging market firms face financing constraints. *Journal of Development Economics*, 89(2), 223-234. doi: 10.1016/j.jdeveco.2008.05.003

Smith, P., Martino, D., Cai, Z., Gwary, D., Janzen, H., Kumar, P., McCarl, B., Ogle, S., O'Mara, F., Rice, C., Scholes, B., Sirotenko, O., Howden, M., McAllister, T., Pan, G., Romanenkov, V., Schneider, U., Towprayoon, S., Wattenbach, M. & Smith, J. (2007). Greenhouse gas mitigation in agriculture. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, 363(1492), 789-813.

Tomek, G., & Vávrová, V. (2011). *Marketing od myšlenky k realizaci*. 3.vyd. Praha: Professional Publishing. ISBN 978-80-7431-042-3.

Tuckett, R. (2018). Greenhouse Gases. Reference Module in Chemistry, *Molecular Sciences and Chemical Engineering*. doi:10.1016/b978-0-12-409547-2.14031

von Hagen, J. (2007). *Budgeting Institutions for Better Fiscal Performance*. In A. Shah (Ed.), Budgeting and Budgetary Institutions (pp. 27-51): Public Sector Governance and Accountability Series. Washington, D.C.: World Bank.

Weiske, A., Vabitsch, A., Olesen, J.E., Schelde, K., Michel, J., Friedrich, R., & Kaltschmitt, M. (2006): Mitigation of greenhouse gas emission in European conventional and organic dairy farming. *Agriculture, Ecosystems and Environment* 112, p. 221–232.

Winer, S. L. (1983). Some Evidence on the Effect of the Separation of Spending and Taxing Decisions. *Journal of Political Economy*, 91(1), 126-140.

Wood, S. & Cowie, A. (2004). A Review of Greenhouse Gas Emissions Factors for Fertiliser Production. Dostupné z: http://www.sciencetheearth.com/uploads/2/4/6/5/24658156/2004_wood_a_review_of_greenhouse_gas_emission_factors.pdf

Zax, J. S., Forbes, K. F., Zampelli, E. M., & Oates, W. E. (1989). Is There A Leviathan In Your Neighborhood? *The American Economic Review*, 79(3), 560.

Zhao, R., Liu, Y., Tian, M., Ding. M., Ca, L., Zhang. Z., Chuai, X., Xiao, L. & Yao, L. (2018). Impacts of water and land resources exploitation on agricultural carbon emissions: The water-land-energy-carbon nexus. *Lanf use Policy*, 72, 480-492.

Evaluation of LAGs in the Czech Republic

Dagmar Škodová Parmová, Zuzana Dvořáková Líšková, Labros Sdrolias, George Aspridis

Abstract: *The aim of the paper is to analyse and evaluate the activities of the selected local action groups (LAGs) within the Czech Republic. This paper does not evaluate only the current effectiveness of the LAG's work, but also its impact on regional development and strategic development of the country. On the bases of the EU regional policy, rural development policy, municipal cooperation it explains the particular concepts such as LEADER method or local action group actions. It also describes both the basic characteristics of the LAG's functioning and outlines the evaluation processes in the strategy formulation and implementation, explaining the principle and possibilities of financial support. According to the findings and results, possible improvements of the state policies will be proposed.*

Key words: Local action groups · Leader method · Evaluation · Cooperation

JEL Classification: R11 · O18 · O20

1 Introduction

As the rural areas defined by the European Union, rural area accounts for more than 90% of the EU area, with a half of the population lining there. Due to this, it is vitally important to discuss the rural area and to deal with its issues.

The Common Agricultural Policy (CAP) is key policy for supporting rural development at the European level. It has undergone a number of changes and reforms during its existence. Nowadays rural development policy is known as the "second pillar", which deals with the versatile and sustainable development of rural areas. The support of local development is rather useful and efficient, as the local people are involved in the region, because they only know their territory best and they know what its main advantage is and on what issues it faces. The Leader method is typical for such bottom-up approach. The local action groups (LAGs) are based on the method. A LAG connects a public, private and non-profit sector and it is based on the principle of mutual cooperation and partnership. The aim of a LAG is the sustainable development of rural regions in particular, together with improving the quality of rural life and improving the environment. One of the ways in which these objectives can be fulfilled by the LAG is their active participation in drawing on financial support from the European and national programmes (Ray, 2000). There are currently around 179 LAGs in the Czech Republic that cover almost the entire territory; with less than two-thirds of the population living there. That is why it is very important to discuss the local action groups and deal with their current activities.

The Leader Method

The Leader Method is a tool supporting the development of rural areas, and its main aim is to show these regions how to deal with such development, unlike traditional rural policy methods that show "what" needs to be done. Currently, the Leader approach is an integral part of rural development policy (High &.Nemes, 2017; Nardone et al., 2010). As a tool, it is also used in rural areas, which are quite varied. Implementation of the Leader method contributes to cooperation, partnership and interconnection of different sectors within the territory and to improving the overall quality of life of the population in rural areas (Lopolito et al., 2011). The bottom-up approach is applied, which means that locals are involved in local action to shape the strategy and prioritization to be monitored. This approach strengthens the local human resources and the belonging of people with their place of residence. Only the local actors are well aware of the potential of their region (i.e. its strengths and weaknesses), and they know best what the area should focus on (European Union, 2017).

doc. Dr. Ing. Dagmar Škodová Parmová, University of South Bohemia in České Budějovice, Faculty of Economics, Department of Regional Management, Studetnská 13, CZ-37005 České Budějovice, e-mail: parmova@ef.jcu.cz

RNDr. Zuzana Dvořáková Líšková, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Regional Management, Studetnská 13, CZ-37005 České Budějovice, e-mail: zuli@ef.jcu.cz

Labros Sdrolias Vice- Rector for Economics, Programming and Development,Technological Educational Institute (T.E.I) of Thessaly, 411 10 Larissa-Greece, e-mail: lsdrolias@teilar.gr

The Leader method is based on seven key principles, as defined by Council Regulation (EC) no 1698/2005, article 61:

1. area-based local development strategies; 2. local public-private partnerships (local action groups); 3. bottom-up approach with a decision-making power for local action groups concerning the elaboration and implementation of local development strategies; 4. multi-sectoral design and implementation; 5. implementation of innovative approaches; 6. implementation of cooperation projects; 7. networking of local partnerships .

In the 2014-2020 programming period, the LEADER method has been extended under the broader term Community-Led Local Development (CLLD) to three additional EU Funds (the European Maritime and Fisheries Fund EMFF; the European Regional Development Fund ERDF; and the European Social Fund ESF).

Although LEADER is obligatory only under the EAFRD, a single action can now be supported under two or more of the four EU Funds at the same time through the concept of multi-funded CLLD. Where this is applied, it enables LAGs to comprehensively integrate local needs and solutions and helps to reinforce the links between rural and urban areas (Navarro et al., 2015, Macken-Walsh, 2011).

Table 1 Dimension of LEADER in EU

Programme	Programme Period	Financial Instruments	EU Budget (EUR)	Number of LAGs
LEADER I	1991- 1993	EAGGF, ESF, ERDF	450 million	217 in EU-12
LEADER II	1994 – 1999	EAGGF, ESF, ERDF	1,7 billion	906 in EU-15
LEADER +	2000-2006	EAGGF	2,1 billion	893 in EU-15 (+250 LAGs from the 6 new MS who joined the EU in 2004 implemented a Leader + type measured
LEADER axis	2007 - 2013	EAFRD	5,5 billion	2308 in EU -27
LEADR/CLLD	2014 - 2020	ERDF, EMFF, ESF	-	2318 in EU – 28 (*8/2019)

Source: European Network for Rural Development - own processing

Local Action Groups

In rural development, the LEADER approach is manifested through local initiatives called Local Action Groups (LAGs). The emergence of the LAGs is important for the Leader approach. A LAG is (in political decision-making) an independent community of citizens, public administration (municipalities, associations of municipalities, state institutes, etc.), the private business and non-profit sector, based on the principle of partnership and cooperation at the local level (Agarwal et al., 2009; Eupen et al., 2012) The primary objective of a LAG is to improve the quality of life and the environment in the countryside. The LAG members work together for the rural development and agriculture and to obtain financial support from the European and national programs for their region (Teimann & Thuesen, 2014).

The LAGs use the bottom-up approach to work so that they are separated from the state authority. A LAG operates in a compact rural area, which can cross the border of the region in order to solve the needs of the given area. In the Czech Republic, the first LAGs appeared between 2002 and 2003. Their development was dynamical with 146 of them registered by 2008. In the programming period 2004–2006, first ten LAGs were supported by the EU funds and could redistribute the finances for the projects of the applicants living in their region (Hudečková &. Lošťák, 2008). In the Czech Republic, as of 21st June 2018, there were 179 LAGs, which included 94% of the municipalities of the Czech Republic (26 in Karlovy Vary Region, 18 in Zlín Region, 17 in South Bohemia Region, 17 in South Moravia Region, 16 in Olomouc Region, 16 in Vysočina Region , 15 in Hradec Králové Region, 13 in Pardubice Region, 13 in Moravian-Silesian Region, 9 in Pilsen Region, 8 in Ústí nad Labem Region, 6 in Liberec Region, 5 in Karlovy Vary Region). As the LAGs are based on the needs of the area, they may have territorial jurisdiction over the boundaries of the region (membership of the region is indicated by location of the organization's headquarters). The territory of different LAGs must not overlap each other. The area is integral, not formed by isolated territorial units, apart from the approved exceptions (the military area, the cadastral territory of the municipality is not integrated, the LAG territory is divided by the cadastral territory of the municipality with more than 25 thousand inhabitants).

2 Methods

An interest in rural development increased after the Czech Republic joined the EU, which opened up a possibility to of the access to rural development support. Fourteen years after joining the EU, it is possible to assess what changes have taken place in the country. In 2004-2006, Czech LAGs could not draw European subsidies and their other activities were provided only from national sources under the LEADER + programme (Pelcl et al., 2008; Lošťák &.Hudečková, 2010). The period of 2007 - 2013 was the first complete period of the Czech Republic in the EU and the possibility of drawing on EU funds (. This period was over and the projects in the n + 2 (i.e. 2013 + 2 following years) could still be implemented. The prerequisite for obtaining grants was the fact that the LAG worked out the Integrated Strategy of the Region for the period 2007-2013. For 2014-2020, it is the community-led local development strategy (SCLLD).

As there are more possibilities of LAG evaluation, the evaluation of the LAGs in the region of South Bohemia used in the paper is based on:

a) the evaluation used by the Ministry of Agriculture of the Czech Republic - the representatives of a LAG presented their activities before the Evaluation Committee in the form of a public presentation and documentary evidence in written and electronic form. The Commission, composed of representatives of the Ministry of Agriculture, the State Agricultural Intervention Fund and the National Network of the LAGs, evaluated the LAG. The evaluation focused on their strategic documents, staffing, call management and project selection within the framework of the Leader Strategic Plan, integration and development, monitoring and evaluation, promotion and extension of activities. Based on the number of points obtained, they were divided into 4 groups, as reported by the table 2.

Table 2 Evaluation by the Ministry of Agriculture of the Czech Republic

The LAGs were classified into four groups, based on their score		
	Name of the group	**Explanatory notes**
A	The best performing LAGs –examples of good practice	Highly transparent and trustworthy, active and activating the area
B	Well-working LAGs	Enhanced use of the LEADER method (i.e. they are able to divide the money and they are also able to define a clear strategy and the distribution of finance through such LAGs proves an added value compared to the centralized distribution
C	Average LAGs	They comply with the formal requirements of existence and support, however the distribution of finance through such LAGs is the same compared to the centralized distribution
D	LAGs that should redefine their approach	They are on the edge of what is expected, they only comply with the formal requirements

Source: Ministry of Agriculture – own processing

b) total use of the funds

$$\frac{\text{Total subsidy in } 2007-2013}{\text{Total allocation in } 2007-2013} = \text{Total use of the funds}$$

(1)

It describes the ability of the LAGs to operate, setting appropriate criteria and listing fishes for different programmes.

3 Research results

The evaluation focused on LAG Třeboňsko and LAG Landscape of My Heart (Krajina Srdce) from the region of South Bohemia.

The area of Třeboňsko LAG consists of cadastral territories of five associations of municipalities - the Association of Municipalities of Třeboň, Vitoraz, Veselsko, Řečice and Jindřichův Hradec-Západ. Třeboňsko LAG joined Veselsko LAG in June 2007. The LAG territory Třeboňsko is mostly a rural area with predominant activities in agriculture, forestry and fishing. There are a large number of historical and cultural sites. The entire territory around Třeboň is connected with a long tradition of construction of ponds, which are intended for freshwater fish breeding (the ponds of Svět, Rožmberk). Other economic activities include mining of gravel, peat, glass and brewing industry. Třeboň has the most powerful

economic potential in its spa and health resorts. The LAG area is also covered by NATURA 2000, which represents a set of protected areas of European significance.

Landscape of My Heart LAG (MAS Krajina Srdce, z.s) consist of 46 municipalities, 40 of which are in the region of South Bohemia (NUTS II - Southwest) and six in the region of Central Bohemia (NUTS II – Central Bohemia). At present, 20 978 inhabitants live in municipalities involved in the area of interest, the area is 633.85 km² and the average population density is only 33.1 inhabitants / 1 km². The territory has a rugged character; the Středočeská pahorkatina hills passes into the Bohemian-Moravian Highlands. These two geological formations are separated by the distinctive ditch structure called Blanická brázda, which can be traced about 130 km from Český Brod through Sázava and the area of interest (Šebířov - Mladá Vožice - Ratibořské Hory) to the border with Austria.

In the LAG evaluation used by the Ministry of Agriculture, the maximum score was 200 and the minimum was 50 points. In the region of South Bohemia, the Landscape of My Heart LAG scored a total of 177, rated as A - a best performing LAG, an example of good practice. LAG of Třeboňsko scored a total of 153, ranked as a well functioning LAG, Table 3.

Table 3 Evaluation of the LAGs

Local action groups - - South Bohemian Region		
Name of LAGs	Score	Category
Krajina Srdce (Landscape of My Heart)	*177*	*A*
LAG Strakonicko	177	A
Rozkvět zahrady Jižních Čech (Flourishing Gardens of South Bohemia)	174	A
Sdružení Růže (Association of a Rose)	171	A
Chance in Nature	169	A
Třeboňsko	*153*	*B*
Vltava	147	B
Lužnice	129	C
Blanský les - Netolicko	126	C
Hlubocko – Lišovsko	117	D
Pomalší	116	D

Source: Ministry of Agriculture – own processing

The comparison of total RDP funds used by the LAGs, the LAG of Třeboňsko used 91% of the total allocation. Such share is evaluated rather positively as there is an interest in obtaining grants for the projects and successful project implementation. This also indicates good work within the LAG. The calls were made for the fiches of interest. The applicants were able to submit well-done projects. In the period 2007 - 2014, the LAG of Třeboňsko LAG implemented the LEADER Strategic Plan called Krčínsko Třeboňsko 2007 - 2013, in which it supported a total of 106 projects with an allocation of more than CZK 47 million.

Regarding the Landscape of My Heart LAG, 100% of the funds is used, indicating excellent cooperation within the LAG together with excellent quality management. The calls were made for the fiches of interest and activities the region needs. With the Strategic Plan for the Leader Program period of 2007-2013, was created the "Together – Clean, Make Accessible and Refresh the Landscape" Plan, rated as the best strategic plan of the country by the Committee for evaluating Leader Strategic Plans. Since then, Landscape of my Heart is managing the European Union Funds, distributing them among farmers, entrepreneur's, nonprofit organizations and its partners which are operating in our intervention area.

4   Conclusions

Rural regions deal with the issue of the lack of finance. They are also threatened by depopulation. Municipalities want to improve living conditions to maintain the population and even attract new people (Coffey &.Polese, 2005). For this reason, the municipalities become a part of a LAG. LAGs have the task of redistributing the funds through the Leader approach. This approach is designed specifically for application in rural areas. The strategy is defined by the citizens

who live in the area. This is a bottom-up approach. Each LAG has its own strategy and it is bound to stick to it. The strategy identifies the main priorities to be funded. Based on the main priorities, the fiches are defined. The announced fiches contain a precise description of the conditions that must be met by the applications and the projects that can use the funds. These priorities are supported by funding from the state and the EU. As revealed by the case studies, it is obvious that the impact of the LAG on the rural area is large.

Some LAGs were able to launch the calls for proposal and thus the support of projects. The impact can be judged by the number of projects implemented. Each LAG has managed to implement a large number of projects to improve the situation in rural areas.

The projects focused on different areas. The main objectives are similar for different LAGs. In particular, they include the promotion of small enterprises, the restoration of historical sites and the improvement of the quality of civic amenities in the municipalities. Such objectives were the most funded. The total subsidy amounts supporting the projects are certainly not negligible. These are tens of millions of Czech crowns. In the small regions these resources are appreciable.

The LAGs were also evaluated by other indicators. The partial target of comparing selected LAGs regarding the support gained from the Rural Development Programme was met. The recommendation for the sample LAGs is to focus on other programmes such as the Environment Operational Programme, the Employment Operational Programme and the IROP.

References

Agarwal, S., Rahman, S., & Errington, A. (2009). Measuring the determinants of relative economic performance of rural areas. *Journal of Rural Studies*,25(3), 309-321.

Coffey, W. J., & Polèse, M. (2005). The Concept Of Local Development: A Stages Model Of Endogenous Regional Growth*. *Papers   in Regional Science*,55(1), 1-12.

Eupen, M. V., Metzger, M., Pérez-Soba, M., Verburg, P., Doorn, A. V., & Bunce, R. (2012). A rural typology for strategic European policies. *Land Use Policy*,29(3), 473-482.

European Union. (2017). Strategy Europa 2020 [online]. [cit. 14-07-2017]. Available from: https://ec.europa.eu/info/strat   egy/euro pean-semester/framework/europe-2020-strategy_en

High C, Nemes G. (2007). Social learning in LEADER exogenous, endogenous and hybrid evaluation in rural development. *Sociologia Ruralis*, 47, 103–119.

Hudečková, H., & Lošťák, M. (2008). LEADER in the Czech Republic and farming sector. *Agricultural Economics (Zemědělská Ekonomika),* 54(No. 12), 555-566.

Lopolito A, Nardone G, & Sisto R (2011). Towards a comprehensive evaluation of local action groups in LEADER programmes. New Medit, 1, 43–49.

Lošťák, M., & Hudečková, H. (2010). Preliminary impacts of LEADER approach in the Czech Republic. *Agricultural Economics (Zemědělská Ekonomika),* 56(No. 6), 249-265.

Macken-Walsh, Á. (2011). Partnership and subsidiarity? A case-study of farmers' participation in contemporary EU gov ernance and rural development initiatives. *Rural Society*, 21(1), 43-53.

Nardone, G., Sisto, R., & Lopolito, A. (2010): Social capital in the LEADER initiative: a methodological approach. *Journal of Rural Studies*, 26, 63–72.

Navarro, F. A., Woods, M., & Cejudo, E. (2015). The LEADER Initiative has been a Victim of Its Own Success. The Decline of the Bottom-Up Approach in Rural Development Programmes. The Cases of Wales and Andalusia. *Sociologia Ru ralis*,56(2), 270-288.

Pelcl, P., Havránek, P., Lehmanová, A., & Martínek, J. (2008). Methodology of Local Action Groups´ Good practice in the Czech Republic. Center of Community Work.

Ray, C. (2000). Editorial. The eu leader Programme: Rural Development Laboratory. *Sociologia Ruralis*,40(2), 163-171.

Teilmann, K. A., & Thuesen, A. A. (2014). Important Types of LAG–Municipality Interaction When Collaborating on Rural Development. *International Journal of Rural Management*, 10(1), 21-45.

Evaluation of Selected Indicators in the Social Dimension of Sustainable Development

Magdaléna Drastichová

Abstract: *The social dimension and those aspects of it related to human health are crucial for sustainable development (SD). By means of a Hierarchical Cluster Analysis (HCA), the European Union countries and another four developed European countries were assessed firstly according to their performance achieved in Life expectancy at birth and Death rate due to chronic diseases, and secondly according to these two indicators along with Current health care expenditure (HCE) (Percentage of Gross Domestic Product (GDP)). The first cluster analysis was carried out for 32 countries (the EU countries plus Iceland, Lichtenstein, Norway and Switzerland) and the second one for 30 countries (apart from Malta and Switzerland). Within each of them three partial analyses were conducted, i.e. for 2014, 2015 and both years together. In the analysis based on the first two indicators, four clusters were constructed and in the analysis based on all three indicators, five clusters were constructed. Switzerland and Lichtenstein, showing both low death rates and high life expectancies, can be regarded as the best performing countries. Cluster 2, consisting of Bulgaria, Romania, Latvia, Lithuania and Hungary in both analyses is the worst performing cluster. These countries showed the lowest life expectancies and the highest death rates, while the HCE ratios of Romania and Latvia were lowest in the sample as well.*

Key words: Hierarchical Cluster Analysis · Sustainable Development (SD) · Life expectancy at birth · Current health care expenditure

JEL Classification: I10 · I15 · Q01

1 Introduction

Sustainable development (SD) and achieving SD goals have gained great importance worldwide. Since the World Commission on Environment and Development (WCED) adopted the most quoted definition of the SD, a huge number of measurement methods and indicators of the SD have been developed. According to this definition, SD is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). SD has become an overarching objective of the European Union (EU) enshrined in its primary law, governing all the EU's policies and activities (European Union, 2012). The EU Sustainable Development Strategy (EU SDS) was adopted in 2001 and renewed in 2006. This strategy provided an EU-wide policy framework to deliver SD (European Union, 2009). The Sustainable Development Indicators (SDIs) reflecting the key challenges of the EU SDS and presented in ten themes were used to monitor the EU SDS. The United Nations (UN) adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) in September 2015. They have given a new impetus to global efforts for achieving SD. The SDGs have provided a recent policy framework worldwide for the issues that are crucial for the path of SD. The EU, in coordination with its Member States, has committed itself to support the implementation of the 2030 Agenda. The EU's response to this Agenda is outlined in the 2016 European Commission's Communication (European Commission, 2016). Accordingly, the EU Sustainable Development Goal (SDG) indicator set replaced the EU SDS in 2017.

The three-pillar approach to SD is based on that view of SD which refers simultaneously to economic, social and environmental systems, all of which must be sustainable at the same time. This is because each of these pillars is independently crucial and the pillars are interlinked. Moreover, the institutional dimension is emphasized as the fourth pillar of SD because of its necessity in supporting progress in the previous three pillars and in SD generally (United Nations et al., 2003). Beyond that, the focus on the economic, environmental and social dimensions of SD needs to be extended, or to be more precise, understood in such a way that it includes a human dimension. This point of view and aspects have been considered in the Human Development Reports (HDR) of the United Nations Development Programme (UNDP). The human development approach is focused on expanding the richness of human life, rather than simply the richness of the economy in which human beings live. This approach is focused on people and their opportunities and choices (see

Ing. Magdaléna Drastichová, Ph.D. Technical University Ostrava, Faculty of Economics, Department of Regional and Environmental Economics, Sokolská třída 33, 702 00 Ostrava 1, e-mail: magdalena.drastichova@vsb.cz

more in Drastichová (2018)). Three foundations for human development are to live a long, healthy and creative life, to be knowledgeable, and to have access to resources necessary for a decent standard of living (UNDP, 2016). The World Health Organisation (WHO) defines health as "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (WHO, 2018). Simultaneously, the aspects related to human health are important part of the social dimension of SD.

Healthcare systems are organised and financed in different ways across the EU Member States (Eurostat, 2018b). Halásková et al. (2017) evaluated financing of long-term care based on the volume and structure of long-term care expenditures (the sum of services of long-term health care and social services of long-term care) in the selected OECD countries in 2008 and 2013. The authors showed that the Netherlands and Switzerland (where health care is financed from mandatory public health insurance) and Sweden and Denmark (where health care is financed from taxes) reach the largest volume of total expenditures on health care. These countries also allocated a larger volume of total expenditures on long-term care. By contrast, the countries with low total expenditures on health care, such as Korea, Estonia, Czech Republic, and Hungary, allocated a lower volume of total expenditures on long-term care.

The aim of the paper is to evaluate the performance of the 28 EU countries along with another four developed European countries in selected aspects of the social dimension of SD. A cluster analysis is applied to group the countries firstly according to their performance achieved in Life expectancy at birth and Death rate due to chronic diseases, and secondly according to these two indicators along with Current health care expenditure (HCE) (Percentage of GDP). The first cluster analysis was carried out for all 32 countries and the second one for 30 countries. Within each of them three partial analyses were carried out. The EU countries are included in both analyses, but the data on HCE were not available in Malta. Moreover, Iceland, Lichtenstein, Norway and Switzerland are included, but the data on HCE are not available in Switzerland in 2015. Malta and Switzerland are thus excluded from the HCA of all three indicators. However, the data on HCE in Switzerland are evaluated, particularly those of 2014.

2 Methods

One of the more concrete ways of defining SD/sustainability is represented by the methods of their measurement. Despite the ambiguity of the concept of SD, some attempts to define it, although implicit in many cases, use the form of indicators (Kates et al., 2005). SD includes social, economic and environmental dimensions, along with institutional aspects, and issues related to its measurement have gained great importance. For the assessment of progress towards SD, statistical tools are required (Adamišin et al. 2015). Performance can be measured in particular dimensions of SD by means of the appropriate indicators used for each of them or an aggregate index can be constructed from the separate indicators to show the overall progress in sustainability and SD (see more for example in Drastichová (2017)).

Cluster analysis is an exploratory data analysis tool for sorting different objects (or cases, observations) into groups in a way that the degree of association between two objects is maximal if they are part of the same group and minimal otherwise (Mooi and Sarstedt, 2011). HCA is a method for cluster analysis focused on the identification of relatively homogeneous groups of cases, or variables, based on selected characteristics, using an algorithm that starts with each case (or variable) in a separate cluster and combines clusters until only one is left. Two analyses based on HCA methodology were carried out. In both analyses, the HCA was applied to create clusters from the sample of countries based on the indicator values of two years for which the data were available, particularly 2014 and 2015. Moreover, in both cases the HCA was also applied to all indicator values, i.e. the indicator values in both years. Ward's method is applied as a cluster method. The squared Euclidean distance was chosen from the measures for interval to specify distance. This was decided because quantitative variables were used. As the variables included were measured in different units, the Z-scores were chosen from the available standardization methods. The formula expressed by Equation (1) shows that the Z-score is the indicator value minus the mean value and the resulting value is divided by the standard deviation (Aldenderfer and Blashfield, 1984; Meloun and Militký, 2002; Řezánková, Húsek and Snášel, 2007).

$$Z = \frac{X - \mu}{\sigma} \tag{1}$$

where:
X the value of indicator,
μ mean value,
σ standard deviation.

Three indicators are applied in the analysis and the data of Eurostat (2018a, b) are used. The first indicator applied is Life expectancy at birth, which is defined as the mean number of years that a new-born child can expect to live if subjected

throughout his life to the current mortality. Death rate due to chronic diseases (number per 100 000 persons aged less than 65) is the second indicator applied in the analysis. Both indicators are included in the EU SDG indicator set and represent SDG 3, particularly to "ensure healthy lives and promote well-being for all at all ages", referred to as "good health and well-being" in the EU SDG indicator set Eurostat (2018a). Current HCE (percentage of GDP), which are applied as the third indicator, is included in Healthcare expenditure statistics. HCE quantifies the economic resources dedicated to health functions, excluding capital investment. According to its function, HCE can be further classified by the purpose of healthcare activities, such as curative care, rehabilitative care, long-term care, or preventive care (Eurostat, 2018b).

Efforts were made to include into the analysis as many countries as possible. In the analysis of 2 indicators, 32 countries are analysed and in the case of 3 indicators, 30 countries were included. Resulting from the correspondent dendograms, in the first analysis based on two indicators four clusters were created, and in the second analysis based on three indicators five clusters were created. Two years for which the data were available, 2014 and 2015, were chosen, and the analysis was carried out for the separate years as well as for both years together.

3 Research results

Firstly, the indicator values and the relationships between them are presented for the analysed sample of countries. Secondly, the results of two analyses (and the partial analyses within them) based on the HCA are presented.

3.1 Evaluation of the indicators in the sample

The relations between two pairs of indicators applied are displayed in the following two Figures. In Figure 1, the relationships between the indicators included in the first cluster analysis, which focused on two indicators, are shown. An indirectly proportional relationship between Life expectancy at birth and Death rate due to chronic diseases exists. In both years the correlation coefficient in absolute values is above 0.9 (-0.957 (2014) and -0.968 (2015) for the whole sample). In Figure 1, two larger groups of countries can be seen. The first group showing relatively high death rates and relatively low life expectancies includes ten new member countries (entering the EU in 2004 and later). The Czech Republic (CR) showed the best results in this group. The first group can be further divided into two subgroups; both with five countries, according to their performance in the analysed indicators (see more in subsection 3.2). The remaining three new member countries, i.e. Slovenia, Malta and Cyprus, belong to the second group, which besides them consists of the developed EU countries and all the non-EU countries included in the sample. Lichtenstein showed the lowest death rates along with the significant decrease of the rate between the years (-9.6 persons). Only two higher decreases occurred in the sample, in Iceland and Luxembourg (-13.2 and -10.2 persons respectively), which confirms that these numbers of people were more variable in the small countries. However, the other two small countries, Malta and Cyprus, can be found at the opposite end of the scale, with the second highest increase in the sample in Malta (4.4) and the third highest in Cyprus (3.8). Moreover, the third new member country with a relatively high performance, Slovenia, showed the fourth highest increase in the sample (3.2 persons). Lithuania, which is the country with the fourth highest death rate in 2014, showed the highest increase (4.8 persons) and reached the second highest rate in 2015. In both years, Hungary had the highest death rate. Bulgaria was the worst performing country in the life expectancy indicator in 2014, but in 2015 Lithuania showed a poorest performance as the indicator increased in the first and decreased in the second country. Lichtenstein and Estonia showed the highest increases between the years. On the other hand, Germany, Italy and Cyprus showed the highest decreases. Lichtenstein also achieved the highest ratio of life expectancy to death rate and it was followed by Switzerland. Iceland significantly increased this share although its life expectancy decreased. This country even surpassed Sweden and Norway, which followed Lichtenstein and Switzerland in 2015 (Eurostat, 2018a, b).

Figure 1 Death rate due to chronic diseases (per 100 000 persons aged less than 65) (DR), Life expectancy at birth (years) (LE), 2015

Source: Eurostat (2018a); Own processing

Figure 2 shows the third indicator, i.e. the HCE ratio, which was included in the cluster analysis of all three indicators, in combination with the life expectancy indicator. In this Figure, three groups of countries can be identified. These groups can be specified according to the life expectancy levels. The first group consisting of the five least developed EU countries showed the lowest levels. Slightly higher life expectancies were shown by the other five new member countries, where the CR showed the highest life expectancy. Bulgaria showed the highest HCE ratio among all the countries in these two groups. Although Romania showed the lowest HCE ratio in both years and it even decreased, life expectancies were the fourth lowest in both years. These two groups contain the same countries as those identified in Figure 1, particularly the countries with relatively low life expectancies and high death rates.

France, Sweden and Germany had the highest HCE ratios among the countries of the sample (exceeding 11% of GDP). Moreover, the HCE ratio of 2014 in Switzerland is the second highest in the sample (11.37%), following France. Germany surpassed Sweden in 2015 as the HCE ratio increased only in this country between 2014 and 2015. In both years, they were followed by the Netherlands and Austria, both exceeding 10% of GDP.

Figure 2 Life expectancy at birth (years) (LE), Current health care expenditure (% of GDP) (HCE), 2015
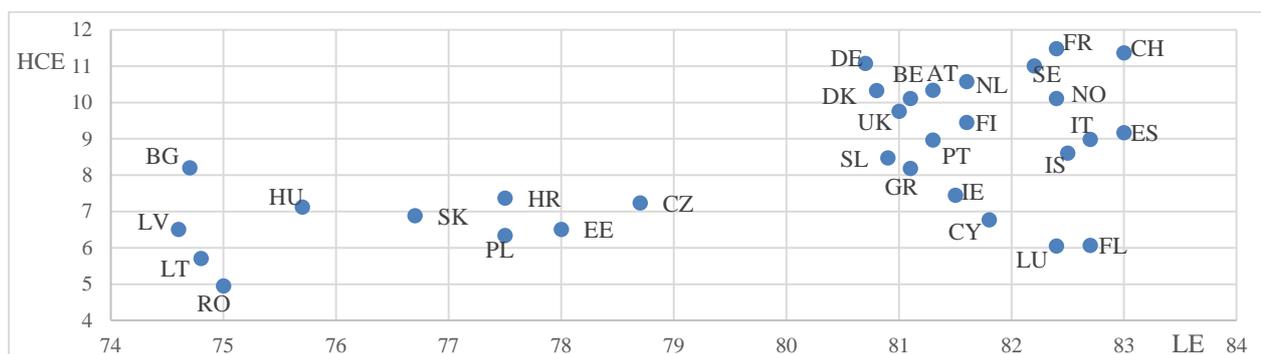
Source: Eurostat (2018a, b); Own processing,

Note: For Switzerland, the HCE ratio of 2014 was used.

Romania, Latvia, Luxembourg and Lichtenstein showed the lowest HCE ratios. The most significant decrease between 2014 and 2015 occurred in Ireland (-2.24 p. p.). Although Lichtenstein had one of the highest life expectancies (the fourth highest in 2015) and the lowest death rates in both years, its HCE share was the third lowest in 2014 and the fourth lowest in 2015.

3.2 Results of the cluster analysis

Following the previous considerations about the division of the sample of countries according to the analysed indicators, the HCA was applied to create clusters according to the indicator values shown in 2014, 2015 and both years together. The results of both analyses in the individual years and both years together are displayed in Table 1.

Table 1 Assignment of countries to clusters in the years 2014 and 2015 and together in both analyses

C	2014(3)	2015(3)	both	2014(2)	2015(2)	both	C	2014(3)	2015(3)	both	2014(2)	2015(2)	both
BE	1	1	1	1	1	1	HU	2	2	2	2	2	2
BG	2	2	2	2	2	2	MT	-	-	-	*1*	*4*	*1*
CZ	3	3	3	3	3	3	NL	1	1	1	*1*	*4*	*1*
DK	1	1	1	1	1	1	AT	1	1	1	1	1	1
DE	1	1	1	1	1	1	PL	3	3	3	3	3	3
EE	3	3	3	3	3	3	PT	*4*	*5*	*4*	1	1	1
IE	4	4	4	*1*	*4*	*1*	RO	2	2	2	2	2	2
GR	*4*	*5*	*4*	1	1	1	SL	*4*	*5*	*4*	1	1	1
ES	*4*	*5*	*4*	4	4	4	SK	3	3	3	3	3	3
FR	1	1	1	4	4	4	FI	4	*5*	*4*	*1*	*4*	*1*
HR	3	3	3	3	3	3	SE	1	1	1	4	4	4
IT	*4*	*5*	*4*	4	4	4	UK	*4*	*5*	*4*	1	1	1
CY	5	*4*	5	4	4	4	IS	*4*	*5*	*4*	4	4	4
LT	2	2	2	2	2	2	FL	5	*4*	5	4	4	4
LV	2	2	2	2	2	2	NO	*4*	*1*	*4*	4	4	4
LU	*5*	*4*	*5*	*1*	*4*	*4*	CH	-	-	-	4	4	4

Source: Own processing

Notes: C – country; the results for the countries that changed their cluster assignment are displayed in italics.

Tables 2 and 3 show the descriptive statistics of the clusters created in both analyses according to all indicator values, i.e. in both years (2014 and 2015). The numbers of countries in particular clusters in both Tables are displayed in parentheses for each cluster. The first analysis was based on two indicators, Life expectancy at birth and Death rate due to chronic diseases. In the analysis of both years together (as shown in Table 2) as well as in the individual years, the results for the descriptive statistics were similar. However, the composition of clusters varied in the partial analyses and therefore the values of statistics were different as well. Cluster 4 showed the highest life expectancies and the lowest death rates, while the opposite is true for cluster 2, which showed the highest death rates and the lowest life expectancies. Cluster 1 is the second best performing cluster in both indicators. The variability measured by Standard Deviation (StD) was the highest in cluster 3 and the lowest in cluster 1 for both indicators in all three partial analyses, except for the life expectancy indicator (2015) in the analysis of both years together. There was the lower StD for this indicator in cluster 4 than in cluster 1. The variability in cluster 4 was predominantly the second lowest. The highest StD at all was reached in cluster 3 for the death rate indicator in 2015.

Cluster 2 consists of the five least developed EU countries placed in the bottom right part of Figure 1 and all these countries with the lowest life expectancies and the highest death rates remained in cluster 2 in both years. Hungary showed the highest death rates in both years and in life expectancies Lithuania showed the worst performance in 2015 as Bulgaria surpassed this country. In Lithuania and Hungary, the life expectancies even decreased between the years, while Lithuania also showed the highest increase in the death rates within the whole sample. Cluster 4 consisted of 10 countries in the analysis based on the indicator values in both years. This group includes two Southern countries – Italy and Spain, three Northern countries – Norway, Sweden and Iceland, Luxembourg, France and Cyprus, as well as the remaining non-EU countries – Switzerland and Lichtenstein. Five countries that changed the assignment between 2014 and 2015 shifted from cluster 1 to cluster 4. This group includes Ireland, Luxembourg, Malta, the Netherlands and Finland. Luxembourg as the only country from this group was assigned to cluster 4 according to the indicator values in both years (see Table 1). In both years, Lichtenstein, followed by Switzerland, showed the lowest death rates. Seven countries included in cluster 4 according to the values of both years followed them. France is the only country whose rates were higher, i.e. over 100 persons (105.3 and 104.2 persons respectively). In all the countries that shifted to cluster 4 the death rates decreased, except for Malta, which showed the second highest increase in the sample. Accordingly, its rate was the highest in this group in 2015 (105.3 persons). However, the increase of the standardized values of the indicator was not that high (the eighth highest in the sample). The remaining shifting countries, i.e. the Netherlands, Ireland and Finland followed the other nine countries (see Figure 1). All the fourteen countries of cluster 4 from 2015 showed the highest life expectancies (in sequence), while the absolutely highest levels were shown by Switzerland, followed by Spain and Italy in both years. The indicator value slightly declined in the Netherlands and Malta and increased in the remaining countries that shifted to cluster 4. However, the standardized values increased in all these countries. The increases of the standardized values were especially high in Finland, Luxembourg and Ireland. This particularly helped Finland and Ireland in moving closer towards cluster 4. Cluster 1 that consisted of twelve countries when the indicators of both years were used showed the decrease in the number of countries from 13 to 8 (Luxembourg is the cluster 4 country also according to the all indicator values). All these countries shifted to cluster 4. Slovenia as the only new member country remained in this cluster in 2015 with the developed EU countries, one Northern country – Denmark, and two Southern countries – Greece and Portugal. All these eight countries followed the fourteen cluster 4 countries as regards the life expectancy indicator. It is similar in the case of death rates; however, Belgium showed a slightly lower value than Malta in 2015. The other cluster 1 countries followed Malta in 2015. The cluster 3 countries follow cluster 1 countries in both indicators, they showed lower performance and the lowest was shown by the cluster 2 countries. Although the changes in the order of countries in particular clusters occurred, the overall order for the cluster 2 and 3 countries remained the same, i.e. these groups showed the lowest and the second lowest performance in both indicators respectively.

Table 2 Descriptive Statistics for the clusters created for both years together in the analysis of 2 indicators

Cl.	Ind.	Min.	Max.	Mean	Std. D.	Cl.	Ind.	Min.	Max.	Mean	Std. D.
1 (12)	DR2014	98.7	128.1	110.892	8.646	**3 (5)**	DR2014	146.2	194.5	168.760	19.124
	LE2014	80.7	82.1	81.408	0.342		LE2014	77.0	78.9	77.800	0.711
	DR2015	98.6	131.3	110.033	9.311		DR2015	141.4	195.2	167.180	21.015
	LE2015	80.7	82.0	81.242	0.382		LE2015	76.7	78.7	77.680	0.736
2 (5)	DR2014	205.7	258.0	230..360	18.741	**4 (10)**	DR2014	70.9	105.3	87.900	10.207
	LE2014	74.5	76.0	74.940	0.627		LE2014	82.1	83.3	82.670	0.483
	DR2015	202.4	255.7	228.420	19.257		DR2015	61.3	104.2	83.980	11.755
	LE2015	74.6	75.7	74.960	0.439		LE2015	81.8	83.0	82.510	0.363

Source: Own processing

Note: Cl. – cluster; Ind. – indicator; Min. – Minimum; Max. – Maximum; Std. D. – Standard Deviation

The average death rates decreased in all the clusters and the most significant decrease occurred in cluster 4. However, life expectancies declined as well, except for cluster 2. To sum up, cluster 4 was evaluated as the best performing cluster showing the best average results in the analysed indicators and with a low variability in these results. Cluster 1 is the second best performing cluster, showing the lowest variability in the results. Cluster 2 is the worst performing cluster and cluster 3 is the second worst, showing the highest variability in the results.

The descriptive statistics for the analysis of three indicators using the indicator values of both years together are displayed in Table 3. The results of the analysis based on all indicator values are the same as those in 2014 (for the values of 2014) because the composition of clusters is the same. In the analysis based on all indicator values, the highest StD values were shown in cluster 3 for death rates, in cluster 4 for life expectancies and in cluster 2 for HCE ratios. Cluster 2 showed the highest average death rates, the lowest life expectancies as well as the second lowest average HCE ratios (following cluster 5). In the separate analysis of 2015, the average HCE ratio was even the lowest. The same five countries as in the analysis of two indicators are included in cluster 2 in both years as well as altogether. These countries are placed in the very left part of Figure 2. This cluster is the worst performing cluster again. Death rates are the lowest in cluster 5 in the analysis based on all indicator values and those of 2014, but they are the lowest in cluster 4 based on the indicator values of 2015. For that year, all four Southern countries, Slovenia, Finland, Iceland and the UK shifted from cluster 4 to cluster 5. On the other hand, Lichtenstein, Luxembourg and Cyprus shifted from cluster 5 to cluster 4. Overall, these three countries are the only countries forming cluster 5 according to all indicator values. This cluster showed the best average results for both life expectancies and death rates according to all indicator values as well as the lowest HCE ratios (along with low variability in the results). The same applies to the separate analysis of 2014. In 2015, these three countries along with Ireland, forming cluster 4, showed the highest average performance in life expectancies and death rates and the second lowest average HCE ratio. So only four small countries were included in cluster 4[2], while the eight countries indicated above shifted to cluster 5. These countries are placed in the upper left part of Figure 1 and in the right bottom part of Figure 2, which indicates that their HCE ratios are relatively low when compared to other countries showing high life expectancies and low death rates. These are particularly the cluster 1 and 4 countries.

Cluster 1 showed the highest average HCE ratios in all analyses. However, this cluster was surpassed in the performance in life expectancies by cluster 5 and cluster 4 in all analyses. This is also the case for death rates in 2015 in the analysis based on all indicator values. The remaining average values of death rates were the second lowest. This cluster was composed of the developed EU countries, including two Benelux countries, two Northern countries, Germany, France, and Austria. The third Northern country, Norway, shifted to this cluster from cluster 4 in 2015, as its death rate declined markedly and the value of life expectancy increased as well. The number of countries increased to 8. This group can be found in the upper right part of Figure 2. Although they can be found at the top of Figure 2, as they showed the highest HCE ratios, they are not in the very right part as they were surpassed by several cluster 4 and 5 countries (according to the year considered). However, Switzerland, which was not included in this cluster analysis, can be found in the very right part, showing the highest life expectancy and the second highest HCE ratio of 2014. The composition of cluster 1 is not the same in the analysis of two indicators, but this cluster can be regarded as the cluster showing high performance again.

Cluster 3 contains the same five countries in all three partial analyses and its composition is the same as in the analysis of 2 indicators and its partial analyses as well. This group can be found in the middle of both Figure 1 and 2. This cluster showed the medium average HCE ratios in both years in all the analyses. The StD value for the HCE ratio was the lowest among the clusters in the analysis of 2015 (the same value is the second lowest in the analysis of both years), while it was the second highest for the HCE ratio in 2014. Its average death rates are the second highest and its average life expectancies are the second lowest in all the analyses. The CR, Estonia, Poland, Croatia[3] and Slovakia in that order directly follow the least developed cluster 2 countries in their life expectancies in 2015 and in the opposite order in their death rates in both years. Thus, the CR was the best performing and Slovakia the worst performing country in this cluster. Life expectancy increased only in Estonia, while the death rate increased only in Slovakia. Although these countries have relatively high death rates in relation to their HCE ratios, their life expectancies in relation to their HCE ratios are relatively high as well, especially those of Poland and Estonia (showing the lowest HCE ratios in this group).

As regards the ratios of death rates to the HCE ratios, Romania along with Latvia, Hungary and Lithuania showed the highest numbers. Switzerland, followed by Sweden and Norway showed the lowest ratios. Those of the Netherlands, France and Italy were among the lowest in both years. Lichtenstein also achieved the highest ratio of life expectancy to death rate and it was followed by Switzerland. Cluster 2 countries can be found at the opposite end of the scale. Those of

---

[2] Malta is not included in this analysis.
[3] Poland and Croatia showed the same life expectancy of 77.5 years in 2015

Hungary were the lowest and those of Bulgaria were the highest in this group. This group as a whole is followed by all cluster 3 countries.

Switzerland and Lichtenstein can be regarded as the best performing countries. In the analysis of 2 indicators, they both were included in the best performing cluster, cluster 4. Lichtenstein showed the highest and Switzerland the second highest ratios of life expectancy to death rate. They both had high life expectancies and low death rates. Lichtenstein showed the lowest death rates in both years and Switzerland the highest life expectancies in both years. Moreover, the relative performance in both indicators in relation to the HCE ratio is high in Lichtenstein, as its HCE ratios were one of the lowest in the sample. Although Switzerland was not included in the cluster analysis, its HCE ratio of 2014 was the second highest, following France. This indicates that the high performance of this country is associated with the high level of the HCE ratio.

Table 3 Descriptive Statistics for the clusters created for both years together in the analysis of 3 indicators

Cl.	Ind.	Min.	Max.	Mean	Std. D.	Cl.	Ind.	Min.	Max.	Mean	Std. D.
1 (7)	DR2014	83.500	114.400	104.586	10.921	4 (10)	DR2014	84.100	128.100	104.840	14.557
	LE2014	80.700	82.800	81.686	0.699		LE2014	81.200	83.300	81.970	0.854
	HCE2014	10.260	11.580	10.787	0.490		HCE2014	7.950	9.690	9.051	0.547
	DR2015	79.100	114.200	102.700	11.478		DR2015	78.900	131.300	102.420	17.118
	LE2015	80.700	82.400	81.443	0.660		LE2015	80.900	83.000	81.800	0.776
	HCE2015	10.110	11.480	10.704	0.496		HCE2015	7.450	10.110	8.918	0.779
2 (5)	DR2014	205.700	258.000	**230.360**	18.741	5 (3)	DR2014	70.900	95.900	83.967	12.538
	LE2014	74.500	76.000	74.940	0.627		LE2014	82.100	82.300	82.233	0.115
	HCE2014	5.030	8.510	6.458	1.387		HCE2014	5.850	6.790	6.303	0.471
	DR2015	202.400	255.700	228.420	19.257		DR2015	61.300	88.900	78.633	15.096
	LE2015	74.600	75.700	74.960	0.439		LE2015	81.800	82.700	82.300	0.458
	HCE2015	4.950	8.200	6.498	1.255		HCE2015	6.050	6.770	6.297	0.410
3 (5)	DR2014	146.200	194.500	168.760	19.124	3 (5)	DR2015	141.400	195.200	167.180	21.015
	LE2014	77.000	78.900	77.800	0.711		LE2015	76.700	78.700	77.680	0.736
	HCE2014	6.210	7.650	6.904	0.673		HCE2015	6.340	7.370	6.870	0.447

Source: Own processing

Note: Cl. – cluster; Ind. – indicator; Min. – Minimum; Max. – Maximum; Std. D. – Standard Deviation

According to the results of this analysis, the efficiency of HCE should be considered. The focus on universal access to quality healthcare, at an affordable cost to both individuals and society as a whole should be regarded as a basic need. The results differed among the countries in the sample as regards each indicator as well as their relationships. The poor performance in life expectancies and death rates along with relatively low HCE ratios was shown by new member countries, except for Malta, Cyprus and Slovenia. The small countries often have different conditions, their population structure may differ and their result were more variable. All these aspects need to be considered. These countries often formed common clusters. All the non-EU countries showed high performance.

4 Conclusions

The aim of the paper was to evaluate the performance of the 28 EU countries along with other developed European countries in selected aspects of the social dimension of SD. The HCA was applied to group the countries firstly according to their performance achieved in Life expectancy at birth and Death rate due to chronic diseases, and secondly according to these two indicators along with the HCE ratio (to GDP). The first cluster analysis was carried out for 32 countries and four clusters were constructed. The second one was carried out for 30 countries (except for Malta and Switzerland) and five clusters were formed.

In the analysis of two indicators, cluster 4 is evaluated as the best performing cluster showing the best average results in the analysed indicators and with a low variability in these results. Cluster 1 is the second best performing cluster, showing the lowest variability in the results. Cluster 2 is the worst performing cluster and cluster 3 is the second worst, showing the highest variability in the results. Ten countries were included in cluster 4 in the analysis based on both years: two Southern countries – Italy and Spain, three Northern countries – Norway, Sweden and Iceland, Luxembourg, France and Cyprus, as well as the remaining non-EU countries – Switzerland and Lichtenstein. The five countries that changed their assignment between 2014 and 2015 shifted from cluster 1 to cluster 4. This group includes Ireland, Luxembourg, Malta, the Netherlands and Finland. Luxembourg is the only country from this group that was assigned to cluster 4 according to the indicator values from both years. Cluster 1, which consisted of twelve countries when the indicators of both years were used, showed a decrease in the number of countries from 13 in 2014 to 8 in 2015. Accordingly, the second

best performing cluster in 2015 consisted of Austria, Belgium, Denmark, Germany, Greece, Portugal, the UK and one new member country, Slovenia.

In the analysis of three indicators, cluster 2 is the worst performing and cluster 3 the second worst performing cluster again. Significant changes occurred in the composition of cluster 4 and 5 in this analysis. Cluster 1 was composed of the developed EU countries, including two Benelux countries, Belgium and the Netherlands, two Northern countries, Denmark and Sweden, Germany, France, and Austria. The third Northern country, Norway, shifted to this cluster from cluster 4 in 2015, as its death rate decreased and its life expectancy increased. Cluster 1 showed the highest average HCE ratios in all analyses. However, this cluster was surpassed in the average performance in life expectancies by cluster 5 and cluster 4 in all analyses. This is also the case for death rates in 2015 in the analysis based on all indicator values. The remaining average values of death rates were the second lowest. The average death rates are the lowest in cluster 5 in the analysis based on all indicator values and those of 2014, but they are the lowest in cluster 4 based on the indicator values of 2015. For that year, all four Southern countries, Slovenia, Finland, Iceland and the UK shifted from cluster 4 to cluster 5. On the other hand, Lichtenstein, Luxembourg and Cyprus shifted from cluster 5 to cluster 4. However, these three countries are the only countries forming cluster 5 according to all indicator values. This cluster showed the best average results for both life expectancies and death rates according to all indicator values as well as the lowest HCE ratios (along with low variability in the results). The same applies to the separate analysis of 2014, when only these three countries are included in cluster 5. In 2015, these three countries, along with Ireland, forming cluster 4, showed the highest average performance in life expectancies and death rates and the second lowest average HCE ratio, following cluster 2. Accordingly, the best performing cluster was cluster 5, apart from the separate analysis of 2015, where the best performance was achieved by cluster 4. More generally, the average performance of other cluster 1 and cluster 4 or cluster 5 countries is also relatively high.

Cluster 2 had the same composition in the analysis of 2 and 3 indicators as well as in all three analyses within each of them. The countries included are Bulgaria, Romania, Latvia, Lithuania and Hungary, which are the worst performing countries showing the lowest life expectancies, highest death rates, while two of them, Romania and Latvia, also have the lowest HCE ratios in the sample. Cluster 3, consisting of the same countries in all the analyses, showed medium average HCE ratios and its average performance in life expectancies and death rates was the second lowest. Only new member countries were included in this cluster as well, that is the CR, Estonia, Poland, Croatia and Slovakia. Accordingly, a poor performance in life expectancies and death rates along with relatively low HCE ratios (except for Bulgaria) was shown by new member countries, apart from Malta, Cyprus and Slovenia. All the non-EU countries showed a high performance. Switzerland and Lichtenstein are evaluated as the best performing countries showing high life expectancies and low death rates.

References

Adamišin, P., Vavrek, R., & Pukala, R. (2015). Cluster Analysis of Central and Southeast Europe via Selected Indicators of Sustainable Development. In: *Environmental Economics, Education and Accreditation in Geosciences: Ecology, Economics, Education and Legislation. (Conference Proceedings: 15th International Multidisciplinary Scientific Geoconference (SGEM 2015) - Vol. 3)* (pp. 135-140). Sofia: STEF92 Technology.

Aldenderfer, M., & Blashfield, R. (1984). *Cluster analysis*. Beverly Hills: Sage Publications. ISBN 978-0803923768.

Drastichová, M. (2018). *The Theory and Measurement of Sustainable Development*, SAEI, 52. Ostrava: VSB-TU Ostrava. ISBN 978-80-248-4171-7.

Drastichová, M. (2017). Measuring Sustainability of the EU Countries with the Selected Indices. In M. Pech (Ed.), *Proceedings of the 11th International Conference INPROFORUM 2017: „Innovations, Enterprises, Regions and Management"*(pp. 11-20): November 9, 2017, České Budějovice: University of South Bohemia in České Budějovice. ISBN 978-80-7394-667-8.

European Commission (2016). Next steps for a sustainable European future. European action for sustainability. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Strasbourg: 22.11.2016. COM(2016) 739 final. [Online], accessed at 1.10.2018. Available at: <<https://ec.europa.eu/europeaid/sites/devco/files/communication-next-steps-sustainable-europe-20161122_en.pdf> [Accessed 17 March 2018].

European Union (2012). *Consolidated Version of the Treaty on the Functioning of the European Union*. Official Journal of the European Union, C 326/132.

European Union (2009). Strategy for Sustainable Development. [Online], accessed at 25. 10. 2016. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV%3Al28117>.

Eurostat (2018a). Sustainable Development Indicators. [Online], accessed at 15. 10. 2018. Available at: <https://ec.europa.eu/eurostat/web/sdi/indicators>.

Eurostat (2018b). Healthcare expenditure statistics. [Online], accessed at 15. 10. 2018. Available at: <https://ec.europa.eu/eurostat/statistics-explained/index.php/Healthcare_expenditure_statistics#undefined>.

Halásková, R., Bednář, P., & Halásková, M. (2018). Forms of Providing and Financing Long-term Care in OECD Countries. *Review of Economic Perspectives*, 17(2), 159-178. ISSN 1213-2446.

Kates, R.W., Parris, Thomas M., Leiserowitz, & Anthony A. (2005). What is sustainable development? Goals, indicators, values, and practice. *Environment: Science and Policy for Sustainable Development*, 47 (3).

Meloun, M., & Militký, J. (2002). *Kompendium statistického zpracování dat*. Praha: Academia. ISBN 80-200-1008-4.

Mooi, E., & Sarstedt, M. (2011). Cluster Analysis. In E. Mooi and M. Sarstedt (Eds.), *A Concise Guide to Market Research*, (pp. 237-284). Verlag Berlin Heidelberg: Springer.

Řezanková, H., Húsek, D., & Snášel, V. (2007). *Shluková analýza dat*. Praha: Professional Publishing. ISBN 978-80-86946-26-9.

United Nations, European Commission, International Monetary Fund, OECD, &World Bank (2003). Handbook of national accounting. Integrated environmental and economic accounting 2003. Studies in Methods, Series F, No.61, Rev.1 (ST/ESA/STAT/SER.F/61/Rev.1). ed.

UNDP (2016). Human Development Reports. [Online], accessed at 16. 10. 2018. Available at: <http://hdr.undp.org/en/humandev>.

WHO (World Health Organisation) (2018). About WHO. [Online], accessed at 10. 10. 2018. Available at: <http://www.who.int/about/mission/en/>.

WCED (1987). Report of the World Commission on Environment and Development: Our Common Future. Oxford: Oxford University Press.

Cooperation between municipalities and financial instruments for regional economic development

Jiří Dušek

Abstract: *On a European scale the Czech Republic is typical of its disintegrated structure and a high number of municipalities, which is typical of other European countries as well, such as France, Italy, Germany and Spain. Nevertheless, the settlement structure is different compared to other EU member states because there are the least populated municipalities on average in the Czech Republic, which is reflected in their economic situation, autonomy and self-sufficiency. The analysis working with 623 municipalities of the South Bohemian Region is based on this very premise. It studies the correlation between the involvement of municipalities in cooperation structures and their success/ability to get grants and subsidies. The research into the involvement of municipalities in different ways and forms of cooperation between municipalities was carried out in 2007-2015. The results were subsequently tested in a correlation and regression analysis, supplemented by descriptive statistics. The analysis showed a clear link between the cooperation level and more success in obtaining grants and subsidies, which also proved a positive effect for regional economic development, because higher involvement of municipalities in the different cooperation patterns means higher absorption ability and regional capacity.*

Key words: Cooperation of municipalities · Municipality · Public administration · Region · South Bohemian Region

JEL Classification: O18· R11· R51

1 Introduction

Regional development instruments can be generally considered as performance aides – support of an activity, says Binek, et al, 2009, p. 59. In the context of zoning development the instrument can be taken as a general term for all resources helping achieve development objectives in the respective area. There are many different perspectives of regional development and/or development of different sectors and material areas, but basic classification based on the nature of the instrument is generally accepted.

2 Regional development instruments

The two main groups of development instruments are Financial Instruments and Non-Financial Instruments and/or Regulation Instruments, as further elaborated by, for example, Klok, 1995, p. 21-36, and Clark and Mountford, 2009, and by Mates and Wokoun, 2006, in the Czech Republic.

Molle, 1990, divides regional policies in two categories as well – macroeconomic and microeconomic instruments and Lacina, 1997, but also Kadeřábková, et al, 1996, Žák, 2006, and others are using the same classification. A collective of authors, 2004, p. 107-113, and Wokoun, et al, 2008, p. 33-37, however point out that in this division there are more instruments than macroeconomic and microeconomic instruments, with no primary economic contents:

➢ macroeconomic instruments (their use is significantly limited by other national policy objectives, e.g. lowering of inflation, current account balance),

  o fiscal policies (regionalisation of taxes and deductions, reduced tax rates in selected supported regions),

  o monetary policy (easier access to loans in selected regions, etc.),

  o protectionism (imposing import limits and duties on products made in non-prosperous regions),

➢ microeconomic instruments (affecting the decisions of economic entities and their localisation),

  o relocation of labour (partial compensation of the cost of moving, purchase of property and support with the purchase of a new apartment),

doc. Ing. Jiří Dušek, Ph.D., College of European and Regional Studies, Department of Science and Research, Žižkova tř. 6, České Budějovice, 370 01, e-mail: dusek@vsers.cz

- o relocation of capital (capital subsidies, subsidies for labour force, cheap loans, tax rebates, transport subsidies, etc.),
- ➢ other instruments (adopted only in exceptional cases) including administrative tools (legal decisions on the suspension of economic activity that is inappropriate in terms regional development), institutional tools (e.g. regional development agencies, etc. Research done within the project "Regional Management as a Way to Sustainable Development of Rural Regions", reg. No. WB-14-04, ZČU in Pilsen and by the College of European and Regional Studies in 2006 shows that despite all the reproach by towns and municipalities regarding the other instruments, it is obvious that regional development agencies have become – for the majority of towns and municipalities – "irreplaceable" partners along with regional authorities (Dušek, Skořepa, 2007, p. 1-6).

The classification stated above and/or pool of macroeconomic instruments is sometimes upgraded by some authors who also add industry policies. These include transportation, energy or agricultural policies. The practical impact of these policies on the individual regions is then connected with a different degree of the concentration of the individual sectors in space (Žítek, 2004, p. 114).

Wokoun, et al, 2008, p. 36, says that the approach to regional policy instruments prepared under traditional foreign literature (more from Yuill and Wishlade, 2001, Klaassen and Vanhove, 1987, and Vanhove, 1999) provides a different perspective. Seven regional policy development instruments are usually mentioned and routinely adopted on the national level. Based on this premise, the following pools of national instruments for regional policies can be identified: infrastructure aid, financial incentives, restrictive means, decentralisation of government authorities, regional allocation of public investments and government contracts, regional development agencies, macropolicy instruments.

Working with the same topics, Beran and Dlasek, 2005, can be mentioned as another example. They determine regional development instruments based on the tools affecting demand generation and hence the long-term economic growth. These include financial instruments, regulation instruments and management instruments, social policy instruments and other instruments. On the other hand, Potůček, 2005, p. 44, does not classify regional development instruments as such, but considers them to be important public policy instruments and names some examples of their implementation: strategic management, political declarations, legal and organisational standards and their development and application, fiscal instruments, and implementation organisation, coordination and management, implementation control, education and indoctrination. The taxonomy of regional development instruments according to the European Union (Stejskal and Kovárník, 2009, p. 87-88), involving different economic incentive-like stimuli, can be mentioned in the end. Different kinds of subsidies and financial aid is the most frequent form of support. The following instruments can be classifies as regional policy instruments from the EU's perspective: labour subsidies (mostly job creation subsidies), tax rebates (often in the form of specific tax-deductible costs), financial subsidies (always up to a certain percentage point of total costs) and further financial aid. There are more authors dealing with regional development instruments: Balík, 2008, Peková, Pilný, Jetmar, 2008, Žárska, 2009, Měrtlová, 2012, Hálová, Alina, 2014, Novotná, Volek, Alina, 2014, Kavan, Brehovská, 2016, Papcunová, Urbaníková, Korenková, 2016, Hrvoľová, Polednáková, Szarková, Krásna, Marková, 2017, and more.

3 Current problems of the settlement structure in the Czech Republic

Perlín, 1999, pp. 91-92, characterises the development of the settlement structure on the Czech territory and states that it is conditioned both by the time of its emergence (12th to 14th century) and by the configuration of the terrain. Rural Czech areas are characterised by small settlements with 30-100 residential buildings and a relatively dense network of smaller towns with 3,000-10,000 residents. These towns are composed of natural shopping centres and centres for the provision of various services. Since the middle of the 19th century, they have also been used as administrative centres for newly emerging state administration (political and judicial districts). Evidence of the fragmentation of the Czech settlement structure is a large number of municipalities or cadastral districts. The individual parts of the municipalities are local areas, the territory of which was originally divided. These parts either exist separately or they may have grown together with another part (urban area) during their further development. Separated parts of rural communities – small groups of houses are quite common in rural areas. In the Czech Republic more than 15,000 parts of municipalities are registered and it is only in rural areas, i.e. outside of towns, where 11,500 parts of rural villages are currently registered. The density of the settlement network can be documented with mean values. For every 10 square km in the Czech Republic there are almost 19 parts of municipalities and when excluding towns, i.e. in rural areas, this value drops to only 15 local parts. However, the number of settlements does not say anything about the administrative structure. The administrative structure, i.e. the structure of public administration, which performs the basic administrative and political administration in the respective area, is highly fragmented in comparison with the surrounding countries, which is due to the historical development and the scattered settlement structure.

The settlement structure of the Czech Republic is characterised not only by large fragmentation, but also by the fact that small municipalities were participating in the disintegration processes. Currently, the smallest Czech municipality is Vysoká Lhota in the Vysočina Region. It has 17 inhabitants. Kuřimany (28 inhabitants) in the Strakonice county is then among the smallest ones in the South Bohemian Region. So while a town needs to have at least 3000 inhabitants to be a town, no such condition exists for municipalities. The municipality can therefore exist with any population. The only condition applying to the size of the municipality is, according to Act No. 128/2000 Coll. on Municipalities (§ 19-25), the case of separation of a municipality from another municipality – a minimum of 1 000 inhabitants. The existence of a large number of small municipalities, mostly the rural ones, since the beginning of the 1990s has been accompanied by a number of long-term issues such as the depopulation of municipalities, population ageing, deterioration in the qualitative and quantitative level of the provision of public services and assets and/or other technical and civic amenities as well as other phenomena. Despite the constant changes in the budget and taxing and the "statistically" growing share of smaller municipalities in the total income of municipalities, there is a significant part of the municipalities with a size of up to 500 inhabitants where the budget has been continuously decreasing, leading to a lack of funds (higher costs of achieving comparable effects in public services or the provision of amenities when compared to larger municipalities) and the deterioration of basic functions of the municipalities and hence further depopulation of the municipalities → the so-called vicious circle of rural municipalities finances. It makes therefore sense that the gradual increase in disparities between municipalities leads to discussions addressing the fundamental contradiction between the democratic right to governance versus economic efficiency and the functioning of small municipalities in a way that makes sense. Any direct attempt to reform and reduce the number of municipalities is hardly feasible in the current political and social situation and the way of gradual economic depletion of municipalities is no correct and conceptual solution to the problem. One solution of this unfavourable situation is a system of financial instruments that could help the most affected municipalities and regions.

4 Methods

Based on the findings from the theoretical sources and from an analysis of the research carried out in the area of interest, the author defined the following hypothesis: "Cooperation between municipalities leads to more success in winning other financial sources". The verification of this hypothesis should refute claims of some authors who speak about a number of instances of inefficient cooperation between municipalities and say that the effect is only formal. These topics have been so far approached only on the level of different forms of cooperation but not on a comprehensive basis, involving all statistically available forms of cooperation. Research into the involvement of municipalities in 12 ways and forms of cooperation between municipalities was carried out in 2007-2015 on a basic set of 623 municipalities in the South Bohemian Region (see more the structure of the C_C coefficient). The results were subsequently tested in a correlation and regression analysis, supplemented by descriptive statistics. To be able to objectively evaluate the intensity of cooperation between municipalities in the region studied, the author constructed model for evaluating the cooperation between municipalities, using a quantification method. The quantitative expression of the dimension represents the value of a synthetic indicator referred to as the Coefficient of cooperation (Cc) – see more in Dušek, 2010, p. 87. The coefficient of cooperation (Cc) is in this contribution used to demonstrate differences in the quality of cooperation among municipalities. The coefficient of cooperation of a given area is calculated as an average of individual coefficients of cooperation found in the studied area.

$$C_C = \sum_{i=MCR}^{EGTC} V_i \tag{1}$$

where:

V_{MCR} member of micro-regions
V_{UTMSBR} member of the Union of Towns and Municipalities of the South Bohemian Region
V_{LAG} member of a local action group
V_{LA21} member of Local Agenda 21
V_{CL} member of clusters
V_{NNLAG} member of National Network of Local Action Groups in the Czech Republic
V_{NHCN} member of the National Healthy Cities Network of the Czech Republic
V_{UTMCR} member of the Union of Towns and Municipalities of the Czech Republic
V_{ALGCR} member of the Association of Local Governments of the Czech Republic
V_{CIC} the municipality is a member of cross-border impulse centres
V_E the municipality is a member of Euroregions
V_{EGTC} the municipality participates in the European Grouping of Territorial Cooperation
i means of cooperation of municipalities

The construction of the formula is based on new typology of means and forms of cooperation of municipalities in the Czech Republic designed by the author, where the formula includes all statistically available forms of cooperation within the studied South Bohemian Region (the formula can be easily modified to suit a different region or even a country). These forms were assigned the same importance 1.0, although their significance for the development of the region varies. The reason for this decision was the fact that municipalities join micro-regions or local action groups first and participate in other "above-standard" types of cooperation later. Rather than the significance of the respective elements, the importance reflects the relevance of the database. In practice, the coefficient of cooperation has a better declaration value in determining equal importance. It is apparent at first sight how many times a town or a municipality has participated in any form of cooperation in the studied region.

5 Research results

There is a number of experts who believe that cooperation is an efficient instrument how to overcome some handicaps of the municipality such as small size, bad geographical location, etc. Income from cooperation shows in the municipal budgets in the transfers received that must be – for the sake of the analysis – adjusted by transfers in the field of delegated power (the municipality performs state administration in its municipal area in matters laid down by the law but the field of power in these matters is the so-called delegated power of municipalities). This means that the town is receiving subsidies for activities performed on behalf of the state, for benefits, social support, etc. Regarding the coefficient of cooperation, most transfers take place in areas of independent power involving the administration of matters that are in the interest of municipalities and their citizens. In financial terms, this applies to grants and subsidies that must be applied for and cannot be claimed (e.g. grants and subsidies from the state budget, regional budget, structural EU funds, etc.). The degree of involvement in municipal cooperation structures can hence significantly affect received transfers but also the entire budget, leading to more growth of particularly small rural municipalities.

A growing trend of received transfers has been confirmed for different coefficients of cooperation (Cc): from CZK 1.1 million for Cc < 1 to CZK 18.6 million for South Bohemian municipalities with Cs 8 and 9 that cooperate most intensively. The analysis cannot evaluate the long-term sustainability of the different cooperation methods that can, in some instances, show the features of purely pragmatic cooperation driven by efforts to obtain as many resources as possible regardless of achieved results and outputs and/or regardless of the long-term benefits for the respective region. Cross-border impulse centres, set up and operating only as long as the subsidies under cross-border operational programmes were being drawn down, are evidence of this. A negative aspect affecting a large portion of South Bohemian municipalities is very high volatility and received transfers (grants and subsidies) as well as the total income. This makes medium-term and long-term planning challenging and even if the transfers can under some circumstances help reduce the fall in income, they cannot fully compensate it.

Figure 1 Received transfers (in CZK '000) for South Bohemian municipalities based on coefficients of cooperation
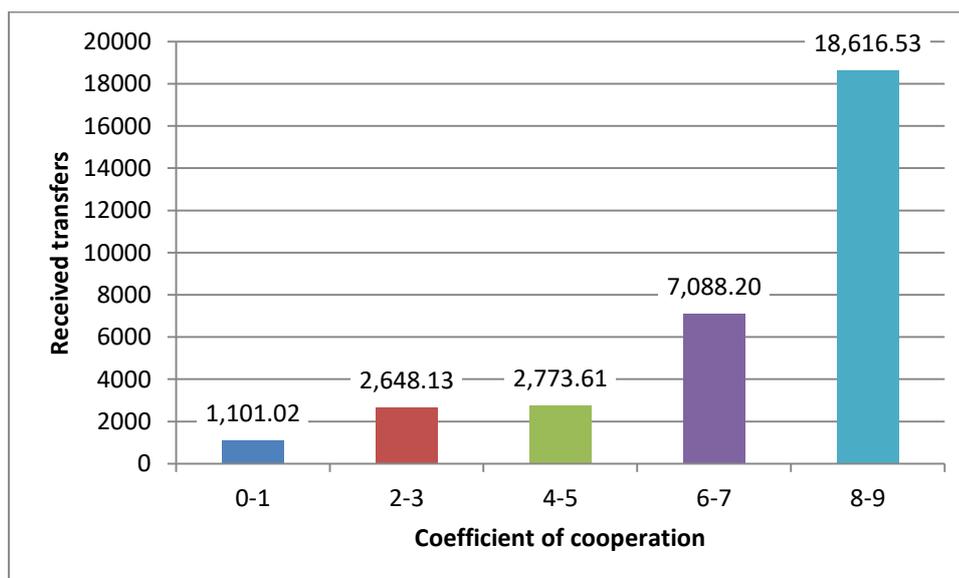
Source: Own processing

The statistical model will produce a pattern in which received transfers of municipalities will be the dependent variable and the coefficient of cooperation will be the independent variable (clarification variable).

$$Received\ transfers = \alpha + \beta \cdot C_C \qquad (2)$$

where:

C_c coefficient of cooperation
α constant
β coefficient β

Table 1 Linear regression output

Regression statistics	
Multiple R	0,148332735
Reliability R	0,0220026
Observation	623

ANOVA

	Difference	SS	MS	F	Significance F
Regression	1	3000526068,44	3000526068,44	13,97101	0,000203
Residue	621	133370903981,05	214767961,32		
Total	622	136371430049,50			

	Coefficients	Standard error of the mean	t Stat	Value P	Lower 95%	Upper 95%
constant – α	-2511,296116	1854,22969	-1,354360859	0,176114	-6152,62	1130,024
Coefficient of cooperation - β	1442,637334	385,9608128	3,737781884	0,000203	684,6908	2200,584

Source: Own processing

The model significance test showed that the proposed regressive model is statistically significant. The P-value of the significance test of the model is equal to 0.0002, so the model is significant on the 1% significance level. The β coefficient estimated says that when the coefficient of cooperation grows by 1, then received transfers among South Bohemian municipalities grow by CZK 1,442,000 on average. The P-value of the coefficient estimated is less than 0.05, so the coefficient can be declared as statistically significant. *Therefore, the hypothesis is confirmed.* The correlation described by the Spearman correlation index being 0.392953 shows medium significance or substantial significance. The constant of the model is insignificant (0.176114), so the model can be created also without the constant or with a constant equalling zero (but then the β coefficient value will change).

6 Conclusions

The analysis showed a clear link between the level of cooperation and the success rate of winning grants and subsidies, because the proposed regression model is statistically significant. We can therefore say that it is mostly those municipalities carrying the disadvantage of their financial, administration and technical environment that obtain better access to grants and subsidy schemes if they get involved in different kinds of municipal cooperation. The financial instruments of regional development will play a significant role in cooperation between municipalities. The most popular and beneficial forms of cooperation between municipalities in the South Bohemian region are microregions (581 municipalities) and local action groups (580 municipalities). Only 16 municipalities are not engaged in any of these two cooperation methods (besides 11 municipalities, there are the towns of České Budějovice and small municipalities from the Jindřichův Hradec area (Dívčí Kopy, Drunče, Dubičné, Zahrádky) that have completely stayed out of cooperation. The reasons of this extraordinary popularity are major financial transfers to the regions: the total financial resources transferred to microregions (voluntary associations of municipalities) was CZK 291 million in 2014. Support from the Rural Development Programme reached CZK 498.7 million in 2017-2013! The annual inflows under grant and subsidy schemes obtained thanks to mutual cooperation are estimated at CZK 350-450 million only in the South Bohemian region. Such a contribution to regional economic development cannot be overlooked. Cooperation between municipalities is no universal and almighty cure of all municipal deficiencies. It entails great efforts, good leaders and cooperation between stakeholders. For all small and big municipalities cooperation is only a potential option which they can, but do not have to use. Unfortunately, despite all the years of existence of different forms of cooperation between municipalities, this regional development

features is still being underestimated in the Czech Republic even though it helps municipalities overcome their different handicaps in more or less formalised cooperation patterns and so obtain resources for their economic growth.

Acknowledgement

References

Balík, S. (2008). *Česká komunální politika v obcích s rozšířenou působností. Koalice, voličské vzorce a politické strany na místní úrovni v letech 1994-2006*. Brno: Centrum pro studium demokracie a kultury.

Beran, V., & Dlask, P. (2005). *Management udržitelného rozvoje regionů, sídel a obcí*. Praha: Academia.

Binek, J., et al. (2009). *Synergie ve venkovském prostoru – Aktéři a nástroje rozvoje regionu*. Brno: GaREP Publishing.

Clark, G., & Mountford, D. (2007). *Investment Strategies and Financial Tools for Local Development*. OECD Publishing.

Dušek, J. (2010). *Faktory regionálního růstu a rozvoje (se zaměřením na spolupráci měst a obcí v Jihočeském kraji)*. České Budějovice: Vysoká škola evropských a regionálních studií.

Dušek, J., & Skořepa, L. (2007). Regionální rozvojové agentury a jejich činnosti. In *Aktuální otázky rozvoje regionů* (pp. 1-6). Pardubice: Fakulta ekonomicko-správní Univerzity Pardubice.

Hálová, P., & Alina, J. (2014). Analysis of Investment in Infrastructure and Other Selected Determinants Influence to Unemployment in CR Regions. In Loster, T., Pavelka, T. (eds.). *8th International Days of Statistics and Economics Location*. Prague : University of Economics. pp. 445-455. ISBN 978-80-87990-02-5. WOS:000350226700044.

Hrvoľová, B., Polednáková, A., Szarková, M., Krásna, S., & Marková, J. (2017). *Ekonomické a sociálne nástroje ako faktor tvorby pracovných miest*. Brno: Tribun EU.

Kadeřábková, J., et al. (1996). *Úvod do regionálních a správních věd*. Praha: CODEX Bohemia.

Kavan, Š., & Brehovská, L. (2016). Spolupráce Jihočeského kraje a přeshraničních regionů se zaměřením na ochranu obyvatelstva. In *19th International Colloquium on Regional Sciences. Conference Proceedings*. Brno : Masarykova univerzita. pp. 907-914. ISBN 978-80-210-8273-1. DOI: 10.5817/CZ.MUNI.P210-8273-2016-117.

Klok, P. J. (1995). A Classification of Instruments for Environmental Policy. In Dente, B. *Environmental Policy in Search of New Instruments* (pp. 21-36). Dordrecht: Kluwer Academic Publishers.

Kolektiv autorů. (2004). *Úvod do regionálních věd a veřejné správy*. 4th edition. Plzeň: Aleš Čeněk.

Lacina, K. (2007). *Regionální rozvoj a veřejná správa*. Praha: Vysoká škola finanční a správní.

Mates, P., & Wokoun, R. (2006). *Management regionální politiky a reforma veřejné správy*. Praha: Linde Praha.

Měrtlová, L. (2012). Porovnání regionálních disparit v regionech České republiky. In *15th International Colloquium on Regional Sciences. Conference Proceedings*. Brno: Masarykova univerzita. pp. 81-90.

Molle, W. (1990). *The Economics of European Integration: Theory, Practice, Policy*. Dartmouth: Hants.

Novotná, M, Volek, T., & Alina, J. (2014). Regional Disparities in Productivity of Small and Medium-Sized Enterprises in the Food Industry. In Klímová, V., Žítek, V. (eds.). *17th International Colloquium on Regional Sciences. Conference Proceedings*. Brno : Ekonomicko-správní fakulta Masarykovy univerzity. pp. 757-763. ISBN 978-80-210-6840-7. WOS:000358536900098.

Papcunová, V., Urbaníková, M., & Korenková, M. (2016). Financovanie preneseného výkonu štátnej správy na úseku matrík na úrovni miestnej samosprávy v SR. In *19th International Colloquium on Regional Sciences. Conference Proceedings*. Brno : Masarykova univerzita. pp. 788-795. ISBN 978-80-210-8273-1. DOI: 10.5817/CZ.MUNI.P210-8273-2016-101.

Peková, J., Pilný, J., & Jetmar, M. (2008). *Veřejná správa a finance veřejného sektoru*. Praha: ASPI.

Perlín, R. (1999). Venkov, typologie venkovského prostoru. In Malý, F., Viktoriová, B. *Česká etnoekologie*. Praha: Cargo.

Potůček, M., et al. (2005). *Veřejná politika*. Praha: Sociologické nakladatelství.

Stejskal, J., & Kovárník, J. (2009). *Regionální politika a její nástroje*. Praha: Portál.

Uill, D., & Wishlade, F. (2001). Regional Policy Development in the Members States: A Comparative Overview of Change. In *Regional and Industrial Policy Research Paper*, no. 45, 49 pgs.

Vanhove, N. (1999). *Regional Policy: A European Approach*. 3rd edition. Aldershot: Ashgate Publishing.

Vanhove, N., & Klaassen, L. H. (1987). *Regional Policy: A European Approach*. 2nd edition. Aldershot: Ashgate Publishing.

Wokoun, R., et al. (2008). *Regionální rozvoj (Východisko regionálního rozvoje, regionální politika, teorie, strategie a programování)*. Praha: Linde Praha.

Žák, M. (2006). *Hospodářská politika*. Praha: Vysoká škola ekonomie a managementu.

Žárska, E. (2009). Finančná kapacita obce ako determinant rozvoja. In *Teoretické a praktické aspekty veřejných financí*. Praha: Oeconomica.

Žítek, V. (2004). *Regionální ekonomie a politika*. Brno: Masarykova univerzita v Brně.

Institutional Limits of Local Development in the Czech Republic

Jaroslav Čmejrek, Jan Čopík

Abstract: *The aim of this paper is to reveal factors limiting the development of Czech municipalities. The subject of interest are the limits related to the municipal establishment and the position of the local self-government in the public administration system of the Czech Republic. There are limits resulting from the specific features of the local democratic process in the Czech Republic, in particular in small towns and rural municipalities. The paper is also focussing on the specifics of decision-making mechanisms in local governments, particularly with regard to investment decision making and the creation and implementation of regional development programmes.*

1 Introduction

The issues of local development and municipal politics in 2018 came to the forefront of the public's interest not only due to the municipal elections, but also primarily in connection with the events on the upper floors of the political vertical. Since 2010, the Czech Republic has been undergoing a turbulent political process characterized by the crisis of programme-based parties, the collapse of the stabilized party system and the arrival of new political parties and movements. When new parties and movements penetrate the national and regional level of the political process, they also try to get positions at the municipal level. Municipal topics had already appeared in the parliamentary election campaign in 2017. The programme of the ANO Movement, the clear winner of the parliamentary elections, included the requirement to strengthen the authority and responsibility of mayors. The Svoboda a přímá demokracie (Freedom and Direct Democracy) movement, which achieved surprising success in the parliamentary elections, included the direct election of mayors and their revocability into the first point of its programme. Similarly, Piráti (Pirates), another dark horse of the last parliamentary election, also had the direct election of mayors and their revocability in their programme. All of these requirements are relating to municipal decision-making mechanisms and their actors. The submitted paper focuses on factors limiting the development of Czech municipalities. These are the factors related to the municipal establishment and the status of local self-governments in the system of public administration of the Czech Republic, as well as factors resulting from specific features of the local democratic process in the Czech Republic, in particular in small towns and rural municipalities. The paper also focuses on the specifics of decision-making mechanisms in local self-governments, in particular with regard to investment decision making and the creation and implementation of development programmes. Data related to the decision-making mechanism in the municipalities of the Czech Republic are based on two surveys. The first of them was a questionnaire between the municipalities' representatives (Kopřiva et al. 2017). The other one focuses on 22 selected municipalities. Data on municipalities were obtained through the study of available documents (websites of municipalities, minutes of meetings of local councils, local chronologies, statistical data, electoral data, etc.) and in particular semi-standardized interviews with local government representatives, e. g. mayors, council members, local political activists etc. (Kopřiva et al. 2017).

2 The position of local governments in the public administration system

The tradition of local self-governments in Bohemia and Moravia dates back to the middle of the 19th century. However, its development was interrupted for over fifty years – first by the Nazi occupation and after the liberation of the State by the establishment of the Communist political system. Until the November Revolution in 1989, territorial public administration represented a three-tier system of national committees, but they were not self-governing. The authorities were formally established by elections, but the principle of pluralism was not maintained during the elections and votes were cast for the joint candidate sheets of the National Front without the possibility to make any choices. Self-governing principles were also contradicted by the submission of lower-level national committees to higher-level national committees.

doc. PhDr. Jaroslav Čmejrek, CSc., Department of Regional Management, FE, University of South Bohemia in České Budějovice; Department of Humanities, FEM, Czech University of Life Sciences, Prague, e-mail: jaroslav.cmejrek@gmail.com

Ing. Jan Čopík, Ph.D., Department of Humanities, FEM, Czech University of Life Sciences, Prague, e-mail: copik@pef.czu.cz

In practice, the national committees functioned as state administration bodies and, like other bodies and offices in the country, were subject to the mechanism of exercising the leading role of the Communist Party, which was enshrined in the Constitution.

Local government was restored in 1990 (Act No. 367/1990 Coll.). However, in the early 1990s, the reform of the territorial public administration was slowed down by controversy over whether the land establishment should be renewed and at what level higher territorial self-governing units should be created. Therefore, in 1990, provisionally before the dispute was resolved, district authorities had to be established as state administration bodies (Act No. 425/1990 Coll.). The temporary existence of district offices lasted for more than a decade until the end of 2002. In the 1990s, local and regional decision-making mechanisms suffered from an incomplete territorial hierarchy of state administration and self-government, unclear competency relationships between institutions and decision-makers and an inefficient system of self-government whose competencies overlapped with the competencies of the state administration. Regional planning was very problematic under these circumstances.

The reform of the territorial public administration began to take on a more concrete form at the end of the 1990s. The dispute over the higher territorial self-governing units was decided in favour of the regions. Constitutional Act No. 347/1997 Coll. created 13 regions (with the exception of the capital of Prague). They were smaller regions compared to the regions that existed between 1960 and 1990, and they were very different from each other in terms of size. By contrast, the districts set up in 1960 remained the same. The disproportion between relatively large districts and the insufficiently large newly-created regions is one of the limiting factors of regional development.

Acts Nos. 129 and 130/2000 Coll. were approved in the year 2000, on the basis of which a regional level of territorial local government was created. At the same time, Act No. 128/2000 Coll. newly modified municipal establishment. After the year 2000, the second phase of the reform of the territorial public administration, which culminated at the turn of 2002 and 2003, could begin. Its main objective was to develop the decentralization and de-concentration processes and the transfer of a number of competencies, which had up to this point been carried out by state administration bodies, to self-government, whether to independent or delegated powers. As of 31 December 2002, the activities of district offices were terminated, and their tasks were mainly transferred to territorial self-government authorities - both in the regions and in the municipalities with extended powers.

At the time when the second phase of the territorial public administration reform was culminating, some experts pointed out the wrong procedure of the reform and that it was un-systemic. "Instead of a coherent and interconnected solution," wrote M. Hampl (2005: 99), "time-separated partial changes were made that became the subject of the rivalry of political parties." The so-called joint model of territorial public administration implemented in the Czech Republic became a source of many difficulties. The Regional Development Strategy of the Czech Republic in 2013 stated: "The negative aspects of the joint model of public administration are manifested mainly by non-observance of the original principles of public administration reform and the enforcement of partial non-systemic decisions. Retention the territorial division of 1960 leads to the non-composability of territorial administrative units. There are many territorial administrative units where public administration is carried out to a varying extent. This state was labelled transitional upon its establishment by the Ministry of the Interior, but it continues to this day. Despite the reform, territorial public administration still faces a number of problems" (Strategy of Regional Development of the Czech Republic 2013: 44). Of these problems, it is necessary to particularly emphasize the complexity of the performance of state administration by the local governments in delegated competence, the confusing division of municipalities according to the exercising of delegated powers, the unclear naming of the administrative territories for the citizens and the unclear separation of autonomous and delegated competencies in a wide range of areas.

3 Local democratic process

The democratic process at the local level is fundamentally influenced by the fragmented settlement structure in the Czech Republic. There were 6,258 municipalities in the Czech Republic on 1 January 2017. Almost a quarter of them (23%) had fewer than 200 inhabitants, more than half (54.9%) had less than 500 inhabitants, and more than three quarters of all municipalities (76.4%) had less than 1,000 inhabitants. There were only 11.6% municipalities with more than 2,000 inhabitants. The vast majority of municipalities are rural municipalities. There are 604 cities in the Czech Republic and there are only six cities with more than 100,000 inhabitants (ČSÚ 2017). The level of political participation of citizens, the degree of pluralism and the form of the local party system depends on the size of the municipality. In large cities, the role of political parties is almost the same as at the national level. In addition, the spectrum of political parties resembles the parliamentary political spectrum in the largest cities. On the other hand, in smaller towns, the party spectrums are incomplete compared to the parliamentary scene and regional entities are employed more. In rural municipalities, the role of political parties is quite marginal. Even where political parties are running for election, their candidate sheets are

usually filled to a large extent, sometimes even exclusively, by independents. In the smallest municipalities with up to 1,000 inhabitants, the local political scene is mainly based on civil society organizations (Čmejrek et al. 2010).

The fragmented settlement structure of the Czech Republic with the predominance of small rural municipalities should be considered something that is given and that needs to be adapted to. Attempts to bring municipalities together, for example by setting the conditions and the coefficients of the budget determination of taxes, have completely ceased to be effective. Therefore, there is also probably nothing left to do but come to terms with the absence of pluralism in the smallest rural municipalities. In terms of local democracy, it is necessary to look for the institutional limits of local development, especially in the setting of the Election Act (Act No. 491/2001 Coll.). In this paper, there is no place for detailed analysis of all of the components of the municipal electoral system in the Czech Republic (see Outlý 2003; Balík 2009), but two aspects deserve particular attention. The first is the personalization of the election, which is of particular importance at the municipal level. The second aspect is the generalization of electoral rules for all size categories of municipalities.

At the municipal level, the personalization of elections is ensured by open candidate sheets, which, combined with multiple votes, allow for preferential voting across the political spectrum, the so-called selection of different candidates from more than one sheet. The purpose of preferential voting is to weaken the dictate of political parties and candidate sheet leaders and open more room for voters to support specific candidates. However, preferential voting was only possible in this form in the early 1990s. In 1994, the Elections Act was amended and there was a significant weakening of the effectiveness of the selection of different candidates from more than one sheet by the introduction of an artificial threshold of 10% into its mechanism. Since then, preferences can only be applied to candidates who have exceeded the average number of votes for the relevant candidate sheet by 10%. This change has weakened the personalization of elections, whilst the position of the candidates preferred by the election party has strengthened (Bubeníček 2004; Outlý 2003).

Practice has confirmed, and municipal politicians have also very quickly understood that, in terms of maximizing the electoral gain, it is essential that the candidate sheet is filled as much as possible, even at the cost of listing candidates who are not actually expected to be part of municipal politics. At the same time, it has been shown that the mandate allocation mechanism disadvantages independent candidates who run alone. Independent candidates can only face this by creating joint candidate sheets, which can sometimes be rather problematic. Attempts to use the option of selecting different candidates from more than one sheet do not often contribute to a better selection of representatives and it only leads to "forfeiting" votes (Bubeníček 2004; Kopřiva and Kotásková 2015, 2016).

Another problem of the Czech municipal electoral system is its generalization. Creating an election system that would be usable and suitable for all size categories of municipalities without distinction is virtually impossible. The effects of the municipal electoral system vary considerably between small rural municipalities on the one hand and large cities on the other. While open candidate sheets are natural in small rural municipalities, and in the largest cities these sheets are at the very limit of technical usability and orientation in them is almost impossible. On the other hand, for smaller towns and rural municipalities, the candidacy of political parties may come across as a disorienting optical illusion. Similarly, the 5% closure clause is also problematic. It makes sense in larger cities, where it prevents excessive fragmentation of the elected representative body, but it is useless in smaller towns and rural municipalities and can be harmful, as it acts against the plurality of the political space. In order to avoid this, the closing clause must be reduced in such cases.

4 Specifics of the decision-making process of local governments

In the Czech Republic, decision-making on local development is entrusted to municipal councils and belongs to the autonomous competence of the municipalities, which is conceived extensively. Councils approve development programmes and the budget, establish municipal organizational units, issue generally binding decrees and decide to announce a local referendum. The Act on Municipal Establishment gives municipalities significant powers, but does not regulate the decision-making mechanism on these issues. Comparing the Czech municipal system to other European countries is not easy, as the situation in European countries is differentiated from this point of view. Comparative studies of local governments in European countries offers different ways to typify European municipalities in terms of competence and political relevance of municipal authorities. The typology of P. E. Mouritzen and J. H. Svara (2002) distinguishes four types of municipal organizations: 1. The Strong Mayor System - a directly elected mayor controls most of the council and also has a majority of executive powers. 2. The Committee Leader System - the mayor or an analogous political leader of the municipality share executive powers with the collective body. 3. The Collective Leadership System in which the collective body has executive powers and whose members are elected members of the council. 4. The Management Committee System, in which all executive functions are in the hands of a professional administration and the mayor has only representative powers (Mouritzen & Svara, 2002).

According to this typology, municipal establishment in the Czech Republic belongs to a collective leadership system. The municipal board is the collective executive body elected by representatives from its ranks, and it is responsible to the council. In municipalities with less than 15 representatives, the board is not elected and most of its powers are exercised by the mayor, who is again responsible to the council. The practice of municipal politics, especially with regard to smaller towns and small municipalities, shows that the mayor's position may be stronger in Czech municipalities than would correspond to inclusion in collective leadership systems according to Mouritzen's and Svars's typology. This was demonstrated by two surveys aimed at obtaining data related to the decision-making mechanism in the municipalities of the Czech Republic.

The first survey was carried out by means of a questionnaire between the municipalities' representatives (Kopřiva et al. 2017). The questionnaire survey involved 3,438 representatives who provided information about 905 municipalities representing 14.5% of the total number of municipalities in the Czech Republic. The questionnaire focused mainly on who provides the investment impulse, the role of the work meetings of the council or work group meetings, what the decision-making mechanism is and what role the individual actors play therein, what is the form of discussion within the municipal council and communication with local citizens.

The second survey of 22 selected municipalities followed the first questionnaire. Data on municipalities were obtained through the study of available documents (websites of municipalities, minutes of meetings of local councils, local chronologies, statistical data, electoral data, etc.) and in particular semi-standardized interviews with local government representatives (mayors, council members, members of council committees and commissions, local political activists). The selection of municipalities respected the considerable fragmentation of the Czech settlement structure, taking into account the differences in the sizes of the municipalities, the different size of the managed property, etc. (Kopřiva et al. 2017).

The research showed that collective decision-making, which corresponds to the relevant system in Mouritzen's and Svara's typology, is particularly characteristic in the Czech Republic for cities with more than 30,000 inhabitants. The collective body that decides is usually the city board, possibly the political coalition or the mayoral college. The size of the municipality is also important in terms of the form of the decision-making mechanism on the key issues of the municipality. In most municipalities, work meetings or seminars of representatives are held before public council meetings. They are primarily held when decisions are made on a municipal budget or more important investments. Work meetings have various functions, such as explaining the agenda, discussing an agenda for the "smooth course of the council meeting", and this may even concern "secrecy" of information and and how to act in front of the citizens of the municipality.

The research has also shown that in smaller cities and non-urban municipalities, mayors play a major role in proposing the agenda of municipalities. They monitor life in the municipality, discuss with citizens, try to solve their problems and satisfy interests arising from citizen participation in public life. The mayors must monitor the state of the municipal infrastructure and inform the representatives and the public about the problems that have arisen, and they also have to look for information on discretionary grant titles that can be used to fund investments in the municipality. This all leads to the development agenda of the municipality. A significant part of the investments are initiated by mayors. Although the municipal council decides on the investment or the form of the budget, mayors are usually those who convinced the representatives about the need to take such a step (Kopřiva et al. 2017).

5 Conclusion

In the Czech Republic, local development is limited by a number of factors related to the fragmented settlement structure, non-systemic steps and inconsistencies in the implementation of the reform of the territorial public administration. They are also related to the problematic elements of the electoral system, which are very different in municipalities of different size categories. In terms of decision-making on municipal budgets and investments, the investigations carried out led to a twofold picture: on the one hand, mayors are the main initiators and promoters of local development, as they have a strong position in rural municipalities and many smaller towns, and on the other hand is manifested the system of collective leadership in bigger towns. In this relation, the natural question is whether these two realities should be better reflected in Czech legislature, both in terms of municipal establishment and the municipal election system.

References

Balík, S. (2009). Komunální politika. Obce, aktéři a cíle místní politiky. Praha: Grada Publishing.

Bubeníček, V. (2004). Komunální volební inženýrství. In Sborník příspěvků z doktorandského semináře 2004. Praha, 17. února 2004. Praha: Provozně ekonomická fakulta České zemědělské univerzity v Praze.

Bubeníček, V., & Kubálek, M. (2011). Interpretation of Local Political Conflicts. Conference on New Dimensions in the Development of Society 2011. Faculty of Social Sciences, Jelgava, Latvia.

Čmejrek, J., Bubeníček, V., & Čopík, J. (2010). Demokracie v lokálním politickém prostoru. Praha: Grada.

ČSÚ 2017. Malý lexikon obcí ČR. Available at https://www.czso.cz/csu/czso/maly-lexikon-obci-ceske-republiky-2017.

Hampl, M. (2005). Geografická organizace společnosti v ČR: Transformační procesy a jejich obecný kontext. Praha: UK v Praze, Přírodovědecká fakulta.

Kopřiva, R., Čopík, J., & Čmejrek, J. (2017). Mechanismy rozhodování o investičních záměrech a rozpočtech obcí. Sociológia, Slovak Sociological Review. Vol. 49, no 5 (2017), p. 588-594.

Kopřiva, R., & Kotásková, S. K. (2016) Political Aspects of Regional Development - the Legitimacy of the Electoral System in the Context of Municipal Councils Elections. SBORNIK PRISPEVKU Z MEZINARODNI VEDECKE KONFERENCE: REGION V ROZVOJI SPOLECNOSTI 2016 Pages: 449-458.

Kopřiva, R., & Kotásková, S. K. (2015) Development of Rural Communities and the Factors Forming Local Political Representation. AGRARIAN PERSPECTIVES XXIV: GLOBAL AGRIBUSINESS AND THE RURAL ECONOMY, Pages: 224-231.

Mouritzen, P. E., & Svara, J. H., (2002): Leadership at the Apex: Politicians and Administrators in Western Local Governments. Pittsburgh: University of Pittsburgh Press.

Outlý, J. (2003). Volby do zastupitelstev – vývoj a souvislosti. Politologická revue 9(2): 17–43.

Strategy of Regional Development of the Czech Republic 2013. Strategie regionálního rozvoje ČR na roky 2014-2020 (2013). Ministerstvo pro místní rozvoj ČR.

Financial and Economic Indicators of Sustainability and Viability of State and Regional Organizations of Property Administration and Maintenance of Highways and Class I, II and III Roads

Miroslav Němec, Darja Holátová

Abstract: *Maintenance of low class roads has numerous aspects to consider. Among the essential ones lists the limited amount of finance allocated to investment activities and a long-term financial limit for these roads maintenance, which is much below the amount required for the essential conservation of the existing situation.*

The notions of "sustainable development" or "sustainability" thus reflect the requirements for public finance, which is limited in a long-term perspective.

Financial management of a subsidized organization established primarily for roads administration and maintenance has many specifics and faces numerous risks. Besides management as such, financial flow management, communication with road users, with construction works suppliers, involved authorities, with municipalities and institutions and with the political representation, it is inevitable to develop marketing activities functioning as information resources and, at the same time, provide the public with a real picture of the situation in the specific field of road administration and maintenance.

The role of managers is, among others, to concentrate management as such, while integrating the issues of financial management, marketing, social aspects of its activities and positive lobbying in the formation of media picture of the relevant organization, and much more.

Effective management of a subsidized organization in the given field must use the standard management methods and involve certain specifics indicated in the presented article.

Key words: Financing infrastructure · Investment · Property administration · Management · Road maintenance · Sustainability

JEL Classification: L20 · M12

1 Introduction

Management in the economic context involves a complex control of financial resources starting from raising capital, other financial resources and budgeting, up to management of the so-called free financial resources. To complete this objective, it is necessary to use a number of methods, techniques and determinants, which can help to better handle financial resources for the whole period of their life cycle. The aim of any organization operating in the free market environment, especially the subsidized entities, should be profit maximization and, in the first place, achieving a maximum market value of the organization.

The main objective of the article is to point out the situation of a road network administered by a subsidized organizations and factors that influence road network maintenance.

2 Financial and economic factors determining company activities

Financial management of an organization

Among the main objectives of financial management list the growth of the company´s market value, continuous solvency and liquidity of the organization. An effective tool for a complex assessment of financial situation is financial analysis enabling the management to take different measures and accept quality decision-making procedures of successful functioning of the organization.

Ing. Miroslav Němec, Správa a údržba silnic Pardubického kraje, Doubravice 98, 533 53 Pardubice, e-mail: miroslav.nemec@suspk.cz

doc. Ing. Darja Holátová, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Management, Studentská 13, 370 05 České Budějovice, e-mail: holatova@ef.jcu.cz

Contrary to book-keeping, which is regulated by national and international standards and regulations, financial analysis is not subject to any particular and harmonized standards and norms. Among the principles of financial decision-making are the following (Vozňáková, Janovská, Sikorová and Mynář, 2008):

- Cash flow, based in the fact that financial flow, i.e. the ways of raising and spending financial means, that is the periods of making profit and also signalize a bad financial condition, are substantial for a successful financial management;

- The principle of a current value based on the fact that an organization is expected to invest in activities showing positive net current value, because the net current value represents the difference between the discounted revenues from its business and expenses on such activity, and therefore it takes in consideration the amount of finance and its scheduling;

- The principle of considering the time factor, which can be expressed in an inflation-free environment by the rule that a Czech Crown owned by the organization at present has a different value from that of tomorrow, i.e. it represents and investment and generating profit (in this particular case);

- The principle risk assessment. Certain degree of risk exists in any organization;

- The principle of capital structure optimization, i.e. finding an optimized bordering point between and owned and foreign capital;

- The principle of capital markets effectiveness which is based on the theory of capital markets effectiveness while differentiating three degrees of effectiveness: high effectiveness, medium effectiveness and ineffectiveness, where no markets may behave entirely effectively due to the existence of abnormalities;

- The planning principle and financial data analysis, where an organization has to thoroughly plan and consequently analyze the compliance with the planned activities.

The Profit and Loss Statement (Synek, 2011) provides the overview of revenues and costs, itemized into operating, financial and outstanding parts in the monitored accounting period, and is always compiled cumulatively for a certain period. As Fotr and Souček (2015) say, a background for Cash flow is a clear overview of the change in financial situation for the given accounting period.

In theory and practice of an organization, we can meet different cash flow categories that differ in its contents, event, method of calculation, etc. These are the following:

- Operating cash flow;

- Investment cash flow;

- Financial activities cash flow;

- Overall cash flow.

Working capital

Synek (2011) wrote that working capital is understood as an equivalent of current assets and as such, it has four parts: stock, long-term liabilities, short-term liabilities and short-term financial assets. Net working capital is an asset required for a company´s operation.

Synek (2011) also says that net working capital (NWC) indicates current assets after deduction of short-term liabilities and can be expressed as follows:

$$NWC = \text{Current assets} - \text{Short-term foreign resources} \tag{1}$$

NWC can be under certain circumstances calculated in the following way:

$$NWC = \text{Working capital} - \text{Short-term liabilities} \tag{2}$$

$$NWC = \text{Stock} + \text{Liabilities} + \text{Financial assets} - \text{Short-term liabilities} \tag{3}$$

Synek (2011) views the net working capital from two different angles: a managerial view aiming at the greatest possible working capital enabling the company to continue their business even if it has to comply with its commitments (the high values of the NWC reduce financial risks of a company); and in terms of the owners, when it is better to minimize net working capital and finance only fixed assets from long-term resources.

Režňáková (2010) wrote that the above mentioned aspects of working capital require determination of the optimized amount of working capital. It is obvious that if the working capital equals zero, the company has no stock and no liabilities; however, it will not dispose of any short-term financial assets (zero working capital therefore makes no sense).

According to Fotr and Souček (2015), the golden rule of financing is a time harmonized structure of assets and liabilities. That is, long-term assets, e.g. buildings or production lines, should be covered by long-term liabilities, especially by the basic fixed assets, undivided profit of past years or by long-term foreign resources. The same analogically applies to short-term assets and liabilities. The reason is the fact that short-term resources are usually expensive for a company and are only available for a limited period of time. It is thus inevitable to reach a higher profit exceeding the costs for acquisition and use of the resources. On the other hand, a company disposes of long-term resources for over one year and only can use them for financing long-term activities, e.g.as an investment in production, buildings, production lines and for other business activities, while their immediate returnability is not required.

Transport and sustainability of transport infrastructure

Transport lists among the most important sectors of national economy; it is a sector characterized by extensive financial requirements. On the other hand, it is a sector which significantly contributes to public budgets. Transport is always consumed in real time and presents a number of risks (especially transport congestions in road transport). The requirement of interoperability in the transport system thus creates pressure to public resources in financing transport infrastructure (construction, maintenance and repairs). Despite a great effort of the involved authorities, the current transport system cannot be considered sustainable in a long-term perspective, and it is inevitable to find a new attitude to its financing.

The White Book (2011) and the Transport Policy (2013) indicate that transport infrastructure creates mobility. It is obvious that no dramatic change in transport will be possible without a corresponding network. Building infrastructure, its renovation and maintenance must be thoroughly planned, designed and carried out in a way respecting the requirements for a sustainable development – i.e. the economic growth will be achieved while negative impact on the environment is minimized.

Annex to the White Book "The Reference Scenarios (2010-2050) of Evaluation of the White Book of Transport" and the analysis of the current situation in sustainable transport and transport infrastructure demonstrate that transport in the following 32 years may not develop the same way (the same applies to its financing).

Principles of evaluation of investment in transport infrastructure

As in other national economy sectors, transport infrastructure accordingly requires evaluation of investment effectiveness, i.e. a thorough prediction of demand for transport and a detailed analysis of costs and benefits, or revenues and effectiveness of the assumed investment.

According to the Sectional Methodology for Evaluation of Economic Effectiveness of Transport Construction Projects (2017), the transport investment benefits involve mainly the following:

- Profit reached from the performed transport, which in terms of transport infrastructure investment applies only in the event that a transport operator is also an owner of the infrastructure, and if end users of the given investment are imposed a fee in the form of transport infrastructure capacity sale and a fee for the use of the infrastructure;

- Benefits and effects by which the investment affects the costs of transport users, or users of the transport infrastructure;

- Benefits and effects by which the investment in transport infrastructure affects the environment;

- Benefits resulting from the state and regional development;

- Indirect external factors, such as improvement or deterioration of social, cultural environmental and other conditions of citizens.

According to the Sectional Methodology for Evaluation of Economic Effectiveness of Transport Construction Projects (2017), a transport investment involves direct and indirect costs of a transport investment, i.e. investment cost affected by an investment project concept and its preferences, maintenance costs relating functionality and effectiveness of transport infrastructure and equipment. The investment amount is affected by a transport infrastructure category, by the character of the territory, climatic conditions, number of bridges, tunnels and other factors and by other indirect costs such as investment cost of the infrastructure construction (e.g. relays of transport and other networks), and by operating costs of the affected parts of the network (i.e. changes to the transport operating costs in others network districts caused by the declining demand).

Investment evaluation may be performed by different methods and by means of appropriately modified and adjusted indicators.

Cash flow from investment

Planning of cash flow investment in transport infrastructure (or in other areas) is, according to Synek (2011), an important part of the whole process and consists of planning of capital expenses and financial revenues relating to the acquisition and functioning of an investment. Capital expenses are expected financial expenses generating the expected financial revenues for a period of over one year. It is essential to differentiate expenses from operating costs where revenues are expected in one year.

The following items are usually listed as material and immaterial investment expenses:

- Expenses for land, machines and equipment acquisition;

- Expenses for the permanent increase of current assets in relation to investment;

- Expenses for research and development;

- Revenues from sales of property replaced by a new investment;

- Tax effects.

Financial revenues from investment involve:

- Profit from an investment during its life-time;

- Depreciation of an investment during its life-time (depreciation is a cost but not an expense);

- Changes of current assets during an investment life-time;

- Revenues from investment property at the end of its life-time;

- Tax effects relating to sales revenues at the end of life-time.

3 Sustainability of road management system

Sustainability of road management system in the Czech Republic

After the World War II, the road management of the Czech Republic was a part of the state military interests and as such, it was controlled by the military and economic treaties of the Eastern Block. This fact also reflected the legislation, organizational structure and financial issues. Priority was given to the transport axis for movement of heavy military technology, including tanks. On the contrary, citizens mobility as well as the access to the west border were largely limited.

The system was controlled centrally by the Ministry of Interior of the Czech Republic; that is by the Transport Administration. The head of this institution was the fifth deputy of the minister of transport. Direct connection to the state administration was carried out through the regional and district national committees.

Regional authorities were responsible for the establishment of organizations called "the road investment units." These organizations, together with the Directorate of Highways, were responsible for investment in highways, speedways and class I, II and III roads. The winter and summer maintenance of all class roads was carried out by district road administration authorities established, controlled and financed by district national committees as budgetary organizations.

So far, the state had always released reasonable amounts for the given field and its financial and economic situation was thus covered. Sustainability was in fact not an issue because nobody had to take any care of it due to the nature of the system operation. Similar situation existed in the west of our state border. Research in sustainability was done rather on the political level (i.e. in connection with sustainability of the political system). It is obvious that the given field has its specifics. As a result of its difference from the common economic activities, there was no need to address the economic sustainability of the transport system in the period 1945 to 1989.

After 1989, within democratic changes in the society, the above mentioned system of financing transport priorities encountered numerous changes. As at 1 October 2001, class I, II and III roads were transferred to the property of the newly established regions. Regional self-administration bodies took over the control over the roads and their maintenance. Their attitude to the problems was different, depending mainly on the left- or right-wing type of local government.

The Act on Roads N. 13/1997 Sb. ordered that road network in the Czech Republic divided in highways, speedways (as specific 1st class roads) and class I, II and III roads. Amendment N. 268/2015 Sb. to this Act, effective of 1 January 2016, newly classified highways and speedways to the 1st and 2nd class highways depending on their expected use.

Sustainable road transport in the Czech Republic, or its property in the form of highways and roads, is conditioned by the ability of financial flows to maintain this property on the level of its mere reproduction, at a minimum.

Highways and class I roads in the Czech Republic have already been below the level of the mere reproduction, therefore financial flows into them prove to be insufficient.

Current financial flows to class II and III (i.e. roads maintained by regional authorities) are described in the following chart. The background documents have been collected on the basis of cooperation with individual regional administration offices. The figure does not show the Ústecký Region because the representatives failed to provide the corresponding source data. In terms of methodology, data collection was used, data analysis, synthesis and its interpretation. Competent representatives of individual regional administration offices have been addressed who provided the primary data sets to be processed, while investment and operating costs calculation followed, including the requirement for the maintenance.

Figure 1 Investment and operating expenses in class II and III roads related to one kilometre of the Czech Republic´s network in 2013 – 2016 e
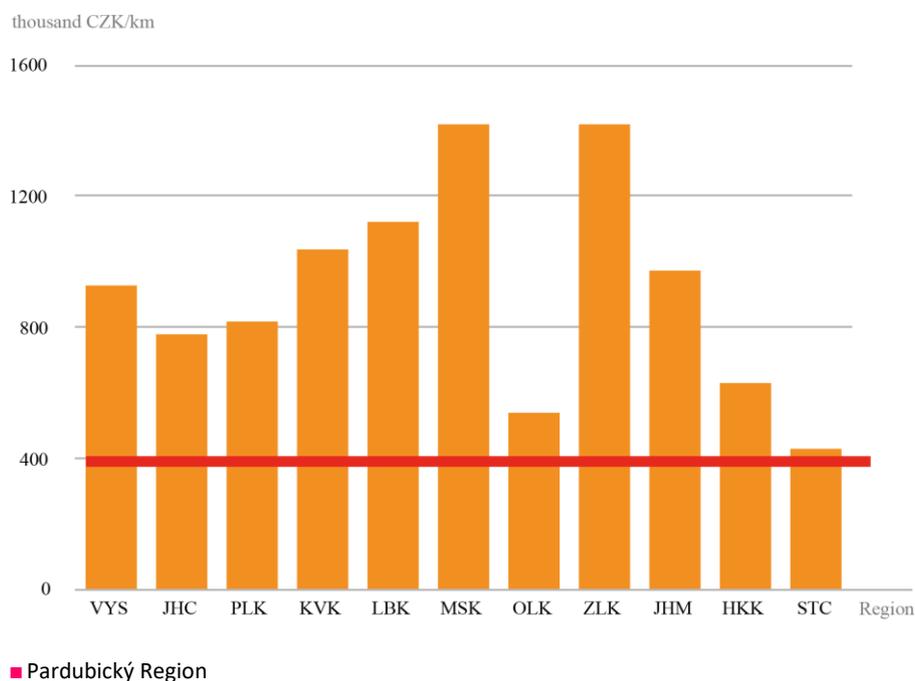
■ Pardubický Region

Source: Internal documents of the Road Management of the Pardubický Region, 2013 – 2016

Unfortunately, at the current financial flows, the property of class II and III roads is not maintainable in the state of a mere reproduction (in a long-term perspective, the current situation will be reflected in the insufficient infrastructure).

Sustainability of the Road management system in the Pardubický Region

Financial flows in class II and III roads are roughly described in Figure 1 in terms of the road management in the Czech Republic. The following part of the contribution analyses the data about the Pardubický Region because the authors dispose of a full database concerning the Region.

The following Table 1 lists results of the research into real value of roads and bridges in the road network of the Pardubický Region. The research proved that the real value of roads and bridges in their area makes CZK 31,778 million. Overall value of roads and bridges was determined based on the so far known technical, technological, financial and accounting parameters, including the requirements for operability and use the system of road and bridge management (a complex data-processing system while designing different options to the road and other subjects management depending on financial resources). The comparison of technical situation, construction period and continuous maintenance resulted in the remaining service life calculation, which determines the financial requirements for the mere reproduction of the existing network size in the given parameters. Another aspect is the time framework conditioned by the remaining service life. It is important to take in consideration that, in regard to the overall network size approaching its end service life, the financial requirements will be higher.

The real value of bridges and roads is defined by the acquisition costs, loss of technical and moral service life, by the costs providing for the operable technical situation, which is a primary purpose of roads and bridges (the corresponding infrastructure for the territory service), and depreciations. We also have to take in consideration the fact that the roads exceeding its service life (at certain events it has already occurred) still serve their purpose (their closing might negatively influence the whole transport system). It is important to stress especially the lower-class roads.

Table 1 Real values of roads and bridges in the Pardubický Region network (mil. CZK)

	Roads		Average residual lifetime (years)	Value of carriageways		Value of bridges			Total value of roads and bridges	
Class	Length (km)	Area (thousand m^2)		Initial	Residual	Number (pcs)	Initial	Residual	Initial	Residual
II	913	6 007	6,3	11 663	5 487	253	700	504	12 363	5 990
III	2 222	12 656	4,2	18 951	8 692	548	465	244	19 416	8 935
Total	**3 136**	**18 663**	**4,8**	**30 614**	**14 178**	**801**	**1 165**	**748**	**31 778**	**14 925**

Source: Internal documents of the Road Management of the Pardubický Region, 2017

Situation of class II and III roads in the Pardubický Region is described in the following two figures (Figure 2 and 3) compiled from the values obtained by research carried out in 2016 in the road network of the Pardubický Region.

Figure 2 Situation of class II roads in the Pardubický Region
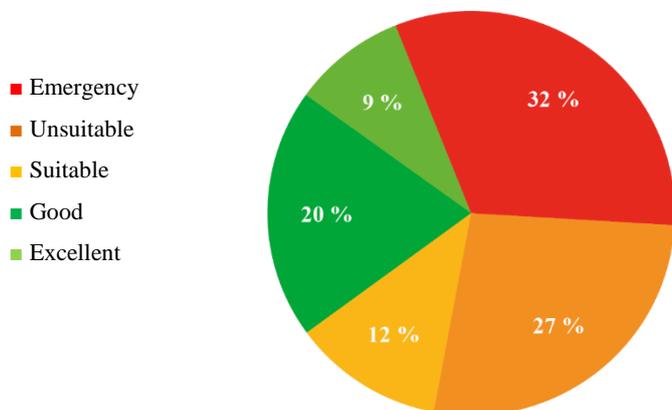
Source: Internal documents of the Road Management of the Pardubický Region, 2017

The research demonstrated that in 2016, 59% of class II roads were in emergency and unsuitable state. Class III roads in emergency state make as much as 87%, which is alarming.

Figure 3 Situation of class III roads in the Pardubický Region
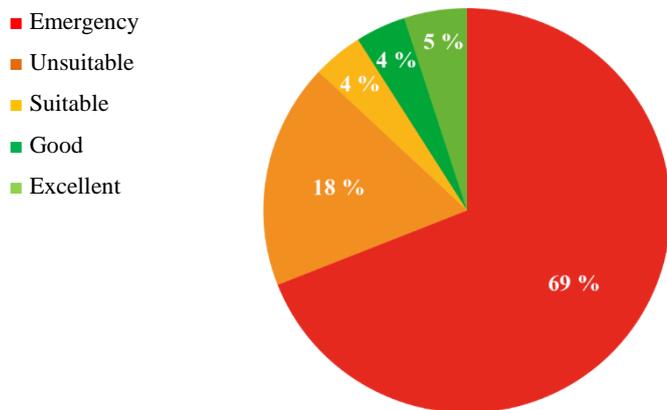
Source: Internal documents of the Road Management of the Pardubický Region, 2017

Monitoring of class II and III roads in the Pardubický Region was carried out repeatedly in the years 2014, 2010 and 2016. Based on the obtained values, we can predict the development of the construction and technical situation of roads in the Pardubický Region. The prediction of the development of class II roads is described in Figure 4; that of class III roads in Figure 5.

The assumed values are based on the linear extrapolation of a data set concerning the construction and technical situation of the given class roads. The data confirm the link between the technical and construction situation of roads and the invested financial resources.

Figure 4 Development of construction and technical situation of class II roads in the Pardubický Region and its prospects
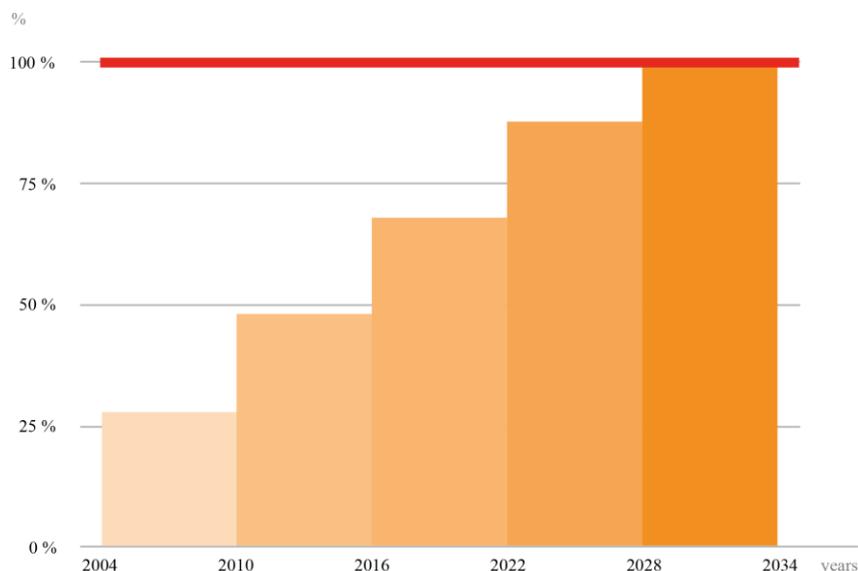
Source: Internal documents of the Road Management of the Pardubický Region, 2004 – 2017

Figure 5 Development of construction and technical situation of class III roads in the Pardubický Region and its prospects
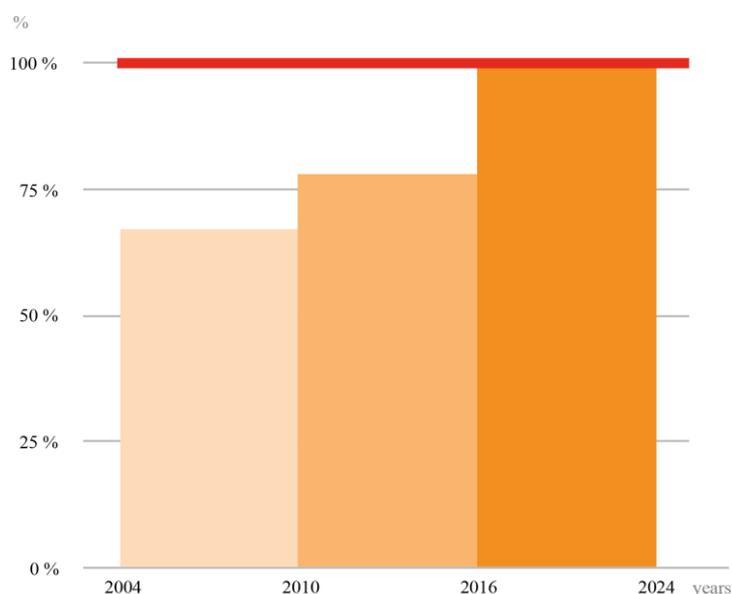
Source: Internal documents of the Road Management of the Pardubický Region, 2004 – 2017

The prospects of construction and technical situation development clearly show that the following decade of this century, the class II and III roads in the Pardubický Region will most probably be in emergency state, unsuitable for all the involved parties. This will happen in the case that the recent financial flows undergo no major change.

The list of results 2004 – 2016 also includes the subsidies from the European Union funds, in particular from the programme Integrated Regional Operational Programme. Should the subsidies be discontinue in the period after 2020, the current financial situation, as well as the future prospects, will become significantly worse.

The return to financing from the national resources also experienced difficulties, since these resources were in the period of the European funding policy included in different chapters, and their return to transport-relating chapter would be extremely difficult.

In the effort to reduce such serious consequences cause by under financing, most road administration organizations take measures to slow down the pace of the transport infrastructure deterioration.

- The first such measure is media support: the general public is, by means of paid advertising, acquainted with the real situation of road property. It is explained that the technical condition is caused by an urgent lack of finance and not by bad management.

- The second measure is use of research results and new technologies.

- The third measure to take is additional economic activity of the road management organizations. This moves between 5 to 25% of the main business outcomes.

- The fourth measure is cooperation with the road management organizations in the regional development projects through the declared public interest.

The above mentioned measures (and their mutual relations) are included in Figure 6 which describes the details of the development of funding, economic activities and their marketing support in a subsidized organization Road Maintenance and Administration of the Pardubický Region.

Figure 6 Development of funding, economic activities and their marketing support in a subsidized organization Road Maintenance and Administration of the Pardubický Region

- ■ Company employees
- ■ Additional activity in total
- ■ Number of employees
- ■ Marketing costs
- ■ Supplier
- ■ Performance on total
- ■ Additional activity productiveness
- ■ Subsidies
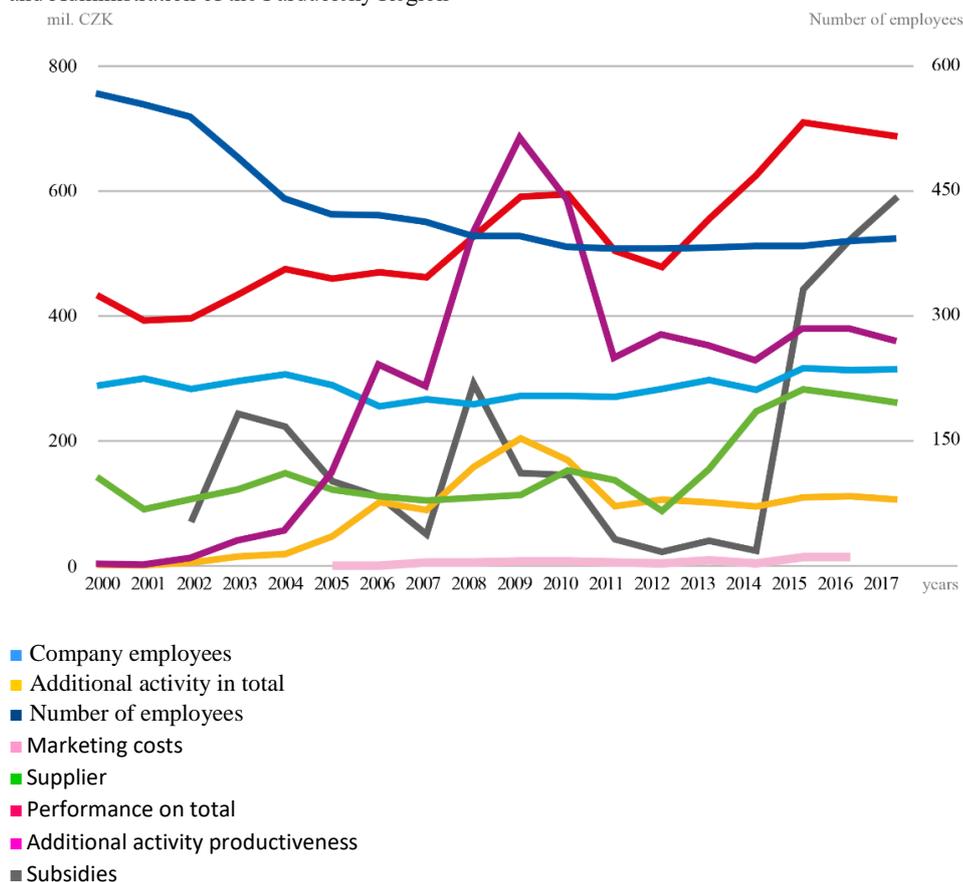
Source: Internal documents of the Road Management of the Pardubický Region, 2016

Figure 6 shows the established balance of the organization in the period 2000 – 2016. The figure demonstrates that the performance of the organization as a supplier and also the performance carried out by its employees show certain growth, and so does the additional economic activity. Summarized activities are shown in the overall performance line of the graph.

4 Conclusion

In any analysis of economic effectiveness of the regional subsidized organization, the Road Management and Administration of the Pardubický Region, it is essential to take in consideration its primary mission for which it was established, that is administration and maintenance of class II and III roads in the property of the Pardubický Region.

It is an organization established for a specific purpose, which is, besides its main business, additional activity – performing specific works and services for other road owners. The organization thus offers a complex service in road constructions.

Obviously, the specifics of a subsidized organization are reflected in the financial indicators, including evaluation of questions relating to roads sustainability. We have to take in consideration two aspects: economic issues of individual activities and influence of the rendered subsidies on the company´s business.

Financial indicators relating to economic performance assessment and financial health of a company (absolute indicators, ratio indicators and solvency and bankruptcy models) not necessarily provide corresponding values of an on-the-purpose-established subsidized organization. In principle, it is necessary to take in consideration the fact that the cost and revenue items in a profit and loss statement are not based on real cash flows.

Financial flow, i.e. the revenues are largely formed from the subsidies and contributions of the establishing body, or from other organizational state bodies and organizations. The ratio of a subsidy to the main business revenues, according to the official documents of the Road Management and Administration of the Pardubický Region, is described in Figure 7.

The chart shows that the management of the organization actively influences fundraising in excess of the subsidies to a subsidized organization (reduction of fund proportion in relation to the main activity revenues).

Figure 7 The ratio of a subsidy to the revenues from the main company business
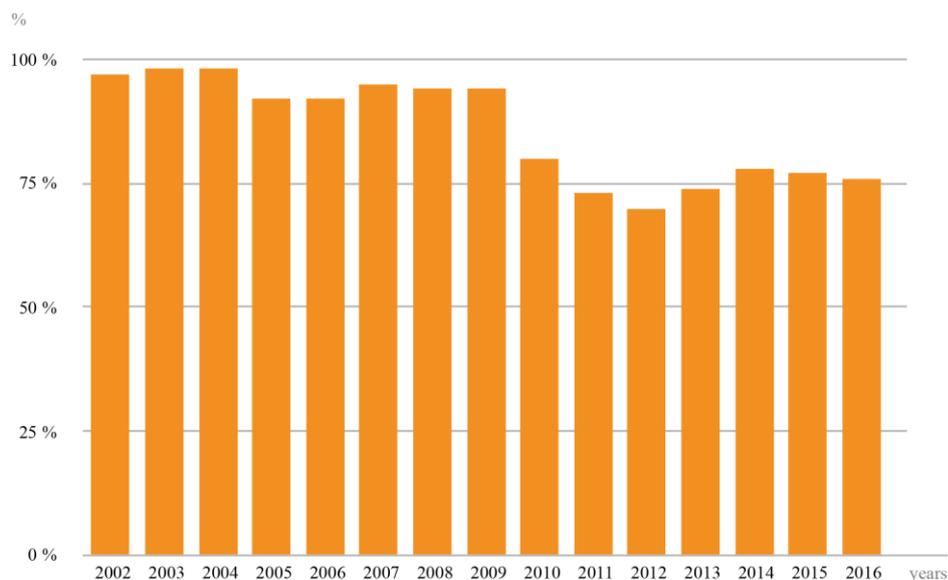
Source: Internal documents of the Road Management of the Pardubický Region, 2002 – 2016

Another factor which determines a long-term business of an organization is the ratio of economic activity to overall business in a relevant year. The ratio is described in Figure 8.

Figure 8 The ratio of economic activity of a company (costs and revenues)

■ Costs
■ Revenues
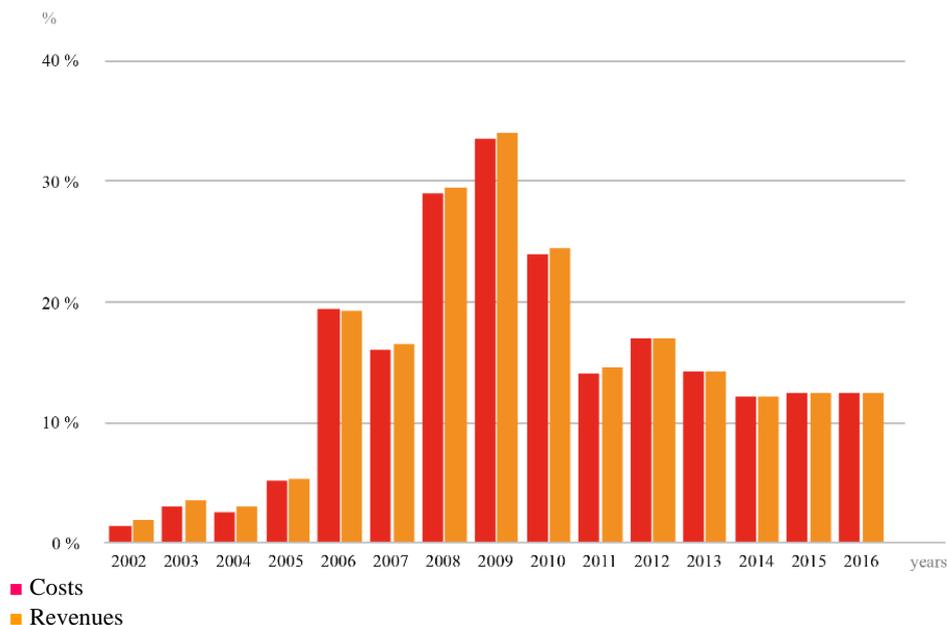
Source: Internal documents of the Road Management of the Pardubický Region, 2002 – 2016

It is obvious that economic activities of the company developed gradually, while its maximum was reached in 2009. In the last three years of the assessment, the ratio of economic activity settled on roughly 13% revenues from all the business.

Figure 8, similarly to Figure 7, shows the growing importance of the commercial activities of the organization: after the initial expansion, the situation became stable (within 10 ÷ 15) %) in costs and revenues. The given case demonstrates a graphic interpretation of the internal bookkeeping data. In terms of future prospects, i tis suitable to further develop the commercial activities.

Overview of the costs, revenues including the rendered subsidies, according to the accounting documents of the organization, is described in Figure 9.

Figure 9 Development of costs, revenues and subsidies (contributions) of the organization

■ Main business costs
■ Economic activity costs
■ Main business revenues
■ Economic activity revenues
■ Operating subsidies
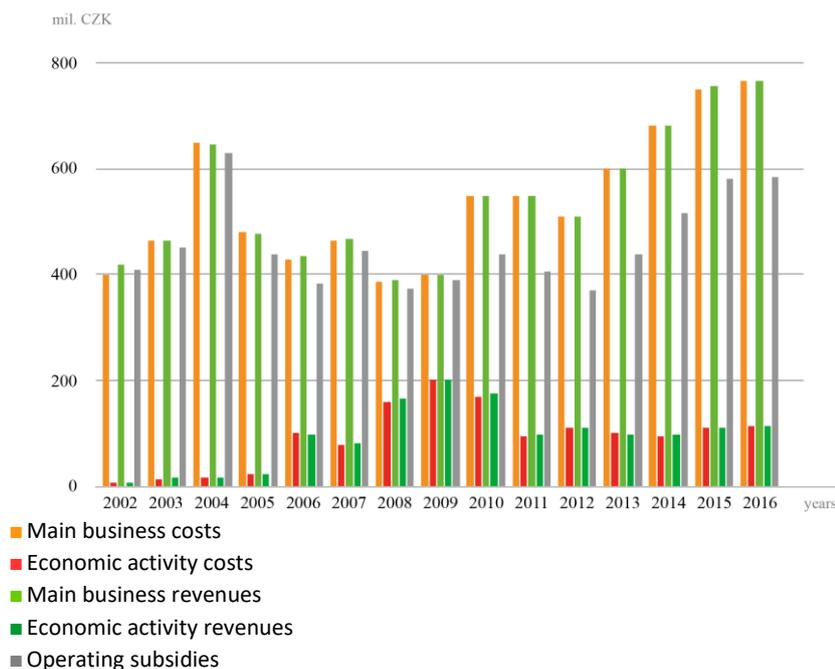
Source: Internal documents of the Road Management of the Pardubický Region, 2002 – 2016

The development of costs, revenues and rendered subsidies results in the correlation of the main business and operating subsidies. The link between the organization and the establishing body represents a strong point; however, it is also a substantial weakness given by the requirement to use the financial resources depending on on-the-purpose financial contributions. Among the positive features is the fact that the organization showed no debt for the whole period of its existence. Fines and penalties did not represent any substantial amounts.

The term „correlation" in the given context is understood as an expression of mutual dependence. Determination of the level of dependence would not be fully objective, especially in regard to the fact that economic activities of individual years are affected by numerous rather variable factors (nevertheless, the significance of commercial activities is obvious).

The financial credit of the company in 2017 was assessed by Moody´s International Rating on international level A2 and national level Aa3.cz.

A major issue for the organization was the termination of activities relating to maintenance of class I roads in 2017.

The company concentrates on fund raising from projects and grant programmes.

A certain degree of risk, being a strong point at the same time, is the direct connection with the establishing body, as the main part of the revenues depends on their contributions.

Another aspect to be taken in consideration is sustainability of the company, i.e. its operability and corresponding condition of the construction and technical situation of the roads. Concerning the current volume of the granted finance and the level of the region, the long-term perspective of the road situation is not maintainable. Many class II and III roads are already in an emergency situation and keep deteriorating.

Is it then possible to reduce the consequences of underfinancing of class II and III roads?

The question presents a complex problem. Reduction of class II and III roads underfinancing can be reached only by the provision of sufficient funds enabling the necessary repairs and also the overall roads reconstruction. Regarding the main purpose of the organization – a subsidized organization – the allocation of funds is mainly on the agenda of the relevant providers. Financial resources are rather limited and their re-distribution is largely affected by political reasons. One of the possible solutions to provide for stability at least on the planning level is the budget tax determination in a way defining a minimum annual financial amounts for class II and III roads. Such measure could eliminate underfinancing of the given roads on the state level. Despite this solution exceeds the capacity of the organization, their main objective is to increase the awareness of the situation through information to public and though marketing activities.

References

EUR – LEX (2011). Bílá kniha: Plán jednotného evropského dopravního prostoru – vytvoření konkurenceschopného dopravního systému účinně využívajícího zdroje. Eur-lex.europa.eu [online]. [cit. 2011-01-17]. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:CS:PDF.

EUR – LEX (2011). Referenční scénáře (2010–2050) ocenění dopadů Bílé knihy k dopravě. Eur-lex.europa.eu [online]. [cit. 2011-01-17]. Available at: http://eur-lex.europa.eu/legal-content/CS/ALL/?uri=CELEX%3A52011DC0144.

EUR – LEX (2011). Zdrojově efektivní Evropa. Eur-lex.europa.eu [online]. [cit. 2011-01-17]. Available at: http://eur-lex.europa.eu/search.html?qid=1509016507349&text=%E2%80%9EZdrojov%C4%9B%20efektivn%C3%AD%20Evropa&scope=EURLEX&type=quick&lang=cs.

Fotr, J., & Souček, I. (2015). *Tvorba a řízení portfolia projektů – Jak optimalizovat, řídit a implementovat investiční a výzkumný program*. Praha: Grada Publishing. ISBN 978-80-247-5275-4.

Ministerstvo dopravy ČR (2013). Dopravní politiky ČR 2014 – 2020, mdcr.cz [online]. [cit. 2013-02-07]. Available at: http://mdcr.cz/getattachment/Dokumenty/Strategie/Dopravni-politika-a-MFDI/Dopravni-politika-CR-pro-obdobi-2014-2020-s-vyhled/Dopravni-politika-CR-2014–-2020.pdf.aspx.

Režňáková, M. a kolektiv (2010). *Řízení platební schopnosti podniku*. 1. vyd. Praha: Grada Publishing. ISBN 978-80-247-3441-5.

ŘSD (2017). Rezortní metodika pro hodnocení ekonomické efektivnosti projektů dopravních staveb. MDČR. Available at: https://www.rsd.cz/wps/portal/web/technicke-predpisy.

ŘSD (2017). Prováděcí pokyny pro hodnocení efektivnosti projektů dopravní infrastruktury. MDČR. Available at: https://www.rsd.cz/wps/portal/web/technicke-predpisy/HDM-4.

ŘSD (2017). Prováděcí pokyny pro hodnocení efektivnosti projektů dopravní infrastruktury. MDČR. Available at: https://www.rsd.cz/wps/portal/web/technicke-predpisy/CBA.

Synek, M. a kolektiv (2011). *Manažerská ekonomika*. 4. přerac. vyd. Praha: Grada Publishing. ISBN 978-80-247-3494-1.

Vozňáková, I., Janovská, K., Sikorová, A., & Mynář, M. (2008). *Ekonomika podniku*. 1. vyd. Ostrava: VŠB-Technická univerzita Ostrava. ISBN 978-80-248-1760-6.

Výkaz zisku a ztrát organizačních složek státu, územních samosprávných celků a příspěvkových organizací. Správa a údržba silnic Pardubického kraje (2002 až 2017).

Agriculture in the Terms of Bioeconomy

Eva Ďurišová, Dominika Čeryová, Natália Turčeková, Peter Bielik, Mária Urbánová

Abstract: *Global population faces various obstacles in the economic, environmental and social spheres and there are many solutions in order to improve the life of society and make it more sustainable. One of the main issues nowadays is an increased exploitation of the natural resources of our planet. Bioeconomy introduces a new approach of the production and consumption of the natural resources without the harm to the environment and with significant economical benefits. Significant part of the bioeconomy is presented by biofuels, which are considered as a renewable source of energy.*

Thus the aim of the paper is to analyze the production and final consumption of the top producers and consumers of the primary solid biofuels in the European Union and the comparison of the results of production and final consumption of primary solid biofuels in Slovak Republic. The first part of the paper describes the current state of bioeconomic development in the European Union. The next part of the research presents the findings of the production and consumption of primary solid biofuels in Germany, France, Sweden, Finland, Italy and Slovakia and its comparison with each other. Also this section determines the impacts of biofuels on the environment. Finally, the last section proposes the recommendations for the utilization of the biofuels. In general, this paper presents the results of the findings about biofuel production and consumption in the European Union. And the aim is to find out which countries are in the top of production and consumption. Last but not least other goals are to find out in which energy sectors biofuels are used more.

Key words: Bioeconomy · Sustainability · Biofuels · Renewable Sources of Energy · European Union

JEL Classification: Q15 · Q18 · Q42 · Q57

1 Introduction

Scientists and organisations define bioeconomy in a different ways. For instance, Shkaruba (2014) defines bioeconomy as a type of economy that is associated with the production and processing of bio resources and determines the application of biotechnology on a large scale. Currently, bioeconomy is a priority and strategic direction of a state development in a number of countries. According to the European Comission [EC] (n.d.) "Bioeconomy is Europe's response to key environmental challenges the world is facing already today. It is meant to reduce the dependence on natural resources, transform manufacturing, promote sustainable production of renewable resources from land, fisheries and aquaculture and their conversion into food, feed, fiber, bio-based products and bioenergy, while growing new jobs and industries." From this statement we can assume that bioeconomy is considered as a perspective future approach in the solution of the general environmental and economic issues. The history of the bioeconomy has described Bobylev et al. (2014) in his researches and he stated that the concept of bioeconomy started to develop actively in the world in the mid - 2000s, when the Organization for Economic Cooperation and Development and the European Commission began to promote programs focused on the bioeconomy in different countries with an aim to realize the potential of biological materials (such as genes, stem cells and fibers) and natural resources (forests and crops) based on biotechnologies for scientific and technological progress and socio-economic development.

1.1 The bioeconomy in the European Union

The European Union is actively involved in the promoting of bioeconomy goals and many member states taking serious national actions toward sustainable future. There is considerable quantity of research done by scientists and various organizations about bioeconomy and renewable sources of energy. Still, there is always a place for improvement. Further researches have to be conducted in order to provide society with more detailed information of all aspects of bioeconomy implementation. Many scientists and organisations define bioeconomy in a different ways. For instance, Shkaruba (2014) defines bioeconomy as a type of economy that is associated with the production and processing of bio resources and determines the application of biotechnology on a large scale. Currently, bioeconomy is a priority and strategic direction

Ing. Eva Ďurišová, MBA, Slovak University of Agriculture in Nitra, Trieda Andreja Hlinku 2, 949 01 Nitra
Ing. Dominika Čeryová, Slovak University of Agriculture in Nitra, Trieda Andreja Hlinku 2, 949 01 Nitra
doc. Ing. Natália Turčeková, PhD, Slovak University of Agriculture in Nitra, Trieda Andreja Hlinku 2, 949 01 Nitra
Dr. h.c. prof. Ing. Peter Bielik, PhD., Slovak University of Agriculture in Nitra, Trieda Andreja Hlinku 2, 949 01 Nitra
Ing. Mária Urbánová, PhD., Slovak University of Agriculture in Nitra, Trieda Andreja Hlinku 2, 949 01 Nitra

of a state development in a number of countries. Social and environmental factors are combined in bioeconomy through the implementation of corporate social responsibility, social partnerships, opportunities for society to influence on the decisions of the government and business entities in order to ensure necessary living conditions for everybody and the production of environmentally friendly products and services (Butenko, 2016). Biotechnology is an essential part of bioeconomy and all its processes. McCormick and Kautto (2013) describe biotechnology as "the science of using living things to produce goods and services. It therefore involves manipulating and modifying organisms to create new and practical applications for primary production, health and industry".

1.2 The biotechnologies in the agricultural

According to Lymar (2015) in the bioeconomy context a considerable contribution to the economic output is provided by the biotechnology. The developing bioeconomy comprises three aspects:

- – Progressive science about genes and complex cell processes for generation of new products and services;

- – The application of renewable biomass and valuable bioprocesses in order to maintain sustainable production;

- – The assimilation of biotechnology awareness and application across sectors.

A variety of the global resource-based issues can be solved thanks to the biotechnology. The benefits are the follows: a rise in the amount of food and fiber production as well as in its environmental sustainability, improvement in the water quality, ability to use renewable energy, advancement in the health system and maintenance of the biodiversity of the species. Nevertheless, in order to achieve successful implementation of the biotechnology in the global economy, there should be applied regional, national and global policies.

1.3 Renewable sources of energy

There are several major types of the renewable sources of energy: solar, wind, hydroelectric power, geothermal and bio-energy. Fossil fuels are not sustainable and not renewable. They have limited sources which will decrease in amount in the long-time period (renewableenergyworld.com, n.d.). Solar energy is a renewable source of energy that uses radiation from the sun to generate heat and power. The sun has created energy for many years and is considered as the fundamental basis for all of the energy sources and fuels that people are using today. Historically, in the past people have used the solar radiation for the purpose of keeping warm and to dry food (meat, fruit, grains). Currently, with the help of innovative technologies people can use solar energy for heating and transform it into electricity (U.S. Energy Information Administration [EIA], 2016).

1.4 Biomass

Biomass was the primary source of energy and materials far before the industrial revolution. However, after the discovery of the potential usage of fossil fuels in the start of twentieth century, utilization of biomass declined. Nowadays, there is a renewed interest in biomass. It can be explained by the mutual aims of bioeconomy and society concern of the environment. Utilization of biomass can result in decrease of society's climate footprint and other issues with the nature, accomplishment of a safer supply of resources and stimulation of bioeconomy (O'Callaghan, 2015). Litvak (2016) defined biomass as a renewable source, which includes any biological material (from agriculture, forestry and animals) and can be presented as a product by itself or as a raw material. Another scientist Champagne (2008) defined biomass as a "…sustainable organic matter feedstock, derived in recent times, directly or indirectly, from plants as a result of photosynthesis." It involves a range of components: forestry and agriculture residues, organic waste, energy crops, wood and municipal green waste. When biomass is produced and utilized on a sustainable base, it does not pollute environment with the carbon emissions and can essentially contribute to the reduction of greenhouse gas emissions.

1.5 Biofuels

The EC (n.d.) defined biofuels as liquid or gaseous transport fuels like biodiesel and bioethanol that are produced from biomass. They provide a renewable alternative to fossil fuels in the transportation sector of the European Union. Biofuel also help to decrease greenhouse gas emissions and develop European security of supply. The European Union set a goal by 2020 to have 10 percent of the transport fuel of every European Union member state originates from renewable sources like biofuels. Additionally, fuel producers are enforced to decrease the greenhouse gas concentration of European Union fuel mix by 6 percent in contrast to 2010. Bio-based products and bioenergy are dominant products of the bioeconomy, at the same time bio refinery is known as a principal technology, which can replace in the next decades petroleum-based refineries. Bio-based transport fuels are generally divided into three classifications. First generation biofuels are produced from food crops, for instance, from wheat, sugar beet and oil seeds. At the same time, second generation biofuels are made from non-food biomass, such as lignocellulose materials, including cereal straw and maize stalks. Third-generation biofuels are based on algae. Just first generation biofuels are produced on a large scale now while the commercialization

of the second-generation biofuels is predicted for future. The third-generation biofuels are currently in an innovative research stage. At the moment, the European Union mainly produces biodiesel from rapeseed (McCormick – Kautto, 2013).

1.6 The European strategies of bioeconomy

In the framework of the EU 2020 Strategy for smart and green growth, in February 2012 the European Commission launched the Communication "Innovating for Sustainable Growth: a Bio-economy for Europe". This Communication presents a Bio-economy Strategy together with Action Plan for promoting more sustainable utilization of renewable natural resources inside the European Union. The goal of the strategy is to guarantee continued supply of healthy and safe food and feed, and also for materials, energy, and other different items. The EU bioeconomy is characterized as all uses of natural renewable resources from land and water as contributions to the industry and energy areas in the primary production of renewable resources and the transformation of these resources into value added items, like food, feed, bio-based products, and bioenergy.

1.7 The sustainable bioeconomy

A sustainable bioeconomy is the renewable segment of the circular economy. It can turn bio-waste, residues and discards into valuable resources and can create the innovations and incentives to help retailers and consumers cut food waste by 50% by 2030. For example, in the livestock sector innovations increasingly allow to safely turning certain food waste into feed for animals, provided the applicable rules and legal requirements are observed.14 It is estimated that the land - currently used to feed animals - that could be saved through these innovations could feed three billion additional people.15 Cities should become major circular bioeconomy hubs. Circular urban development plans could translate into very significant economic and environmental gains. For instance, the city of Amsterdam estimates that the better recycling of high value organic residue streams could generate EUR 150 million in added value per year, create new 1.200 jobs in the long run and save 600.000 tonnes of carbon dioxide annually. (A sustainable Bioeconomy for Europe, 2018)

A sustainable Bioeconomy for Europe:strengthening the connection between economy, society and the environment, 2018 (Brussels, 11 October 2018) - An action plan to develop a sustainable and circular bioeconomy that serves Europe's society, environment and economy. It aims to improve and scale up the sustainable use of renewable resources to address global and local challenges such as climate change and sustainable development.

2 Methods

The extreme importance in the economy has energy production, because all sectors of economy utilize energy sources. Agriculture in the terms of bioeconomy can be an excellent source of energy, so-called energy from renewable sources. One of the types of such energy is biofuel. The aim of the research is to conduct an analysis of the production and consumption of the primary solid biofuels in the European Union and to find out the advantages and disadvantages of their utilization in order to promote the use of the renewable energy sources over fossil fuels. The units of the analysis of the research are member states of the European Union. The information is mainly presented in the form of graphs in order to show the clear picture of the current situation of the utilization of the renewable sources of energy.

Partial goals of the research are:

− to analyze the current status, from the latest data available, of the production and final consumption of the member states of the European Union of the primary solid biofuels in the year 2015;

− to find out top five producers of the primary solid biofuels and countries which consume the most types of renewable energy; compare its production and consumption during the time period from 2013 till 2015;

− to analyze the impacts of the primary solid biofuels on the environment and its advantages and disadvantages.

The subject of the research is the production of renewable energy and its utilization in the European Union. Specifically, in the paper the production and consumption of the primary solid biofuels in the member states of the European Union will be observed. Also, it discusses the impact of the biofuels on the environment with its advantages and disadvantages. The working process of the research consists of the following steps:

− gathering and studying information from Eurostat Database and International Energy Agency,

− analyzing the summarized data about bioeconomy, renewable energy use, biofuels and the support of these fields from the states of the European Union; and compare the findings about different member states of the European Union,

− proposing the recommendations and improvements for further development of the selected research area.

For evaluation and interpretation of the results of this research following methods has been used:

- Analytical methods – evaluating of the relevant data from Eurostat Database and International Energy Agency, finding the way of the improvements or the cause of failures, proposing the solutions;

- Statistical methods – combining data through grouping and visualizing processes; processing information in the form of bar charts, line charts and pie charts;

- Synthesis methods – summarizing results of the research.

The main results and recommendations will be presented at the end of the paper in the part of Conclusion.

3 Research results

The demand for biomass is expected to double over the period of the next thirty years. Especially it is predicted by scientists that there will be a rapid increase in the use of biomass for energy purposes. Recently the utilization of biomass for energy production has been the subject of intense debate in the world and particularly in the European Union. There are many producers and member states in favor of bioenergy, but there are also many contradictions among different opinions. From one side there are many advantages of the utilization of the bioenergy like the fact that the use of biomass in the energy production is greenhouse gas neutral. From the other side, many people believe that the natural resources like land and water used for biomass crops would be better used for food production.

3.1 Primary solid biofuels and its utilization

The production of bioenergy, especially biofuels, is very popular in the member states of the European Union. International Energy Agency [IEA] presenting various data each year about the production and consumption of all types of energy by almost all countries in the world. They divide energy statistics by the data about coal, electricity and heat, natural gas, oil and, renewables and waste. Primary solid biofuels are characterized as any plant matter that is directly utilized as a fuel or generated into other forms before combustion. As an input for primary solid biofuel can be used materials from wood converted by industrial processes or supplied directly from the agricultural and forestry sectors like wood chips, firewood, bark, sawdust, shavings, animal wastes and other solid biomass. Primary solid biofuels can be used for power generation and heat purposes in the industry, commercial and public services, agriculture, forestry and for residential purposes. The major part of the production of primary solid biofuels is going to the generation of electricity. Electricity plays a significant role in the lives of people. From the running the water on manufacturing plants till the surfing in Internet in residential areas – all this requires electricity. Not less significant part of generation of primary solid biofuels is going into the production of heat. The raise of the energy prices caused the increased interest to the solid biofuels and it led to the search of the innovative ways of energy production with improved efficiency, decreased emissions, and better convenience.

3.2 The production and final consumption of the primary solid biofuels in the European Union

The figure 1 describes ten biggest producers of primary solid biofuels in the European Union, Slovak Republic production as well as two countries with the least productions in year 2015 within the European Union based on the latest data available. As we can see, the undaunted leader when it comes to production of primary solid biofuels is Germany with more than 470 000 terajoules (TJ) [13.23 % - Share in EU] in year 2015. It is not surprising, due to the fact that Germany is the biggest economy of the European Union. The second place is taken by the second biggest economy in the EU, France with almost 380 000 terajoules [10.61 % - Share in EU] production of primary solid biofuels, showing the traditional economy tandem of Franco - German cooperation within the EU. The third place is occupied by very innovative and developed country in terms of bioeconomy, Sweden with production a little over 370 000 terajoules [9.23 % - Share in EU]. Another representative of northern countries is Finland. The total amount of primary solid biofuels is approximately 340 000 terajoules [8.67 % - Share in EU] in year 2015 for Finland. The fifth biggest producer of biofuels is surprisingly Italy. Even though Italy has the comparable welfare as Slovakia, it is more ahead in production of biofuels and with their over 270 000 terajoules [8.05 % - Share in EU] they got ahead of countries such as Spain (216 066 TJ; 5.77 % Share in EU), Austria (183 258 TJ; 4.94 % Share in EU) and even United Kingdom (127 606 TJ – 4.21 % Share in EU). Slovak Republic performed it the lower part of division with production of primary solid biofuels in amount of nearly 32 000 terajoules [0.98 % - Share in EU]. On the other side of our comparison is Cyprus with least production from all countries, 355 terajoules (0.01 % - Share in EU). One place ahead of Cyprus is Luxembourg with their production of 2 756 terajoules (0.06 % - Share in EU) in year 2015. But due to the size of the country this low production rate is quite understandable.

Figure 1 Top producers of the primary solid biofuels in the European Union in 2015

Production (TJ)
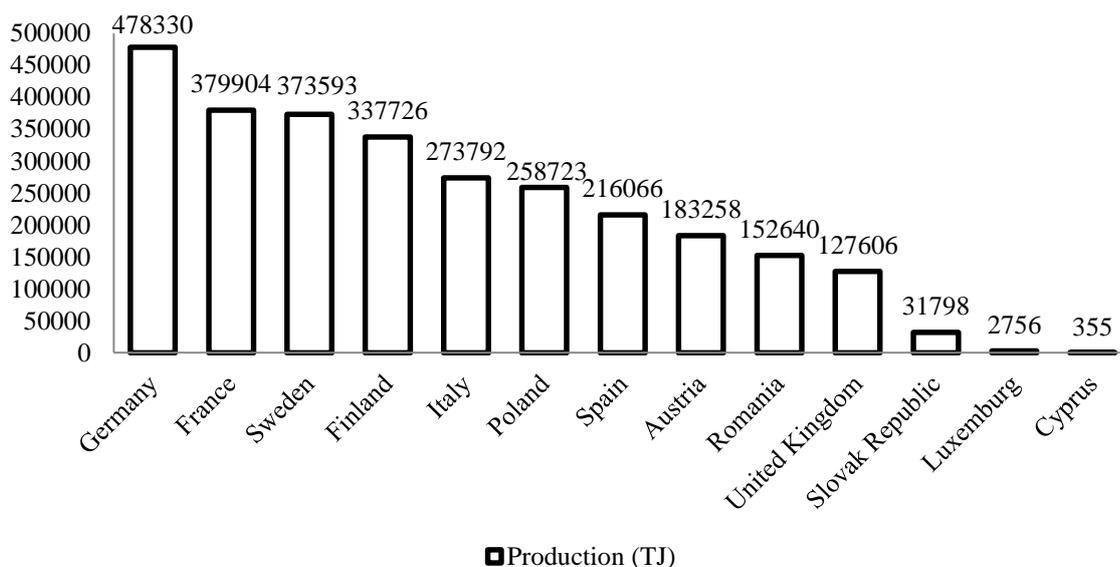
Source: International Energy Agency - Own processing

The figure 2 shows us data about final consumption of the primary solid biofuels for ten countries with biggest consumption, Slovak Republic consumption and countries with two least consumption within the European Union for year 2015. When it comes to consumption, we have the same leader as in production. It is Germany with over 328 000 terajoules (share in EU-28:19.3 %) for year 2015. France occupies the second place, very tightly behind Germany, with consumption more than 322 000 terajoules for year 2015. Third biggest consumer of biofuels is Italy, which consumed over 251 000 terajoules. Nordic countries take another two places. With consumption of slightly over 217 000 terajoules at fourth position ended up Sweden followed by fifth place Finland with its final consumption around 202 000 terajoules of the primary solid biofuels for year 2015. Quite interesting seems fact that developed countries such as Austria (124 125 TJ) and United Kingdom (85 089 TJ) consumed much less primary solid biofuels that other comparable economies within the European Union. Slovak Republic performed over 15 000 terajoules in year 2015, which is the lower part of the distribution. The two countries with the least consumption were Ireland and Luxembourg. Ireland did consume only 8 191 terajoules and Luxembourg 2 039 terajoules of primary solid biofuels in year 2015.

Figure 2 Top consumers of the primary solid biofuels in the European Union in 2015

Final consumption (TJ)
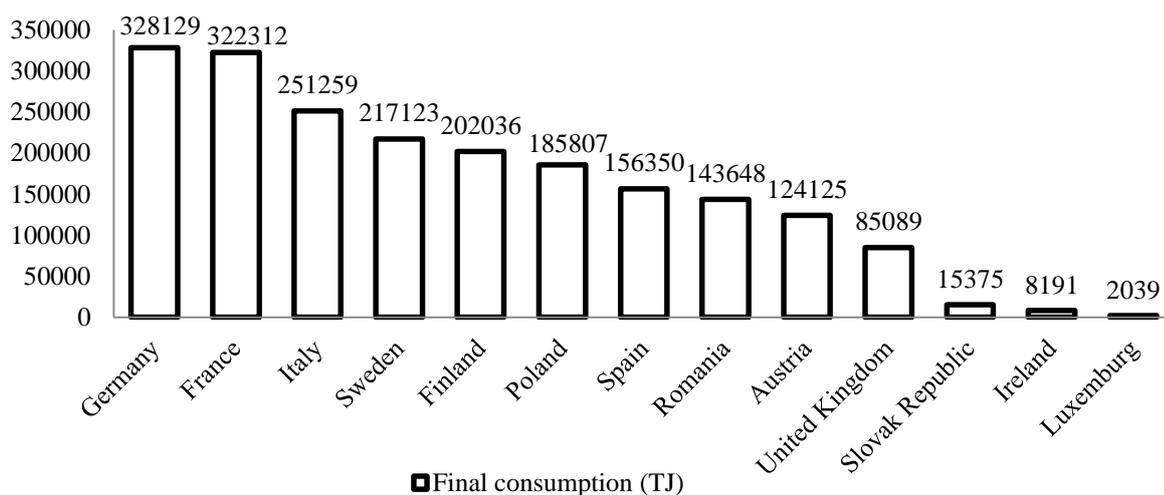
Source: International Energy Agency - Own processing

The figure 3 represents the individual production of the five biggest producers of the primary solid biofuels during year 2013 until 2015 within the European Union. The only country, which increased its production in comparison with year 2014, is Germany. Totally they produced over 478 000 terajoules of biofuels and they are the biggest producer. All other four countries decreased their productions. The second biggest producer, France, dropped from almost 435 000 terajoules to 380 000 terajoules. Third place took Sweden, which is the only country from our division, which decreased

its production for both year 2014 and 2015. Sweden produced a bit over 400 000 terajoules in 2013, followed by almost 386 000 terajoules in 2014 and at last in year 2015 they produced nearly 374 000 terajoules of primary solid biofuels. Fourth place is occupied by Finland. It is the country with quite stable development of production of biofuels with marginal changes over year 2013 – 2015. In year 2014 Finland yielded 338 359 terajoules and in year 2015 - 337 726 terajoules, which has difference only in 633 terajoules. Our comparison closes Italy. Its production decreased from nearly 312 000 terajoules in year 2014 to almost 274 000 terajoules in year 2015.

Figure 3 Comparison of production of primary solid biofuels of the top 5 biggest producers in the EU during the years 2013-2015
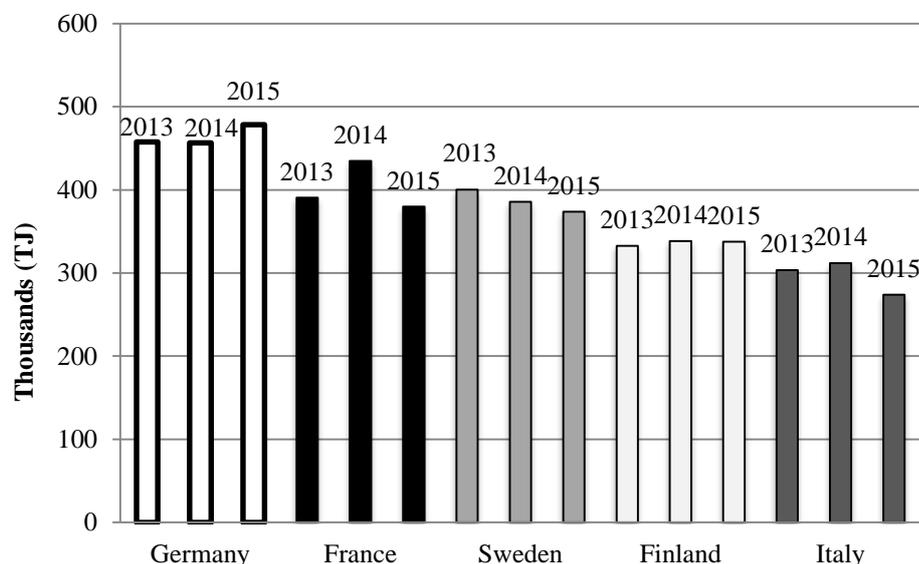
Source: International Energy Agency - Own processing

In the figure 4 we can see top 5 countries in terms of final consumption of the primary solid biofuels within the EU in years 2013 – 2015. The first country is France. France consumption oscillates without any visible trend. In year 2013, France devoured over 343 000 terajoules, followed by rapid increase to 385 000 terajoules in 2014 and decreased even more swiftly to the figure slightly over 322 000 terajoules in 2015. The second place has Germany. It is the only country in our comparison, which has stable growth of consumption. The total growth is from almost 306 000 terajoules in 2013 to over 328 000 terajoules in 2015. Third place took Italy, which has also quite brisk decrease between years 2014 (287 443 TJ) to 2015 (251 259 TJ). Sweden, on the fourth place, is the only country with steady decrease among years 2013 to 2015. Consumption of Sweden in year 2013 was almost 230 000 terajoules, pursued by over 220 000 terajoules in 2014 and in year 2015 figure was slightly over 217 000 terajoules. Our group of five countries closes Finland. Changes were modest starting on figure almost 196 000 terajoules in year 2013, followed by over 195 000 terajoules in 2014 and finishing on consumption of the primary solid biofuels within the EU up to 202 000 terajoules in year 2015.

Figure 4 Comparison of final consumption of primary solid biofuels by top 5 consumers in the EU during the years 2013-2015
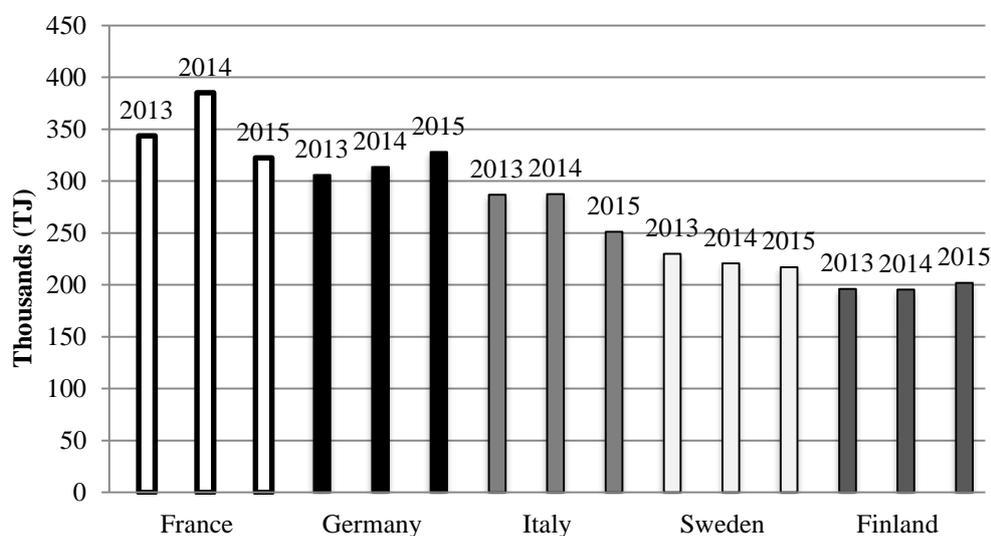
Source: International Energy Agency - Own processing

From the presented figures above we can conduct that in the list of top 5 countries of the European Union in the production of primary solid biofuels in 2015 are Germany, France, Sweden, Finland, Italy. From these results we can assume that the strongest economies in the EU are more willing to support the production and consumption of the primary solid biofuels due to their broader possibilities of the implementation of bioeconomy in the future.

3.3 The comparison of production and final consumption of the top 2 countries in the EU in the period 2005-2015

Figure 5 Production and final consumption of the primary solid biofuels in Germany during the years 2005-2015
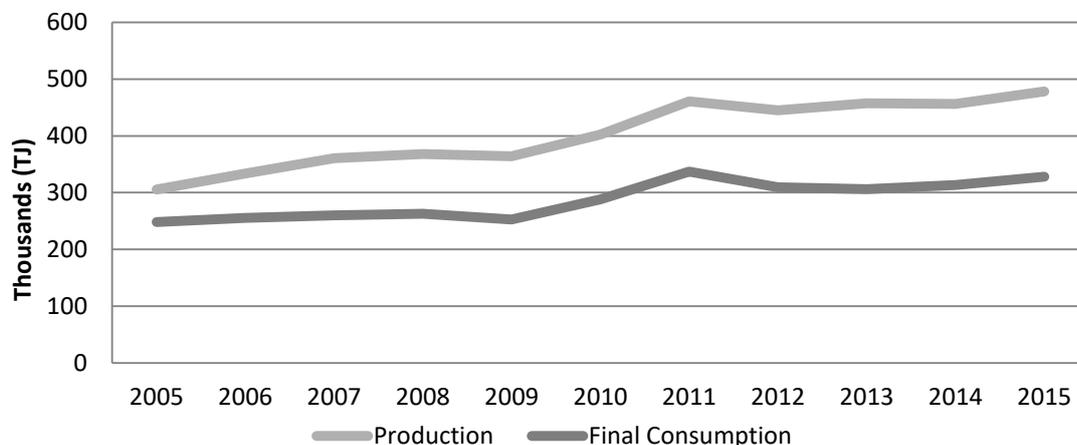
Source: International Energy Agency - Own processing

Over the past 12 years the production and utilization of primary solid biofuels in the such a countries as Germany and France has changed many times in different directions. On the figure 5, we can see comparison between production and final consumption of primary solid biofuels in Germany from year 2005 to 2015. What is visible on first sight is the fact that we can assume there is a correlation between consumption and production in this country. The trend curves are copying each other, so when we observe decrease in production it is most of the time followed by the approximately same drop in consumption. Interesting pattern is visible in year 2011 when there was peak in both production and consumption of primary solid biofuels.

The figure 6 shows the difference between production and final consumption of the primary solid biofuels in France for year 2005 – 2015. France´s case is similar to Germany one in terms of correlation in development between production and consumption. However we can observe interesting fact in year 2005, when our two monitored values had almost identical figure. In contrast with Germany, France reached peak in both consumption and production during year 2014. Quite alluring is fact that in year 2011 both values almost reached peak (consumption value of 373 833 TJ, production 430 718 TJ) and in consecutive year 2012 both nearly reached their lowest point (consumption scoped 303 509 TJ and production 361 863 TJ).

Figure 6 Production and final consumption of primary solid biofuels in France during the years 2005-2015
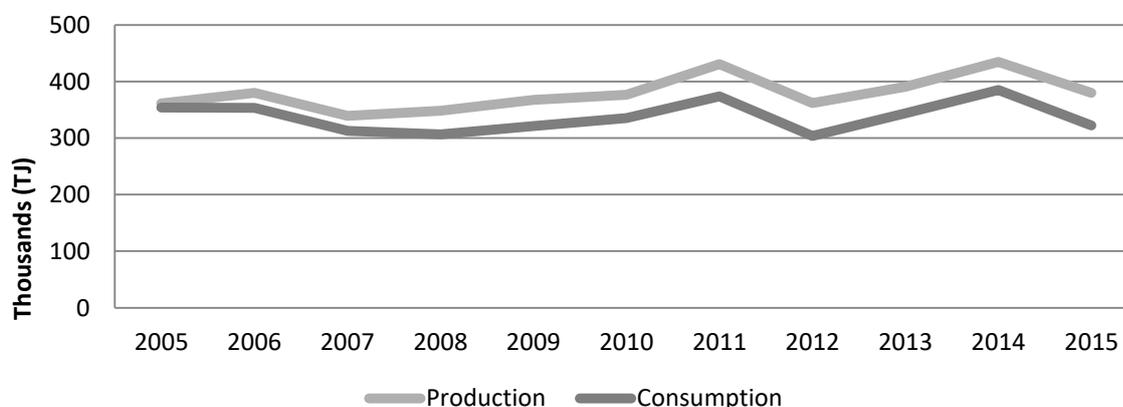
Source: International Energy Agency - Own processing

3.4 Impact of biofuels on the environment

From the conducted research we can clearly see that that many countries in the European Union are interested in the utilization of the renewable energy, especially in the biofuels. However there are excising some controversies about the impact of the environment of the biofuels. It is a well-known fact now that biofuels are less harmful for the nature than fossil fuels. But the essential question is – for how much biofuels are better for the environment in comparison to fossil fuels? On this question we can answer after conducting a comparison and evaluation of the advantages and disadvantages of the biofuels. Over the last few years there has been an active discussion in the European Union about the process of growing crops for energy purposes. This attractive possibility proposing to use the waste and residuals from agriculture and forestry in order to generate bioenergy. But it can also have a negative impact on land use, food security and biodiversity. Because the additional sources of income from the sale of residues waste can cause a rise in plants and wood and that will also lead to the rise of food prices all over the world. But with the sustainable production and smart use of land this risk can be avoided. Various studies have shown that the utilization of solid biofuels creates less environmental impact rather fossil fuels. However, when solid biomass as wood or plant waste are burned it decreases the air quality and in some cases it can be more harmful than the production of oil. It is particularly dangerous when it is done outside without any ventilation and supervision, because it emits a big amount of damaging particles. Those particles are able to damage the DNA and can cause health risk to the animals. In order to get biofuels sometimes can be also used so-called energy crops. They are grown specifically for the reason of burning them and to convert into biofuels. Most of such a kind of crops is woody and before the combustion they are dried and then transported to the refinery. From one side, with the sustainable use and production of energy plants there should be no problems, but this process should be supervised by the governmental and environmental organizations in order to prevent extensive land use. Currently, various European policies suggest that forest biomass used for energy purposes is a 'carbon-neutral' source and supposing that wood combustion actually releases the same amount of CO_2 that it would be absorbed by the plant growth. However, as is mentioned above, there is a risk of the exploitation of the land and natural resources. Thus it is always has to be considered a sustainable way of management and production.

For the production of biofuels is required water. The utilization of water is necessary during the all supply chain of the biofuels. Sometimes it can the amount of consumed water can occur bigger than for the production of fossil fuels. Still it depends from the management style of the production and feedstock type. Anyway, if the water will be consumed in the big amounts for the production of biofuels it can increase the problem of the shortage of water in some regions of the world.

Currently the production of biofuels is receiving a lot of attention from the European Union due to the fact that it might be a solution to the improvement of the environmental problems. However, it is very important to assess all of the advantages and disadvantages of the biofuels before making any investments.

4 Conclusions

Bioeconomy is becoming more and more interesting topic for discussions not only in the European Union, but also all over the world. Many scientists research this field of study in order to get the answers on many questions connected to the environment and the production of energy. The cause of such a scientific movement is based on the inefficiency, numerous disadvantages and lack of the fossil fuels in the future. Bioeconomy is able to provide global population with the sustainable and prospective future. Important part of bio economy – bioenergy – has many approaches how to generate energy from the renewable sources. One of the types of bioenergy is biofuel, which is developing in its technologies and applications very fast. Many member-states of the European Union have already adopted policy frameworks on local and global levels in order to support bioenergy production and bioeconomy in general. This paper is focused on the presenting the information about the bioeconomy, bioenergy and specifically biofuels in the European Union. The main goal was to analyze the production and consumption of the primary solid biofuels in the countries of the European Union and to identify 5 biggest producers and consumers among the member states. Thus the main top 5 producers and consumers of the primary solid biofuels are Germany, France, Finland, Sweden and Italy. Biofuels are using renewable sources of energy. Nevertheless, they are not totally safe for the environment. In general, their production and consumption is much better than the utilization of fossil fuels. Fossil fuels have met a problem of scarcity and this problem will increase in the future, while biomass, which is used for the production of biofuels can be renewed by the natural processes. Biofuels can use crop residue and waste in order to generate energy and with the right and sustainable management it has less negative impact on the environment. It can support biodiversity and be an optimum substitute for the fossil fuels in the engines of the vehicles.

However, with the fast developing technologies and ongoing researches, these issues with the biofuels can be solved. That is why, it is very important to continue studies and examinations of the further improvements of the production of

the biofuels and bioenergy in general. In the future bioeconomy can play a crucial role in the life of population and can help to solve serious environmental and economical issues in the European Union and in the world. In long-term predictions bioeconomy can support economic growth and can provide employment for many workers in agricultural and industrial sectors of economy, decrease dependence from fossil fuels and raise the economic and environmental sustainability of the primary production and processing industries. In order to implement the bioeconomy the local and global levels of the governmental administrations have to cooperate, and it is important to involve the business sector into this process as well as the society opinion.

4.1 Recommendations

Bioeconomy can make huge changes in the production of goods and services in the future. Especially, it can change the way we look at the production of energy. With the further advancement of the technologies used for the bioenergy generation, it can produce energy from renewable sources of energy without any harm to the environment. In this case more researches have to be conducted in this area with the support of the educational, research, governmental and non-governmental organizations.

As it was mentioned above, there are many countries that are working on its own policy strategies of the development and implementation of the bioeconomy. However, very often there is a need of the support from the other countries and organizations. In this case, a good recommendation would be to combine the forces and support the development of the bioeconomy on the local and global levels and to create new policy strategies for the implementation of the bioeconomy. Also a positive impact on the development and promotion of the bioeconomy would be the informative campaigns for the society. For instance, some informative events for people in schools, universities and just on some special organized environmental events. For producers of different segments of industry it can be the professional workshops or seminars with the real examples of working companies, which are producing or utilizing the biofuels and renewable sources of energy.

References

Bobylev, S., Mikhailova, S., & Kiryushin, P. (2014). Bioeconomy: challenges of formation. In *Economy. Taxes. Law* [Online], vol. 7, 2014, no. 6, p. 20-25. [Cit. 2018-02-20] Retrieved from: < http://cyberleninka.ru/article/n/bioekonomika-problemy-stanovleniya >.

Butenko, V. M. (2016). Bioeconomy as a mechanism towards sustainable development. In *The Journal of Agricultural Sciences of the Black Sea Region* [Online], vol. 88, 2016, no. 1, pp. 19-28. [Cit. 2018-02-20] Retrieved from: < http://dspace.mnau.edu.ua:8080/jspui/bitstream/123456789/1895/1/n88v1r2016butenko.pdf >.

European Commission. n. d. [Online] [Cit. 2018-02-20]. Retrieved from: < https://ec.europa.eu/commission/index_en>.

European Technology Platforms. n. d. *The European bioeconomy in 2030: delivering sustainable growth by addressing the grand societal challenges*. [Online] n. d. p. 4. [Cit. 2018-02-20]. Retrieved from: < http://www.epsoweb.org/file/560 >.

Litvak, O. A. (2016). *Development of agricultural sector in the context of bioeconomy: PhD. thesis.* Supervisor O.M.Vyshnevska. Mykolaiv: Department of economics and management of national economy, National Agricultural Mykolaiv University, 275 p.

Lymar, V.V. (2015). Bio-economy in Europe: Modern tendencies and challenges. In *Young Scientist* [Online], vol. 19, 2015, no. 4, p. 97-100. [Cit. 2018-02-20] Retrieved from: < http://molodyvcheny.in.ua/files/journal/2015/4/21.pdf >.

Mccormick, K., & Kautto, N. (2013). The bioeconomy in Europe: An overview. In *Sustainability* [Online], vol. 5, 2013, no. 5, pp. 2589-2608. [Cit. 2018-02-20] Retrieved from:
< https://pdfs.semanticscholar.org/49af/047f80f1d369fb502a9154177e9b04b75192.pdf >. ISSN 2071-1050.

O'callaghan, K. (2016). Technologies for the utilisation of biogenic waste in the bioeconomy. In *Food Chemistry* [Online], vol. 198, 2016, pp. 2-11. [Cit. 2018-02-21] Retrieved from:
< http://www.sciencedirect.com/science/article/pii/S0308814615301758>.

Renewable Energy World. n. d. [Online] n. d. [Cit. 2018-02-20]. Retrieved from: <http://www.renewableenergyworld.com/index/tech.html >.

Shkaruba, A. M. (2014). *Biotechnology as innovation discipline*. 2014. [Online]. p. 1. [Cit. 2018-02-20]. Retrieved from: < http://cyberleninka.ru/article/n/biotehnologiya-kak-innovatsionnaya-distsiplina >.

U.S. Energy Information Administration (2016). [Online] 2016 [Cit. 2018-02-20]. Retrieved from: < https://www.eia.gov/energyexplained/index.cfm?page=solar_home>.

http://ec.europa.eu/eurostat/search?p_auth=OBMbbaVx&p_p_id=estatsearchportlet_WAR_estatsearchportlet&p_p_lifecycle=1&p_p_state=maximized&p_p_mode=view&_estatsearchportlet_WAR_estatsearchportlet_action=search&text=Infrastructure+-+biofuel+production+capacities+-+annual+data.

European Commission 2018: A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment [Online] <https://ec.europa.eu/research/bioeconomy/pdf/ec_bioeconomy_strategy_2018.pdf> 105 p. *ISBN 978-92-79-94144-3 doi:10.2777/792130*

SESSION

ECONOMICS OF AGRICULTURE

Assessment of Role and Efficiency of Subsidies Using an Example of Livestock Breeding and Selected Predator Type

Jana Lososová, Jindřiška Kouřilová, Andrea Dohnalová

Abstract: *The paper is aimed to point out the main impacts of the progressive spreading of the wild predator in the cultivated landscape. Increase in compensations and aids of protective measures result only in the expenditure spill-over and not in solving the problems, while the target situation is not quite clear from the conservation institutions´ viewpoint. In mid-November 2017, the European Parliament warned that certain species have already achieved the good degree of protection in some European regions and may currently pose a threat for both the other wild species and the livestock. The coexistence of people and large carnivores, especially the wolves, may have in some regions an adverse impact on the sustainable development of ecosystems and populated rural areas, especially in terms of the traditional farming and the sustainable tourism and other social and economic activities. The livestock farmers insist that the wolves no longer need this degree of protection that is currently applied and ask for the establishment of areas where their presence will be tolerated.*

Key words: Subsidies · Sheep breeding · Wolves protection · Regions

JEL Classification: Q1 · Q14 · Q18

1 Introduction

The topic was developed upon the impetus and the needs from practice as the farms lose their livestock as a result of an increase in attacks by especially protected predators. The context is being transmitted to economic relations.

The paper is aimed to analyse impacts of both the subsidies spent on the promotion of livestock farming and the subsidies spent on the spread of wolves using the more comprehensively addressed issue of the farms and the attitudes of involved institutions. These subsidies are, in principle, of an antagonistic nature and their increase leads to the growth of other public funds spent on preventive measures and the damages caused by the wolves´ attacks. The attention is also paid to the related, often overlooked aspects, such as the additional induced costs, behavioural factors, suffering of animals and their stress.

2 Methods

The paper is based especially on the initiative and needs of the agricultural and regional practice. The primary range of problems, namely, the mutual conflict of subsidies, was identified upon analyses in making the monograph on the given topic at first stages. Whereas the subsidies, as a rule, come from the public finances and the losses, or more exactly, their compensations, are and will be increasing, the issue will become more up-to-date in future. It is not only about financial aspects, but also about certain risks stemming from changing the landscape, its value for tourism and the impact of behaviour of entities involved in the process of promoting the spread of predators in the landscape, in particular, the direct and indirect induced costs of farms and the effects of proposed measures. The finding process is complicated due to the lack of data and the biological essence of the problem.

The topic is divided into 12 chapters, with a large portion of the text devoted to the literature review and other parts focusing on subsidies, costs, involved institutions, economic context, legislation, behavioural aspects and risks, various

Ing. Jana Lososová, University of South Bohemia in České Budějovice, Faculty of Economics, Department of Finance and Accounting, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: lososova@ef.jcu.cz

doc. Ing. Jindřiška Kouřilová, CSc., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Finance and Accounting, , Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: kourilova@ef.jcu.cz

Bc. Andrea Dohnalová, University of South Bohemia in České Budějovice, Faculty of Economics, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: dohnaa03 @ef.jcu.cz

clashing opinions and the links to hunting. This paper is based on the current trends substantiated in the monograph and focuses especially on the financial aspects of the issue.

Ascertained trends:

–   The subsidies for the ovine and caprine animal breeding have increased, both in total and per farm.

–   The future development of subsidies for the animal farming will probably decrease, while the predator promotion will tend to grow.

–   The damages of animals killed by predators, especially the wolves, have been increased significantly and this trend will continue its upward movement. The growing population of wolves will result in both the increasing number of harmful events and the amount of compensations for killed animals since the compensations currently paid out to the farmers cover only a part of their damage.

–   The subsidies for preventive measures to protect the herds will grow; these measures are, however, not quite efficient and the arguments are not quite substantiated.

–   Also behavioural aspects of the problem on both sides are far from negligible.

–   There are a number of risks generated by the above mentioned trends.

3 Research results

3.1 Subsidies for Farmers

The subsidies paid out to farmers are of the cost character. The planned reduction of agricultural subsidies from EU does not offer a too optimistic perspective on promoting funding the agricultural activities in the landscape.[1]

No considerable increase in the national aids can be expected.[2] All of this reinforces the need for monitoring of their effectiveness.

As apparent from Table 1 and Table 2, in 2016, an average farm specializing in the sheep and goat breeding obtained less than one third of operating subsidies as compared to an average farm, which is given by its size. The farm specializing in sheep and goat breeding is 10 times smaller than an average farm in the Czech Republic both from the viewpoint of the total area of agricultural land and the economic size.

Table 1 Structure of subsidies for an average farm specializing in the sheep and goat breeding (EUR/farm)

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Operational subsidies total	46902	79105	52764	40561	49342	33578	31786	34198	25748
Total subsidies on livestock	1755	2372	1268	614	1236	958	1895	2330	2073
- subsidies on sheep and goats	415	910	502	280	889	840	1778	2045	1917

Source: FADN

Table 2 Structure of subsidies for an average farm in the Czech Republic (EUR/farm)

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Operational subsidies total	76866	76336	77152	81443	73159	83254	83465	83803	90994
Total subsidies on livestock	1427	1436	3079	2901	1801	1626	3035	4471	4520
- subsidies on sheep and goats	46	55	30	22	64	62	121	125	112

Source: FADN

The development of subsidies for animals is also interesting. The subsidies were higher for sheep farms until 2009, while in 2010, as a result of introducing the aids for dairy cows, the subsidies for animals on an average farm considerably increased. Subsidies for sheep and goats are, of course, considerably higher in case of sheep farms; in individual years it is 9 to 17 times more (Table 1). In light of the total development of subsidies between 2008 and 2016 by comparing an average farm in the Czech Republic and the farm specialized in sheep and goat breeding, we may see a significant decreasing trend in case of sheep farms as opposed to the average Czech farm (Table 2). This trend is caused by an increasing number of small sheep farms. If we eliminate the size of the farm by converting the subsidies per hectare of the land used,

---

[1] https://euractiv.cz/section/aktualne-v-eu/news/komise-navrhuje-omezit-dotace-pro-zemedelce-penize-chce-vyuzit-na-obranu/

[2] https://www.novinky.cz/domaci/458368-snemovna-schvalila-statni-rozpocet-na-rok-2018.html

the subsidies for sheep farms fluctuate (the growth rate is less than 0.5 %), while the subsidies for an average farm grow, on average, by 3 % every year. The precondition for obtaining the subsidy for environmental measures including the organic farming, the payment for areas facing natural or other specific constraints (LFA) and the voluntary coupled support – support for maintaining ewes or goats – is to comply with a minimum stocking density. Animals being killed by predators may result in the breach of the condition of the mandatory stocking density and the loss of subsidies (e.g. 1 sheep has a coefficient of 0.15 livestock unit).

3.2 Spreading of Wolf Population

Pursuant to the Czech Act on the Landscape and Nature Protection, a wolf is a protected species, classified as a critically endangered animal. In the Czech Republic, the packs of wolves inhabit the Kokořínsko-Máchův kraj Protected Landscape Area, Northern Bohemia, the district of Broumov, Krušné hory and Šumava. Appearances by individual wolves are observed in Beskydy, Bílé Karpaty, the district of Jeseník or Vysočina and other locations (e.g. recently observed wolves in the districts of Česká Lípa or Třeboň).

According to the Czech Statistical Office (basic data on hunting grounds), the number of individual wolves in the Czech Republic territory has increased quickly. Between 2010 and 2014, the Czech Statistical Office registered the number of wolves up to 10 animals. In 2015, the number of wolves was 13, then 30, 61 and, in 2018, the number of registered wolves in our territory amounted to 118, which is an average growth rate of 45 percent a year. This leads to an increase in losses and an amount of their compensations (Figure No. 1). The spread of predators in the landscape entails pleasure of the realisation of the intended action, on the one hand, but also problems to those who share the space with the wolves, on the other hand. The farmers, hunting associations and villagers have to solve the biggest problems associated with wolves.

In the context, we can observe the spread of wolf population in other European countries, too. The spread of wolves in Germany has damaged the livestock for a few years; the amount of damage grows twice faster than the wolf population itself.[3]. If we count on the average annualised growth of wolves of 30 to 35%, the losses of livestock have increased by 50 to 90 % a year since 2013. Other information on the problem progress in Germany can be found on the website of Interessengemeinschaft der Weidetierhalter Deutschland (wnon.de), Landesjägerschaft Niedersachsen e.V. (www.wolfsmonitoring.com).

3.3 Subsidies to Protect Herds of Livestock against Predators

The livestock killing by large carnivores entails the economic losses to farmers in many parts of the world (Baker et al., 2008, Gren et al., 2018, Ramler et al., 2014, Sommers et al., 2010). In their paper, Widman and Elofsson (2018) analyse the cost of damage caused by the beasts of prey in Sweden. The compensations of the livestock killed by large carnivores are provided for the attacks by the brown bear (Ursus arctos), the wolf (Canis lupus) and the Eurasian lynx (Lynx lynx). According to the results, the increase in the density of carnivores by 1% leads to an increase in the cost of compensation by 0.3 to 0.4 %, whilst the increase in the sheep stock density by 1 % results in increasing the cost of compensation by 0.8 % in case of the brown bear and by 1.1% in case of wolves.

As the wolves have been spreading in our territory, the number of attacks on the livestock, especially the sheep and calves, has recently increased, which results in the conflicts between the interests of protectionists and the livestock owners (Dickman, 2010, Johansson et al., 2012, Naughton-Treves et al., 2003, Redpath et al., 2013, Young et al., 2010). The last-year amount of financial means in the declared 58th call increased by 40 million CZK to 120 million CZK. To secure their herds, the breeders may obtain up to 85 % of eligible cost. Money can be used, for example, on electric fences, complements to solid fences or for buying and training of sheepdogs. Funds from new calls are, however, designed for other projects as well, e.g. drought fighting. Eligible expenditure is defined in the Subsidy Verification Manual published by the Chamber of Auditors of the Czech Republic in 2014[4]; whether this type of subsidies is spent in accordance with the principles of economy, efficiency and effectiveness appears to be relatively questionable. Another problem is economy in the form of establishing the maximum price limits in case of preventive measures.

The figure 1 based on available data of the trend in the wolf population on the Czech Republic hunting grounds (CSU 2018) and the trend in the compensations of damage caused by wolves (Ekolist 2018) prove the high statistical dependence between the trend of wolf occurrence in the Czech Republic territory and the trend in compensations paid for damage of the livestock caused by wolves (Figure No. 1). Considering the current amount of compensation of damage caused by wolves, an increase in the wolf population by 1 will result in the growth of compensations of damage by almost 13 thousand CZK a year. Based on the current data on the wolf population occurrence on hunting grounds (CSU), the

---

[3] https://www.dbb-wolf.de/wolfsmanagement/herdenschutz/schadensstatistik
[4] https://www.kacr.cz/file/2128/prirucka-final

prediction of compensations of damage caused by wolves in 2018 show an increase of 89 % (Figure No. 1). Whereas the amount of compensations currently includes only the price of meat and the frequency of attacks increases, the amount of compensations in future is very likely to grow even faster. In the field of preventive measure support, a new measure should be introduced under the next common agricultural policy allowing for the flat-rate subsidies for registered farmers in the territory with the occurrence of wolves, bound to livestock units. The subject of subsidy should be the compensation of increased cost defined as fulfilment of the minimum standard for securing the herd, i.e. higher standard of solid fences, more demanding organization of grazing, mobile elements, etc. This measure has not been specified in more detail yet and will be the subject of further debate.

Figure 1 Link between the growth of compensations of damage caused by wolves and the number of wolves in the Czech Republic territory

$$y = 12.871x - 30.098$$
$$R^2 = 0.967$$
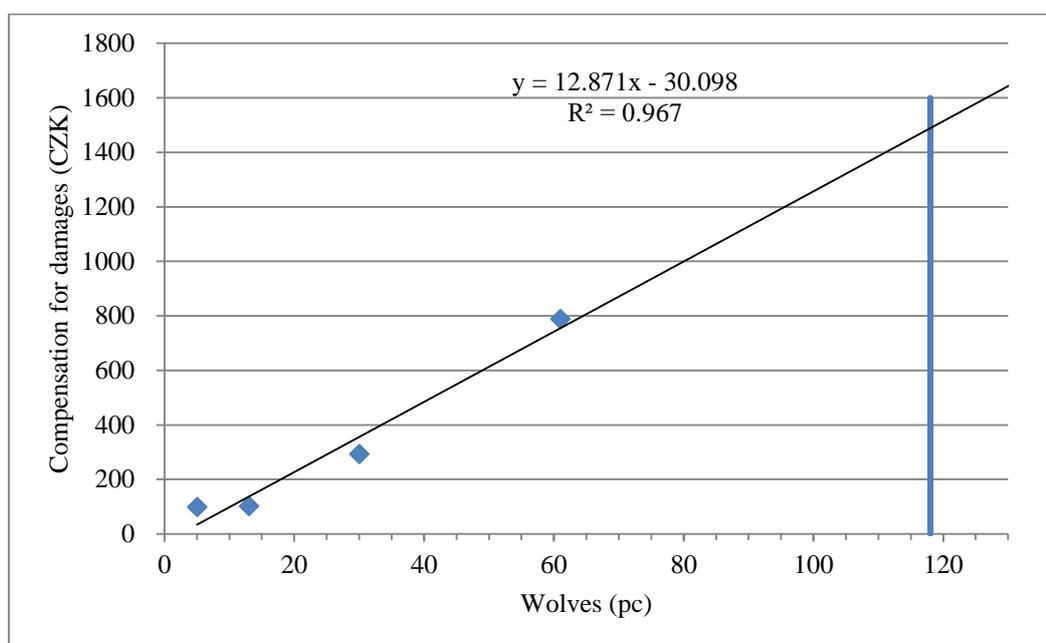
Source: Authors´ own processing based on the Czech Statistical Office (CSU) data (occurrence of wolves in hunting grounds); Ekolist.cz, dated 5 April 2018 (trend in compensations of damage caused by wolves).

The case of France illustrates that the absolute protection of wolves has hit its limitations. The damage caused by wolves increases dramatically from 45 million CZK in 2004 to 544 million CZK in 2017, representing 2,176,800 CZK per wolf in France. Despite all protective measures recommended by those who favour an absolute protection of wolves, the numbers of killed livestock have been permanently growing. France reports the increase in killed livestock from 8,576 pieces in 2014 to 11,741 pieces in 2017[5].

The situation is similar in Italy and Spain where the returning wolf population contributes to rural depopulation and elimination of the traditional pastoral farming. In the Land of Saxony, Germany, which is set as an example by the wolf protection advocates, the damage reported in last years increased three times (www.dbb-wolf.de). Paradoxically, the Kingdom of Norway, which provides our wolf protectionists with the generous aid by means of the Norwegian funds, decided to shoot to death 47 wolves out of 68 wolves living in Norway[6]. In this context, it is interesting to compare the area (385,203 square km) and the population density (14 inhabitants per square km) with the number of wolves in the Czech Republic (118 wolves) and the area of 78,866 square kilometres and the population density of 134 inhabitants per square kilometre.

As stated by Steele, et al. (2013), compensations of damage caused by wolves take into account only the direct effects of the attack by a predator. Indirect effects, such as the effect of the stress arising from the presence of a beast on the livestock acquisitions and pregnancy may also reduce profitability. Unless compensation programmes include indirect effects of the wolves´ presence near the pastures, they may systematically discriminate the farmers. Based on their results, indirect year-to-year financial impacts of wolf attacks may be as big or bigger than direct impacts.

---

[5] http://www.leseleveursfaceauloup.fr

[6] https://www.theguardian.com/environment/2016/sep/16/norway-wolf-cull-government-wwf-friends-earth-environment-protest

3.4 Suggested Measures

Recommended preventive measures towards protecting the herd against attacks include especially fencing (AC electric fence, electric fence, deterrent fence), overnight housing of the herd and buying of the trained sheepdog. Procurement of electric fences and overnight housing are addressed as the investment. This investment, however, cannot be considered cost-effective.

Extensive grazing has a big influence on maintaining biodiversity in given (mainly mountain) areas. It is also used for maintaining the downhill courses (e.g. Hinojosa, Lambin, Mzoughi & Napoléone, 2018). Reduction or elimination of sheep grazing in the Czech Republic will result in further deterioration of valuable grassland of biotopes and disappearance of a wide range of biotopes of rare plant and animal species of the European importance (Krahulec et al., 2001). Protectionists advise the farmers to protect their sheep with fences and, at the same time, they do not want to disturb the current appearance and landscape continuity and its role for tourism. Overnight housing prevents the necessary breeding work and requires the higher consumption of the feed. The animal welfare is difficult to keep in big herds and grazing of all needed areas is reduced. In case of the elimination of farming or leaving of wolves, the investment may become frustrated.

The predominant lay visions that buying of the sheepdog as a next investment is sufficient for protecting herds are not justified according to the farmers and dog breeders´ experience. The selection of the dog breed, the dog training and abilities are the risk factors. Not every dog can become a good sheepdog. Not only costs of and demands for buying the good quality dog but also coming to terms with the potential dog´s injury or death after the attack by a wolf represent the problem for farmers.

3.5 Costs of Abandonment of Farming

The breeding cost can be, basically, calculated. In context of the problem of increasing attacks by predators, also the costs related to the cessation or cancellation of the animal breeding and the compensation for the landscape upkeep also play a substantial role. The reason may also be the persistent problem which lies in the costs spent on maintaining the standard (desired) state of biodiversity, water management conditions, soil as a potential production factor including the cost of production restoration under changing climatic conditions. Besides that it is necessary to add the cost of buying the machinery (already owned by farmers), social costs (unemployment and related costs), loss of income of control institutions, loss of taxes (income tax, VAT or property tax), unregistered self-supply, loss of production, compensations arising from the cessation of continuity, subsidies (refund of excise duty on fuels), cultural heritage (breeds, varieties) conservation as well as indirect costs of supporting the spread of wolves which were not quantified (MF, Duha movement). If all of the above costs are identified, economic efficiency would be lower.

Figure 2 Diagram of costs induced by the predator attacks
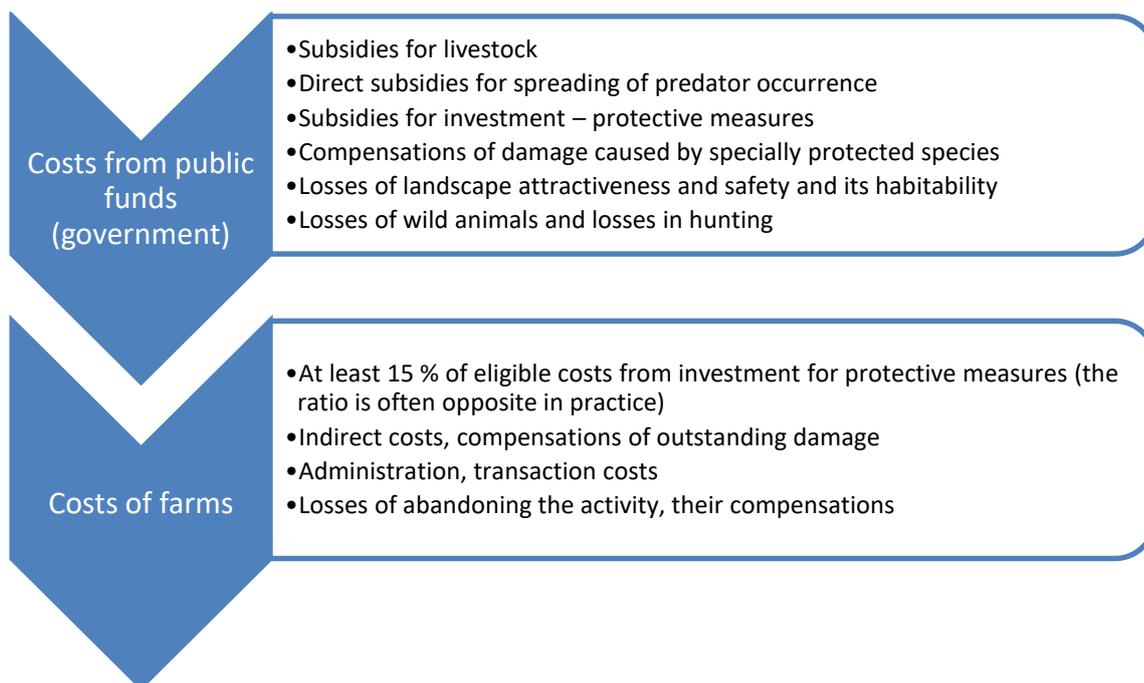
Source: Authors

3.6 Institutions

The institutions related to this issue include the state institutions (Ministry of the Environment, Ministry of Agriculture, Nature Conservation Agency of the Czech Republic), mainly the farms (livestock breeders), non-profit organizations (Czech Union for Nature Conservation, Children of the Earth, Greenpeace CZ, Brontosaurus Movement, Duha Movement, Rosa, Zelený kruh), professional organizations (Association of Sheep and Goat Breeders, Czech and Moravian Hunting Union) and multinational organizations (EC, COPA-COGECA). As far as the subsidies for wolf spread support are concerned, only the DUHA Movement spent 5,656, 820 CZK[7] on the Šumava and the Czech Wilderness Conservation Projects in 2017. The involved institutions have totally different interests and background. Their powers are also different, which is given by their financial, competence and media support, different approach to cruelty to animals, degree of responsibility and the access to finances. Adverse impacts of the problem are borne especially by livestock farmers and hunting associations. Farmers do not suffer from the financial impacts only; they have to cope with a number of psychological problems accompanied by many risk moments.

3.7 Risks

Genetically, approximately 60 % of the wolf population in Europe cannot be considered absolutely genetically pure as there are traces of distant cross-breeding with domesticated dogs in their gene pool. Potential impacts of this finding on the protection of wolves are described by Pilot, et al. (2018). This fact may also be a reason for a strange behaviour of the predator and the difficult protection of the pure animal gene pool.

Apart from attacks on the livestock, an absolute protection of the predator and its uncontrolled expansion in areas where no wolves have been found for hundreds of years entails other risks, with spread of rabies and other diseases being the biggest ones. Introduction of the missing carnivores in the areas where they did not live before will soon result in re-emerging of diseases and parasites that need both herbivores and carnivores to complete their cycles. The risk of attacks on humans is not negligible, either, although the protectionists strive to argue that the fear of wolves stems from the fairy tales and myths and that a wolf is an elusive animal that avoids the people and that healthy wild animals do not attack on humans only those that contracted rabies. As another argument, they use the fact that the man was last killed by the wolf in Europe in Spain in 1974.

Opponents claim that the myth about the shy wolf dates back to the time when the wolves were chased away to uninhabited areas and when the meeting of the wolf and the man resulted in the wolf´s death. They also claim that the wolf is a very intelligent and adaptive animal. It will soon find out that the people do not represent any danger for it and as the wolf population will expand to the densely populated areas, the attacks, not only on the livestock, will be more frequent. A significant discrepancy among the institutions of conservationists, farmers and hunters is logical. There are many sources which document the wolf attacks on not only the livestock and dogs but also the people and there are plenty of them. The documented attacks on the humans were compiled in the so-called Linnell´s report (Linnell, et al. 2002) and other cases (although majority of them are outside of the EU), of course, still emerge (for example the latest attack on two children in Poland near the border with Slovakia)[8].

3.8 Controlled Culling of Beasts of Prey

All (state and non-governmental) organizations dealing with the nature conservation thoroughly refuse the debate about possible controlled culling of beasts of prey in the event of their outbreak and further expansion in the cultivated landscape. With the declared natality of 35 %, the expected development is alarming, let alone the migration from Poland, Germany and Slovakia. The Federal Agency for Conservation of Nature (BfN), for example, predicts that the wolf population in Germany will grow from current 1,000 animals to more than 4,000 in 2022, whereby the capacities of locations suitable for wolves will be exhausted (https://wnon.de). In this context, the issue of the speed of wolf expansion in the Czech Republic is really alarming since, based on the current data, the wolf population in the Czech Republic amounts to already 118 animals, which significantly exceeds the natality. If we add the migration, this development will need an intervention of the humans. Our landscape is not ready for such development.

As early as in 2003, Treves and Karanth published that the population of beasts of prey recovered in some areas to such an extent that the controlled hunting was considered. The reason for culling of beasts is to prevent the agricultural losses or to protect other species. In many areas the controlled culling of beasts happens. The policy of controlled culling should include scientific monitoring using the sensitive methods that would reveal a significant population decline. The duly performed regulation might contribute to the greater tolerance of the public towards beasts of prey (Treves a Karanth, 2003). Tensions that have built up in connection with occurrence of these beasts in Europe nowadays have reached a

---

[7] http://www.hnutiduha.cz/o-nas/financovani

[8] http://www.tvnoviny.sk/domace/1925548_vlk-napadol-dve-deti-utok-sa-stal-v-polsku-nedaleko-slovenskych-hranic

dangerous level. Sweden where the current wolf population is estimated to be 400 included wolves in the list of game in 2015. Finland, where the wolf population is estimated to 235 animals, has performed reduction culling for five years with 75 wolves killed in this period. In the last hunting season, 43 wolves were shot and the planned cull for this year is 53 wolves. Both countries explain that the reduction culling done by hunters is a necessary tool helping them maintain the limited wolf number. It is necessary to proceed in such a way that this indicator is acceptable both for local hunting grounds and local biotopes. Representatives of these countries, at the same time, warn that they will defend their opinion before the General Court of the European Union (taken from the magazine Myslivost 2018).

An efficient livestock protection is so expensive and demanding that its price exceeds several times all profit from farming. Authors of the conservationist policy must understand that the densely populated parts of Europe are not permanently suitable for large predators. Unless the defence results in killing of wolves, the wolves will start to consider it a certain type of a game and become less shy when meeting the people and they will come closer to or directly enter the human settlements where they consider practically all domestic animals as their prey. The greatest misunderstanding between protectionists and farmers is that the former protects predators and the latter their animals.

4 Conclusions

This paper is aimed to point out the main impacts of the clash with the progressively expanding wild predator in the cultivated landscape. This problem may, for the time being, appear as marginal, however, it will undoubtedly become more and more serious in near future as indicated by experience from other European countries. It is necessary to realize especially the potentially significantly increasing expenditure from public funds giving rise to further expenditure. Increase in compensations and aids of protective measures result only in the expenditure spill-over and not in solving the problems, whilst the target situation is not quite clear from the conservation institutions´ viewpoint. The data and information on costs related to this issue should be made available without undue delay.

In November 2017, the European Parliament warned that certain animal species (in former Directive these species were ranked among the animals in need of extraordinary protection) have already achieved a good status of protection in some European regions. In this situation they may endanger other wild species as well as the farm animals. This may disturb the natural balance of the ecosystem. The European Parliament, therefore, asks the European Commission to develop the procedure for assessment of the status of protection in particular regions in order to allow the change on the basis of already achieved desirable level of protection. It also reminds that the coexistence of people and large carnivores, especially the wolves, may have in some regions an adverse impact on the sustainable development of ecosystems and populated rural areas, especially in terms of the traditional farming and the sustainable tourism and other social and economic activities (EP, 2017).

The livestock farmers insist that the wolves no longer need the degree of protection that is currently applied and that the wolves do not belong to the cultivated landscape, and ask for the establishment of areas where their presence will be tolerated and the areas where the wolf will be eliminated. Serious damages to the livestock are the result of the fact that wolves are not afraid of farmers and that their attempts to attack herds do not end fatally for them as documented by experience from other countries. The sheep breeders in the district of Broumov tried to draw attention to this plight even by means of the legal dispute, but with no success. The government so far does not seem to listen more attentively to the damaged farmers. The Broumov sheep breeders, however, managed to publicize this matter at least.

The multifunction effect of the pastoral farming of the livestock must continue as well as its production it generates. The development and sustainability of life in the country depends on them. Both the Czech and European legislation strictly protects wolves. Also thanks to this fact, the wolves expand throughout Europe and their populations increase not only in the Czech Republic but in all neighbouring countries, too. It appears that the nature conservation has its own limits as well. It is up to individual countries what they will protect more. The claim that absolute protection of wolves is necessary for the inhabitants is questionable. Meaningfulness of laws should not be put in question, which is, however, not possible when all protective measures, projects and management are a product of the protectionist lobby that claims that the people have to get used to the wolves coming and denies that the damaged farmers have the priority right to protect their livelihood, property and safety.

References

Baker, P. J., Boitani, L., Harris, S., Saunders, G., & White, P. C. L. (2008). Terrestrial carnivores and human food production: Impact and management. *Mammal Review*, 38(2-3), 123-166. doi:10.1111/j.1365-2907.2008.00122.x

ČSÚ (2018). *Základní údaje o honitbách, stavu a lovu zvěře*. [Online]. Available at https://czso.cz/csu/czso/zakladni-udaje-o-honitbach-stavu-a-lovu-zvere-od-1-4-2016-do-31-3-2017. [Accessed: 07-05-2018].

Dickman, A. J. (2010). Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict. *Animal conservation*, 13(5), 458-466.

Ekolist (2018). Absolutní ochrana vlků je proti zdravému rozumu, říká chovatel ovcí, který neúspěšně zažaloval stát, *Ekolist*, 5. 4. 2018. Available at https://ekolist.cz.

European Parliament, (2017). European Parliament resolution of 15 November 2017 on an A*ction Plan for nature, people and the economy* (2017/2819(RSP)). Available at http://europarl.europa.eu/sides/getDoc.do?type=TA&reference=P8-TA-2017-0441&format=XML&language=EN

European Parliament, (2018). *Research for AGRI Committee: the revival of wolves and other large predators and its impact on farmers and their livelihood in rural regions of Europe*. Directorate-General for Internal Policies of the Union. ISBN 978-92-846-3439-2, doi:10.2861/37712.

Gren, I., Häggmark-Svensson, T., Elofsson, K., & Engelmann, M. (2018). Economics of wildlife management—an overview. *European Journal of Wildlife Research*, 64(2) doi:10.1007/s10344-018-1180-3.

Hinojosa, L., Lambin, E. F., Mzoughi, N., & Napoléone, C. (2018). Constraints to farming in the Mediterranean Alps: Reconciling environmental and agricultural policies. *Land Use Policy*, 75, 726-733.

Johansson, M., Sjöström, M., Karlsson, J., & Brännlund, R. (2012). Is human fear affecting public willingness to pay for the management and conservation of large carnivores? *Society & Natural Resources*, 25(6), 610-620.

Krahulec, F., Skálová, H., Herben, T., Hadincová, V., Wildová, R., & Pecháčková, S. (2001). Vegetation changes following sheep grazing in abandoned mountain meadows. *Applied Vegetation Science*, 4(1), 97-102.

Linnell, J., Andersen, R., Andersone, Z., Balciauskas, L., Blanco, J. C., Boitani, L., ... & Loe, J. (2002). T*he fear of wolves: A review of wolf attacks on humans.* s.65, ISBN 82-426-1292-7

Myslivost (2018). Řeč je o vlku. Available at http://myslivost.cz/Pro-myslivce/Ze-zivota-myslivcu/Rec-je-o-vlku

Naughton-Treves, L., Grossberg, R., & Treves, A. (2003). Paying for tolerance: rural citizens' attitudes toward wolf depredation and compensation. *Conservation biology*, 17(6), 1500-1511.

Pilot, M., Greco, C., vonHoldt, B. M., Randi, E., Jędrzejewski, W., Sidorovich, V. E., ... & Wayne, R. K. (2018). Widespread, long-term admixture between grey wolves and domestic dogs across Eurasia and its implications for the conservation status of hybrids. *Evolutionary Applications*, 11(5), 662-680.

Ramler, J. P., Hebblewhite, M., Kellenberg, D., & Sime, C. (2014). Crying wolf? A spatial analysis of wolf location and depredations on calf weight. *American Journal of Agricultural Economics*, 96(3), 631-656.

Redpath, S. M., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., ... & Gutierrez, R. J. (2013). Understanding and managing conservation conflicts. *Trends in Ecology & Evolution*, 28(2), 100-109.

Sommers, A. P., Price, C. C., Urbigkit, C. D., & Peterson, E. M. (2010). Quantifying Economic Impacts of Large-Carnivore Depredation on Bovine Calves. *The Journal of Wildlife Management*, 74(7), 1425-1434.

Steele, J. R., Rashford, B. S., Foulke, T. K., Tanaka, J. A., & Taylor, D. T. (2013). Wolf (Canis lupus) predation impacts on livestock production: direct effects, indirect effects, and implications for compensation ratios. *Rangeland Ecology & Management*, 66(5), 539-544.

Treves, A., & Karanth, K. U. (2003). Human-carnivore conflict and perspectives on carnivore management worldwide. *Conservation biology*, 17(6), 1491-1499.

Widman, M., & Elofsson, K. (2018). Costs of livestock depredation by large carnivores in Sweden 2001 to 2013. *Ecological Economics*, 143, 188-198. doi:10.1016/j.ecolecon.2017.07.008

Young, J. C., Marzano, M., White, R. M., McCracken, D. I., Redpath, S. M., Carss, D. N., & Watt, A. D. (2010). The emergence of biodiversity conflicts from biodiversity impacts: characteristics and management strategies. *Biodiversity and Conservation*, 19(14), 3973-3990.

Comparison of farms focusing on dairy production in the production and economic conditions of the Czech and Slovak Republic

Patrik Rovný, Dušan Dobák

Abstract: *The endeavor to encourage competitiveness of family farms in the EU in the current programming period of years 2014–2020 is anchored and implemented via its Common Agricultural Policy. The agricultural sector in the Czech and Slovak Republic has negative economical results in animal production. These problems are in big and also in small farms. That is reason why ´the aim of paper is to compare the production and economic risks in dairy farming in the economic and production conditions of the Czech and Slovak Republic. The paper is based on the assumption of the family farm algorithm, which is focused on the dairy cows. A family farm is represented by two adults and two children. The aim is to calculate the minimum size of the farm and the minimum number of animals needed to achieve the average income (in the national economy) of the 4-member family in Czech Republic and in Slovakia.*

The algorithms for determining the size of a family farm focused on dairy farming in the mountain production area in the economic and production conditions of the Czech Republic and the Slovak Republic were given the following inputs: the average annual income of a 4 member family, own costs for individual categories of cattle according to accounting legislation, own costs for meadows and pastures, prices for milk and meat, subsidies in mountain areas for animals and agricultural land, average annual utility of individual categories of livestock average annual harvests of meadows and pastures and volumes requirements of feed and other mineral ingredients. Data were obtained from the ministries of agriculture and statistical offices from both states.

We calculate the average 4 member family in Slovakia needs to earn minimum 16 77.44 Euro per year and in the Czech Republic 18 322.08 Euro per year. The results of the paper proved that, according to the model of an average farm focused on dairy production, the acreage of 92.29 ha in Slovakia and 57.14 ha in the Czech Republic of agricul-tural land needs to have one family farm. From the point of view on number of animals one Slovak family farm needs to have minimum 11 dairy cows and farm cows in the Czech Republic need to have 15.5. This option assumes that the family farm will not hire another employee and will not calculate with burden costs and administrative costs.

Nowadays in Slovakia, Ministry of Agriculture and Rural Development Program of the SR state that size of sustainable farms has to be 28 ha of agricultural land. The article shows that the minimum farm size should be 92.29 ha of agricultural land, and 11 dairy cows. In case of Czech republic is different situation were minimum farm size should be 57.14 ha of agricultural land (3/5 of the Slovak value), and 15.5 dairy cows (4 cows more in comparison with Slovakia).

Key words: Farm size · Agricultural land · Milk production · Dairy cows · Costs · Prices · Subsidies

JEL Classification: Q12

1 Introduction

Entrepreneurship on the agricultural land belongs among the oldest economic sectors of every country. Slovakia and Czech Republic were for many centuries typical agrarian countries. Despite the areal industrialization after 1950 agriculture remained its characteristic feature. Evidential sector organization of agricultural production was created as a result of manufacturing expansion. It was caused by industrialization process. It caused largely one-side orientation of rural regions towards the agricultural activities. In the current era of globalization, especially after the accession to the EU, the position of agriculture is changing especially in the trend of EU CAP reforms (Horská, Nagyová & Felixová, 2010; Kleinová & Neománi, 2010, Dvorak, 2017).

Ing. Dušan Dobák, Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Address: Trieda A. Hlinku 2, 94976 Nitra, Slovakia

doc. Ing. Patrik Rovný, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Marketing and Trade, Address: Trieda A. Hlinku 2, 94976 Nitra, Slovakia, e-mail: patrik.rovny@gmail.com

Faced to sustainability problems, European agriculture is looking after better solutions to maintain jobs and economic activities while respecting the natural resources (Cvik & MacGregor Pelikánová, 2015).

The changing position of agriculture and the differentiated rural areas is also reflected in the theoretical approaches trying to explain this transformation with agriculture seen as one of the sectors and industries in the rural areas which can ensure the sustainability of rural households and the quality of life in rural areas through combination of agriculture and other activities (tourism or other services) in the frame of multifunctionality concept. (Zdráhal et al., 2016, Koneny, 2015).

There are many authors who are calculating with size of farm and economical results. Some results show that there is a negative relationship between farm size and productivity and positive relationship between credits and productivity. These results were statistically significant in all models at coefficient estimation using the method of least squares and the fixed effect model. According to the reached results by authors Ladvenicová and Miklovičová (2015) can say that for Slovak farmers it would be better to operate on smaller size of farm than they do. Many studies estimated that in agriculture there are constant returns to scale. In our case we can follow decreasing returns to scale – each hectare of land leads to the decrease of production. Positive effect can be follow in credits. Access to credits can depend on farm size. If the amount of credits depends on collateral, then larger farms may have easier access to credits. They can use more inputs and it causes that productivity will depend positively on farm size.

Many authors are solving problem relationships between farm size and sustainability. Large-scale dairy farms had a higher labor productivity and NFI than other dairy farms, without compromising on phosphorus surplus, energy use or ghg emission. Higher profits were accompanied by a lower solvency ratio on large-scale farms. Pesticides use, however, was higher on large-scale dairy farms due to a lower share of grassland. Large-scale farms had a shorter cow lifetime and applied less grazing compared to other dairy farms.(Meulen, Dolman, Jager & Venema, 2014).

2 Methods

In the submitted paper had been used the data on farmers in Slovakia and the Czech Republic from the data of business calculations by Research Institute of Agricultural and Food Economics from Slovakia and Research Institute of Agricultural Economy from Czech Republic. For determination of the farm size value and the number of livestock in the cattle category of a small family farm, we can determine the following algorithm.

Each step of the algorithm must be unambiguously and precisely defined; in each situation, it must be fully clear what and how to do and how will the algorithm continue.

Algorithm usually works with some inputs, quantities that are available before or during the activity. Inputs have defined sets of values they can acquire. The algorithm has at least one output, quantity that is in the desired relation to the inputs, thus forming the answer to the problem that the algorithm solves. In general, we require that the algorithm has to be effective, in the sense that we require each operation required by the algorithm is simple enough to be at least in principle converted at the end time only by the use of pencil and paper. The algorithm does not solve one specific problem (e.g., "how to calculate 3×7"), but solves a general class of similar problems (e.g., "how to calculate the product of two integers").

Figure 1 Scheme of Algorithm for Calculation of Acreage and Number of Animals

Inputs
- Consumer expenditures,
- Own costs of cattle categories ,
- Own costs of meadows and pastures,
- Yield and harvest,
- Animal nutrition,
- Prices,
- Supporting mechanisms

Family farm

-4 members:
2 adults and 2 children
- Objective: Covering households expenditures

Outputs

-number of animals

- acreage of

agricultural land

Source: own processing
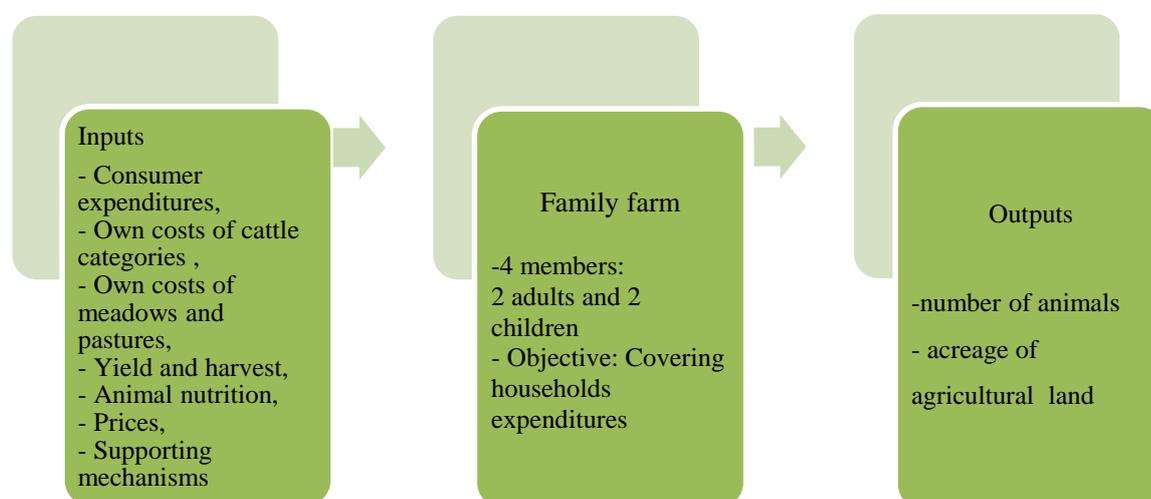
The algorithms for determining the size of a family farm focused on dairy farming of beef-cattle in the mountain production area in the economic and production conditions of the Slovak Republic were given the following inputs:

1. Annual consumer expenditures of the average four-member family,

2. Own costs of cattle categories,

3. Own costs of meadows and pastures,

4. Producers prices for milk and meat,

5. Support mechanisms in mountain areas in beef-cattle farming and in meadows and pastures,

6. The average annual yield of the different categories of livestock (beef-cattle),

7. Average annual yields of meadows and pastures,

8. Nutrient and Nuclear Feed Needs and Purchase of Other Mineral Ingredients, etc.

The outputs of the presented algorithm will be the following variables:

1. Acreage of meadows and pastures required for beef-cattle breeding in Slovakia and in the Czech Republic,

2. The numbers of animals by individual accounting categories in Slovakia and in the Czech Republic.

The paper is calculating with average household expenditures in amount of 16 177,44 EUR in the Slovak Republic and amount of 18,597.34 in the Czech Republic (year 2016).

3 Research results

The business structure in agriculture is in constant motion. In the presently existing forms of business is changing the number of farms, their size structure and their representation on the managed land plots. Agribusiness is determined mainly by the EU CAP and internal socio-political development, with an emphasis on agrarian government policy (state aid) and the formation of a business environment (legislation, economic instruments, financial sector policy). The family farming represents the predominant business model in the agriculture in the European Union. The family farms, with their 97 percent share, represent the most common type of farms, including large and small farms, full-time as well as the part-time ones. In 2013, the average acreage of agricultural holding in the EU-28 was 16.1 hectares, while in Slovakia it was 80.7 hectares of agricultural land per holding.

In the European multifunctional farming, the beef-cattle breeding performs more important tasks. They can be simply defined as tasks of a productive and non-productive nature. The production mission of livestock is the production of the main commodities - milk and meat, which have a significant role in human nutrition and contribute significantly to the revenues of agricultural subjects (on average in the Slovak Republic these account for about one quarter of agricultural production revenues and more than half of livestock production revenues). In addition, milk production ensures a continuous supply of cash. Production of high quality livestock manure can also be included in production functions. The most important non-productive livestock functions are important contributions to maintaining the cultural landscape and the social function resulting from the existence of employment opportunities in this sector. (Brestenský, 2015)

Grazing as the cheapest and the most natural form of cattle nutrition has and always will have a special meaning. Different habitats, production, economic and other conditions determine the intensity of management and corresponding grazing systems. The primary aim of the grazing system is to adapt the quantity and quality of the grass to be delivered during the season to the needs of grazing animals.

In the submitted calculations, the authors predict the average production of milk from grassland at the level of 10 kg per 1 feeding day, which represents 3,050 kg of milk per milk- cow. When reaching such a level of nutrition, we can regulate the feeding of concentrated feeding stuff depending on the overall performance of the dairy cows. Production feed mixtures are given to dairy cows for each kilogram of milked milk excessing the basic production from the bulk feed (grass and hay).

The amount of feed required for each kilogram of milked milk depends on the nutritive content in 1 kg of the compound feed. In our calculations is calculated that dairy cow produces 2 kg of milk from 1 kg of compound feed.

During life, the beef-cattle go through different stages of development, which is economically evaluated by calculating as direct costs spent on calculated output, which in the shortest term expresses - the production costs.

In beef-cattle breeding aimed at milk production, we measure the following calculation breeding categories:

- *calves (from birth to 6 months),*
- *rearing of young cattle (heifers from 6 months to 7 months),*
- *heavily pregnant cow (in 8th and 9th month of gestation),*
- *cattle fattening (bulls from the age of 6 months to carcass maturity);*
- *cows (from 1st harvesting to disposal).*

Herd turnover expresses quantitative relationships between categories and groups of livestock. The herd turnover is based on the number of born calves, the growth intensity and the breeding rate in the offspring. Therefore, detailed age categorization needs to be made, in line with biological change and housing options. From the herd turnover it is possible to determine the length of stay and the number of animals in each breeding category. For the herd turnover calculation, it is also crucial to assume the reproductive and utility parameters of the animals.

In our paper we assume that each dairy cows are fed once a year and half of the born calves will be heifers and the other half will be the bulls. From the herd turnover was calculated the expected status of breeding bulls and heifers in individual breeding categories. The calculation is based on the residence time of the animals in the given category and the number of animals assigned and eliminated.

Our calculations show that for one dairy cow is the structure of other breeding categories based on the following coefficients (Table 1):

Table 1 Indicators of the Conversion of Other Accounting Categories per 1 Structured Dairy Cow

Calves 0-6 months	0.50
Rearing of young heifers	0.94
Cattle fattening (bulls)	0.64
Heavily pregnant cows	0.04

Source: own calculations

The above coefficients indicate that in average on one cow is 0.50 calves at the age of 0-6 months, 0.94 heifers, 0.64 fattening bulls weighing 550 kg and 0.04 heavily pregnant cows (cows in the 8th and 9th months of pregnancy).

The herd turnover serves us to calculate the length of stay in feed days for each category, and on the basis of feed days, we calculate the feed balance. From the feed balance we calculate the required acreage of meadows and pastures in hectares for all categories of livestock.

The utility parameters of dairy cows and breeding categories were taken from the Research Institute of Agricultural and Food Economics from Slovakia and from the Research Institute of Agricultural Economy from the Czech Republic.

The paper aims at determining the minimum number of animals and the minimum size of agricultural land in hectares needed by small family farms to cover average consumer expenditure. As a small family farm in the described algoithm is a family with 4 members.

The algorithm is based on the assumption that besides the cows of a basic herd, we also have to calculate the following accounting categories of animals: calves 0-6 months, rearing of young heifers, bulls fattening and heavily pregnant cow. Another assumption in the calculations is the fact that in our paper, the proposed algorithm is applied in the mountainous production and economic conditions of the Slovak Republic. It means that from the above mentioned, the farm will have only meadows and pastures and no arable land. The compound feeds will have to be secured from the external sources and the meadows and pastures will be used for grazing respectively the hay production for the winter fodder season.

The algorithm for calculating the size and number of livestock is based on the average yield of dairy cows in mountain production conditions and on the price of milk per 1 liter according to research institutes. In addition, the production and reproduction indicators are included in the calculations for individual animal categories:

- Braking of dairy cows 25%, Elimination from breeding is referred as braking and is expressed in %. In case of 25% braking, the basic herd is changed every 4 years.

- Price of braking meat is 1.5 Euro per 1 kg of live mass.

- Average slaughter weight of braking dairy cows is 500 kg.

-% of natality 100%, i.e. we plan to breed one calf per dairy cow a year on the basis of the assumption that half of the born calves will be bulls and the second half will be heifers.

The fertility of meadows and pastures together with the costs were taken from research institutes as a mountain production area. The yield of meadows in green matter is 9.75 t.ha^{-1} and the yield of pastures is 6.91t.ha^{-1} in the production and economic conditions of the mountain regions of the Slovak Republic. For pastures, we plan to consume 55 kg of green matter per 1 feed day and 1 dairy cow during the summer period of 185 feed days. In the winter, we plan to feed the hay that we produce on the meadows where we plan with 11 kg of hay for 1 feed day and 1 cow. The grassland stockpile on trampled pastures is scheduled to be 30%. The loss of hay is 10%. Reserve of the whole food balance is 15%, which is recommended by Slovak researchers for the stability of the production of bulk feeding stuffs. In the calculations, we expect milk to be produced at a volume of 10 liters and the remaining will be produced by cows from the bought grain feed. Production efficiency of 1 kg of grain feed is 2 liters of milk (i.e., from 1 kg of grain feed, the dairy cow produces 2 liters of milk). From the above calculations, the proposed farm produces 3,051 liters of milk from bulk feed and 2,319 liters of milk from grain feed per dairy cow for a single accounting year. On the basis of these nutrition adjustments for dairy cows it is necessary to buy 1,160 kg of the production compound feed for one dairy cow. The price of compound feed is 0.27 Euro per 1 kg.

The algorithm calculation in Slovakia

Table 2 shows the calculated basic indicators for the area of meadows and pastures for the feeding of 11 dairy cows and other cattle categories, their costs, revenues and subsidies. The paper is calculazing with following categories: calves, heifers, heavily pregnant cows and fattening cattle.

Revenues from cows consists of revenues from sold milk and revenues from braking meat of dairy cows and from revenues from selling fattening cows and it represents together amount / 25,907.91 EUR /.

The costs of dairy cows and also other categories in the present calculation algorithm consists from the cost of the total area of meadows and pastures, which includes the harvesting losses, losses of trampled pastures grazing pastures and the feed stockpile. The cost per 1 hectare of meadows reaches a cost of 96.33 EUR and a pasture 63.29 EUR. According to our calculations, the area of meadows for feeding the dairy cows is 15.31 ha and area of pastures is 33.43 ha.

Subsidies for the farm consist of subsidies for area of meadows and pastures amounting to 18,752.47EUR and subsidies for live stock worth 4,180.86 EUR.

Table 2 Overview of Calculated Basic Indicators in Dairy Cattle Breeding in Slovakia

Indicator	Unit	Dairy-Cows	Calves 0 – 6 Months.	Heifers From 6th To7[th] Month Of Pregnancy	Heavily pregnant cows	Fattening cattle	TOTAL
Number of animals		11.00	5.50	8.69	0.57	6.68	-
Area of meadows required for breeding	HA	15.31	3.59	11.34	1.79	11.67	43.69
Area of pastures required for breeding	HA	33.43	0.00	10.18	0.00	0.00	43.61
Area of arable land needed for animal production	HA	3.60	0.19	0.33	0.04	0.84	4.99
Size of farm	HA	52.34	3.77	21.84	1.83	12.51	92.29
Own costs total (crop+ livestock production)	EUR	21,612.53	2,268.68	4,252.86	430.82	4,086.90	32,651.80
Revenues	EUR	22,931.48	0.00	0.00	0.00	2,976.43	25,907.91
Subsidies for crop production (meadows and a pastures)	EUR	10,634.25	766.64	4,438.42	371.23	2,541.93	18,752.47
Subsidies for livestock production	EUR	2,752.31	0.00	0.00	0.00	1,428.55	4,180.86
Revenues +Subsidies (crop+ livestock production)	EUR	36,318.04	766.64	4,438.42	371.23	6,946.92	48,841.25
(REVENUES +SUBSIDIES FOR FARM) – OWN COSTS	EUR	14,705.51	-1,502.04	185.57	-59.59	2,860.01	16,177.44

The calculations show that household consumption expenditure, which in 2016 were 16,177.44 Euro (for a 4-member family), requires the meadows area of 43.69 ha and pastures area of 43.61 ha, which together represents 92.29 ha of agricultural land. Regarding the structure of cattle, the farm will record 11 dairy cows, 5.5 calves, 8.69 heifers, 0.57 heavily pregnant cows and 6.68 fattening cattle. If a farm will record higher area of agriculture land and higher animal numbers, it will only have a positive economic impact on family management.

The algorithm calculation in the Czech Republic

Table 3 shows the calculated basic indicators for the area of meadows and pastures for the feeding of 15,50 dairy cows and other cattle categories in case of farm in the Czech Republic. Revenues from cows represents together amount / 38,040.42 EUR /. The costs of dairy cows are in amount / 34,878.14 EUR/ . According to our calculations, the area of meadows for feeding the dairy cows is 32.29 ha, area of pastures is 17.48 ha and area of arable land is 7.36 ha. Subsidies for the farm consist of subsidies for area of meadows and pastures amounting to 13,344.88 EUR and subsidies for live stock worth 2,090.18 EUR.

Table 3 Overview of Calculated Basic Indicators in Dairy Cattle Breeding in the Czech Republic

Indicator	Unit	Dairy-Cows	Calves 0 – 6 Months.	Heifers From 6th To 7th Month Of Pregnancy	Heavily pregnant cows	Fattening cattle	TOTAL
Number of animals		15.50	7.75	10.11	0.98	8.28	0.00
Area of meadows required for breeding	HA	12.15	2.85	7.42	1.72	8.15	32.29
Area of pastures required for breeding	HA	13.97	0.00	3.51	0.00	0.00	17.48
Area of arable land needed for animal production	HA	5.61	0.26	0.39	0.06	1.04	7.36
Size of farm	HA	31.73	3.11	11.32	1.78	9.19	57.14
Own costs total (crop+ livestock production)	EUR	24,331.66	2,602.72	3,773.99	476.41	3,693.35	34,878.14
Revenues	EUR	34,124.03	0.00	0.00	0.00	3,916.40	38,040.42
Subsidies for crop production (meadows and a pastures)	EUR	7,411.47	726.29	2,644.14	416.76	2 146,21	13,344.88
Subsidies for livestock production	EUR	2,090.18	0,00	0.00	0.00	0.00	2,090.18
Revenues +Subsidies (crop+ livestock production)	EUR	43,625.67	726.29	2,644.14	416.76	6,062.61	53,475.48
(REVENUES +SUBSIDIES FOR FARM) – OWN COSTS	EUR	19,294.01	-1,876.43	-1,129.85	-59.65	2,369.26	18,597.34

The calculations show that household consumption expenditure in the Czech Republic, which in 2016 were 18,597.34 Euro (for a 4-member family), requires agricultural land in area of 57.14 ha of agricultural land. Regarding the structure of cattle, the farm will record 15.5 dairy cows, 7.75 calves, 10.11 heifers, 0.98 heavily pregnant cows and 8.28 fattening cattle. If a farm will record higher area of agriculture land and higher animal numbers, it will only have a positive economic impact on family management.

4 Conclusions

Slovakia's agricultural policy is based on the Common Agricultural Policy ("CAP"). One of the objectives of the CAP reform in the dairy sector is to contribute to increasing its competitiveness and market orientation, especially in view of the increasing demand for milk and dairy products in the world market. The reform of the SPP in the milk and dairy products sector has focused production on market requirements and the aid is not linked to production but is geared to meeting food safety, animal welfare and environmental requirements.

The algorithms for determining the size of a family farm focused on dairy farming in the mountain production area in the economic and production conditions of the Czech Republic and the Slovak Republic were given the following inputs: the average annual income of a 4 member family, own costs for individual categories of cattle according to accounting legislation, own costs for meadows and pastures, prices for milk and meat, subsidies in mountain areas for animals and agricultural land, average annual utility of individual categories of livestock average annual harvests of meadows and pastures and volumes requirements of feed and other mineral ingredients. Data were obtained from the ministries of agriculture and statistical offices from both states.

We calculate the average 4 member family in Slovakia needs to earn minimum 16 77.44 Euro per year and in the Czech Republic 18 322.08 Euro per year. The results of the paper proved that, according to the model of an average farm focused on dairy production, the acreage of 92.29 ha in Slovakia and 57.14 ha in the Czech Republic of agricultural land needs to have one family farm. From the point of view on number of animals one Slovak family farm needs to have minimum 11 dairy cows and farm cows in the Czech Republic need to have 15.5. This option assumes that the family farm will not hire another employee and will not calculate with burden costs and administrative costs.

Nowadays in Slovakia, Ministry of Agriculture and Rural Development Program of the SR state that size of sustainable farms has to be 28 ha of agricultural land. The article shows that the minimum farm size should be 92.29 ha of agricultural land, and 11 dairy cows. In case of Czech republic is different situation were minimum farm size should be 55.30 ha of agricultural land (3/5 of the Slovak value), and 15.5 dairy cows (4 cows more in comparison with Slovakia).

Acknowledgements

References

Cvik, E. D., & MacGregor Pelikánová, R. (2015). 'Agricultural policy and law as reflected by Websites of Czech organic farmers', *Proceedings of the Agrarian perspectives XXIII*, Prague, pp. 82 - 89, ISBN 978-80-213-2581-4

Dvorak, M. (2017) Comparison of the financial management of local self -government in the Czech Republic and the Slovak Republic *Proceedings from international scientific conference „Region in Development Society 2017"* Brno, pp. 185, ISBN 978-80-7509-548-0.

European Commission, (2013). Overview of CAP Reform 2014-2020. *Agricultural Policy perspectives* Brief No. 5, December 2013. [Online], Available: http://www.fao.org/3/a-i4910e.pdf, [Accessed: 23 Nov. 2015].

Fuller-Love, N. (2006). Management development in smaller firms. *International Journal of Management* Reviews 8 (3), p.395-404. ISSN 1468-2370.

Hoppe, R.A. (2014). Structure and Finances of U.S. Farms: Family Farm Report Cited online: https://www.ers.usda.gov/webdocs/publications/43913/50363_eib-132-report-summary.pdf?v=42103.

Horská, E., Nagyová, Ľ., & Felixová, I. (2010). CAGE distance framework among Visegrad countries, Ukraine and Russia and lessons for international business. Economics, *Social Policy and Citizenship in the European Union : Evidence of V4 Countries and Perspectives for Ukraine*. Nitra : SUA, 2010. pp. 54-98. ISBN 978-80-552-0448-2.

Kleinová, K., & Neománi, J. (2010): Perception of food origin by the Slovak consumer. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*., (2010), LVIII, No. 6, p.227–234. ISSN 2464-8310.

Konecny, O. (2014). 'Rural Development, Multifunctionality and Agriculture: The Perspective of Czech Farmers', *Proceedings of the Agrarian perspectives XXIII*, Prague, pp. 304-311, ISSN 2464-4781.

Lacko-Bartošová, M. (2005). *Sustainable and ecological agriculture.* Nitra : VES SPU, 2005, 575 p.. ISBN 80-69-556-3

Ladvenicová, J., & Miklovičová, S. (2015): The Relationship Between Farm Size and Productivity in Slovakia: *Visegrad Journal on Bioeconomy and Sustainable Development* Vol. 4, no. 2 (2015) p. 46–50 ISSN 1339-3367.

Larson, D.F., Otsuka, K., Matsumoto, T., & Kilic T. (2014). Should African rural development strategies depend on smallholder farms? *An exploration of the inverse-productivity hypothesis Agricultural Economics*, 45 (3) 2014, p. 355–367. ISSN: 0305-750X.

Lauwere, C.C. de, (2005). The role of agricultural entrepreneurship in Dutch agriculture of today. *Agricultural Economics* 33, 2005, p.229-238. ISSN: 1574-0862.

Meulen, H., Dolman, M.A., Jager, J.H., & Venema, G.S. (2014). The impact of farm size on sustainability of dutch dairy farms. In: *International Journal of Agricultural Management,* Volume 3, Number 2, 1 January 2014, pp. 119-123(5) ISSN 2047-3710

Prokeinová, R. (2013): *Statistics in SAS – SAS in Statistics*. Publisher ASPA, (2013), 211 p. ISBN 978-80-89477-12-8.

Weiss C. R. (1998).: Size, Growth, and Survival in the Upper Austrian Farm Sector. Small Business Economics, 1998, Vol. 10, Issue 4, pp 305–312 ISSN: 0921-898X

Zdráhal, I., Chmelíková, G., Blažková, I., & Bečvářová, V. (2016). Differences in the Performance of the Dairy Industries within the Visegrad Group Countries. In *Proceedings of the 10th International Scientific Conference INPROFORUM.* 1st ed. České Budějovice: Jihočeská univerzita v Českých Budějovicích, 2016, p. 132--136. ISBN 978-80-7394-607-4. URL: http://ocs.ef.jcu.cz/index.php/inproforum/INP2016/paper/view/852.

Development of Purchase Prices for Cow´s Milk in the Slovak Republic and Comparison with the Czech Republic

Ivana Váryová, Iveta Košovská

Abstract: *Over the period of the last years, the Slovak dairy market has been characterized by an unfavorable situation. The abolition of milk quotas, the Russian food embargo and the weak demand from China have caused surpluses of milk on the European market, which have led to the decrease of milk purchase prices. The article's task is to assess and present the development of purchase prices of raw cow's milk at processors in the Slovak Republic in the observed period of years 2008 – 2017 and to compare it with the development in the Czech Republic. The essential information sources for the processing of before mentioned issues are presented by monthly reports on purchase of milk and cream and production of milk products acquired from the Ministry of Agriculture and Rural Development of the Slovak Republic and data from Eurostat database.*

It can be stated that the purchase prices of raw cow's milk in the observed period of the years 2008 - 2017 show high volatility. As in the Slovak Republic, three crisis periods can be also identified in the Czech Republic during which the purchase price of raw cow's milk at processors dropped below 30 eurocents per kilogram. The biggest differences in milk prices between the Slovak and Czech Republic are observed during the "great dairy crisis". The milk crisis in the years 2008 – 2009 and 2015 – 2016 affected the Slovak and Czech primary producers and led to liquidation in this area of animal production.

Key words: Cow's milk · Milk Crisis · Purchase Price · Processor

JEL Classification: Q10 · Q11 · Q13

1 Introduction

Raw cow's milk represents one of the most important commodities in the agricultural market. Raw cow's milk is an essential source of the nutrition of calves and a raw material for the production of liquid milk and dairy products, which have a unique place in the human nutrition and dietetics (Šimo, Mura and Buleca, 2016). The dairy industry is one of the most important industrial sectors for healthy development of Europe. There is not a single country being part of the European Union that does not produce milk (Pilvere, Nipers and Krievina, 2016). The dairy sector represents one of the most important branches of agriculture and food industry in the Slovak Republic. The production of milk belongs to the prospective sectors of the agriculture in the Slovak Republic, mainly due to the natural conditions, extraordinary suitable for breeding of dairy cows. However, the dairy sector is losing its scope continuously, also production is diminishing and moreover it faces several problems affecting the sector (Lajdová, Kapusta and Bielik, 2017).

The milk quota system was introduced in 1984 to the European Union dairy market to control the structural surpluses resulting from imbalances between supply and demand for milk encouraged by subsidies to the sector (Costa-Font and Revoredo-Giha, 2018). The underlying reason for this measure was the financial problems caused by the increasing butter and milk powder reserves. The previous system provided a price guarantee and intervention for producers regardless of the quantity produced. Until the introduction of the direct milk supports in 2004, the milk quota system was the only measure that had a direct impact on European Union milk production. The quotas also affected the processors, as the rules related to their raw material base and limited the processing quantity (Voneki, Mandi-Nagy and Stark, 2015).

Since the 1st of April 2015, European dairy quotas, one of the iconic instruments of the Common Agricultural Policy, have been removed. With this removal, the European Commission expects to develop a more competitive and market-oriented dairy sector in light of increasing world food demand (Salou et al., 2017). The abolition of milk quotas was aiming to improve the competitiveness of European dairies, making production more sensible to market variations. The

Ing. Ivana Váryová, PhD., Slovak university of Agriculture in Nitra, Faculty of Economics and Management, Department of Accounting, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: ivana.varyova@uniag.sk

Ing. Iveta Košovská, PhD., Slovak university of Agriculture in Nitra, Faculty of Economics and Management, Department of Accounting, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: iveta.kosovska@uniag.sk

removal of milk quotas at the same time intensifies the economic outlook of certain areas/categories of dairy production with comparative disadvantages (Dreve, Calin and Bazga, 2016). The new era of milk output without quota constraints will result in both opportunities and challenges for the European Union dairy industry. The opportunities will arise from the expanding global dairy market. The challenges will involve the ability of the European Union dairy industry to achieve international competitiveness in servicing the increased global demand for dairy products (Donnellan and Kean, 2015).

The prices of agricultural commodities have been volatile in the last years and dairy sector has not been an exception (Vargová and Rajčániová, 2017). After the abolition of the milk quota in the European Union, milk price volatility is expected to increase because of the liberalized market conditions. The European dairy farms will be more dependent on the milk price of the world market (Schulte and Musshof, 2018; Schulte, Musshof and Meuwissen, 2018). The direction of the agricultural policy of the European Union adopted after 2008 contributes to a deeper liberalization of the milk market and dependence on the global situation. The prices of milk and dairy products in the European Union depend to a greater extent on the situation on the world markets (Parzonko, 2018).

2 Methods

The article's main task is to assess and present the development of purchase prices of raw cow's milk at processors in the Slovak Republic in the observed period based on the selected literature sources. The article's other task is to compare the development of purchase prices of raw cow's milk at processors in the Slovak Republic with the development in the Czech Republic. The essential information sources for the processing of before mentioned issues are presented by monthly reports on purchase of milk and cream and production of milk products acquired from the Ministry of Agriculture and Rural Development of the Slovak Republic (hereinafter referred to as "MARD SR) and Reports about the dairy market issued by the Department of Agricultural Information – ATIS (Agricultural Market Information of Slovakia), which is the part of Agricultural Paying Agency. The data about the average purchase prices of raw cow's milk in the Czech Republic are gained from Eurostat database. The average purchase prices of raw cow's milk in the Slovak Republic are evaluated for the period 2008 - 2017. Comparison with the development in the purchase prices of cow's milk in the Czech Republic is carried out over the same period of 2008 – 2017.

The basic methodical approach of processing in a theoretical as well as in a practical level is presented by standard methods of scientific work such as selection, analysis, comparison, deduction and synthesis. The gained data about the average monthly purchase prices of the cow's milk in the Slovak Republic and in the Czech Republic are chronologically arranged into interval time series with the length of 120. The time series are illustrated by the line graphs usage, which enable to assess the development, size and course of changes in the observed period. In order to compare the purchasing prices of cow's milk in two periods, there are used the elementary characteristics of time series as the absolute change (increase or decrease), absolute value of a percentage of increase (decrease), the growth coefficient and the growth rate.

3 Research results

The dairy market has undergone several major changes in recent years. Between the years 2003 and 2007, the demand for milk and dairy products grew not only in Europe, but also around the world. As of April 2008, a 2% increase of milk quotas was approved in order to meet the growing demand within the European Union, but also on world markets. The increase of quotas was a preparation for the abolition of the milk quota system because the regulation of overproduction of milk through the milk quotas was considered to be out of the question, since the demand for milk and dairy products started to increase globally. From 2009 until 2013, quotas increased by 1percent each year, to ensure controlled and gradual cancellation. The milk quotas in the European Union were abolished on 1 April 2015. Not only was the milk production in Europe regulated by the milk quota system. The milk quota system contributed to the stabilization of the dairy sector in terms of the prices of the milk, too. The following part of the paper evaluates the development in average purchase prices of the raw cow's milk in the Slovak Republic in the period of years 2008 -2017.

3.1 Development in purchase prices of raw cow's milk in the Slovak Republic

Development in average purchase prices of raw cow's milk in the Slovak Republic during the observed period 2008 - 2017 is illustrated by the line graph in Figure 1.

Figure 1 Development in purchase prices of raw cow's milk in the Slovak Republic (Eur/100 kg)
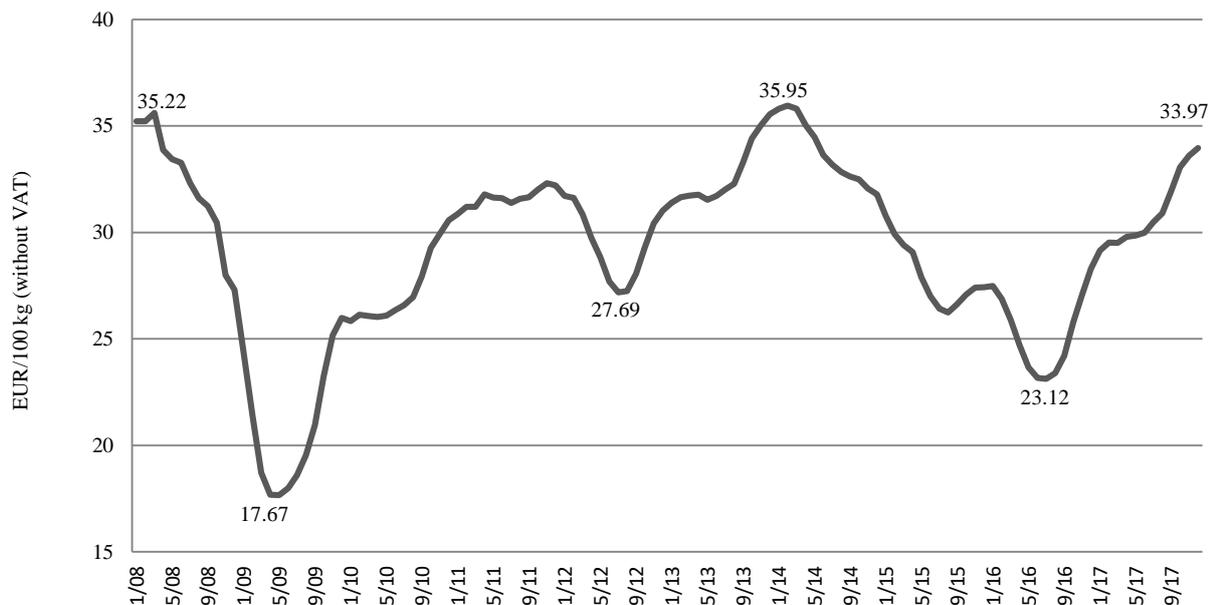
Source: Own processing pursuant to the Monthly reports on purchase of milk and cream and production of milk products (MARD SR)

It can be stated that the development in the prices of cow's milk in the given period was characterized by a fluctuating trend. Three crisis periods during which the milk price per kilogram fell below 30 cents could be identified over the observed period. Depending on the rate of decline in milk prices, we mark the individual crisis periods as "great", "medium" and "small dairy crisis". The period of the years 2008 - 2009 is marked as the "great dairy crisis". The development in milk prices during the "great dairy crisis" is illustrated in Figure 2.

Figure 2 Development in purchase prices of raw cow's milk in the Slovak Republic during the "great dairy crisis" (Eur/100 kg)
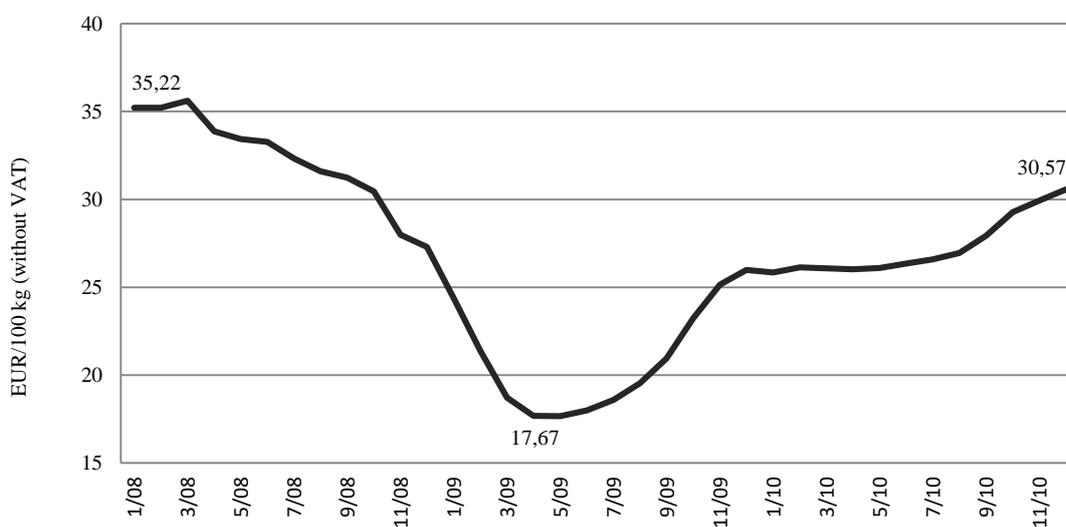
Source: Own processing pursuant to the Monthly reports on purchase of milk and cream and production of milk products (MARD SR)

In 2008 there was a significant deterioration in the dairy market. In the previous year 2007, there was a quick and substantial increase in prices due to a significant drop in the milk supplies from Oceania. After the restoration of the world supply of milk, the prices returned to more usual levels, but the subsequent financial and economic crisis has had a negative impact on milk producers in the European Union, which has contributed to the volatility of prices. While milk production in the European Union has been continuously stable, the reduction in global and European demand for milk and dairy products has led to a collapse in prices in the European Union. As a result, the prices of raw cow's milk in the Slovak Republic have decreased significantly.

At the beginning of the year 2008, the average price of raw cow's milk in the Slovak Republic was above 35 Eur/100 kg. Since March 2018, the prices have decreased gradually. In November, the price of milk fell below 30 cents per kilogram. At the end of 2008, the price dropped to 27,30 Eur/100 kg. During the year 2008, the purchase prices of raw cow's milk decreased by 22, 49 percent. The decrease in prices continued also in the following year 2009, until May, when the "great dairy crisis" culminated and the price of milk fell below 18 cents per kilogram of milk (17,67 Eur/100kg). This price is also the lowest price throughout the monitored period of the years 2008 - 2017. In comparison to the beginning of the monitored period, in May 2009 there was a significant decrease by 17,55 Eur/100 kg, it means a decrease by 49,83 percent. In the next months of the year 2009 and in the year 2010, the price was gradually increasing and in December 2010 the milk price of primary producers exceeded the border of 30 eurocent per kilogram of milk (30,57 Eur/100 kg).

In the following years, with the partial retreat of the economic recession, the price level of milk was rising until a temporary decline in 2012, when we talk about the "small dairy crisis". The development in the cow's milk prices of the primary producers during the "small dairy crisis" is illustrated in the graph in the Figure 3.

Figure 3 Development in purchase prices of raw cow's milk in the Slovak Republic during the "small dairy crisis" (Eur/100 kg)

Source: Own processing pursuant to the Monthly reports on purchase of milk and cream and production of milk products (MARD SR)

The decline in milk prices in 2012 was the result of a previous significant increase in global milk production that exceeded demand. This fact also affected the development of the prices of raw cow's milk in the Slovak Republic. During the period from April to October 2012, the price of raw cow's milk temporarily fell below the threshold of 30 eurocents per kilogram. During this period of the "small dairy crisis", the lowest milk price dropped to the level 27,18 Eur/100 kg in July 2012. In comparison to the lowest price of raw cow's milk achieved in the Slovak Republic during the pan-European "great dairy crisis", this milk price was 1,53 times higher. In November 2012, the price increased month-on-month by 3,75 percent and after a temporary reduction, the price exceeded the threshold of 30 eurocents per kilogram of raw cow's milk. In the next months, the price of raw cow's milk was rising steadily and at the end of 2013 it reached the historic highs, exceeding 35 eurocents per kilogram. In December 2013, raw cow's milk was being purchased from primary milk producers at a price of 35,55 Eur/100 kg, that means a year-on-year increase by 14,57 percent.

The price growth continued until February 2014, when the price of raw cow's milk climbed to 35,96 Eur/100 kg, that is the highest price of raw cow's milk in the Slovak Republic during the whole observed period of the years 2008-2017. The absolute difference between the highest and the lowest average price of raw cow's milk in the Slovak Republic during the evaluated period is 18,28 Eur/100 kg. The historical maximum of the raw cow's milk price is 2,03 times higher than its lowest price from the period of the "great dairy crisis".

After reaching the historic price maximum, the prices of raw cow's milk began to decrease gradually during the year of 2014. The unfavorable development of prices in the Slovak Republic copied the development of the world prices of milk and dairy products and resulted into the next milk crisis in the years 2015-2016. This crisis is referred to as the "medium dairy crisis" depending on the rate of the prices decline. The development of purchase prices of raw cow's milk in the Slovak Republic during the "medium milk crisis" is shown in the graph in Figure 4.

Figure 4 Development in purchase prices of raw cow's milk in the Slovak Republic during the "middle dairy crisis" (Eur/100 kg)

A negative trend in price development can be observed from March 2014, when the price of raw cow's milk in the Slovak Republic declined steadily. In February 2015 the price dropped even below 30 eurocents per kilogram (29,92 Eur/100 kg). In 12 months, the purchase price of raw cow's milk decreased by 6,03 eurocent per kilogram. It means a year-on-year decline by 16,77 percent from the historical maximum price level of 35,96 Euro/100 kg in the same month of the previous year. Purchase prices of raw cow's milk were kept below 30 eurocents per kilogram for more than two years until the end of the first half of 2017. Especially the year 2016 was challenging for the primary milk producers when the price of the raw cow's milk oscillated approximately between 23 and 28 eurocents per kilogram during the whole year, while in July 2016 the price dropped to a minimum. At that time, the milk processors were purchasing 100 kg of raw cow's milk for only 23,12 Eur. These were the lowest purchase prices of raw cow's milk since 2009.

This adverse development in the dairy sector was associated with a significant global imbalance between supply and demand. During the years 2014 and 2015, the global demand for milk and dairy products declined as a result of several events that occurred in the given period. One of the reasons for the price drop was the decline of demand for milk and dairy products as a reaction to high prices at the turn of 2013 and 2014. Negative impact on demand was also the ban on imports of agricultural products from the European Union into the Russian Federation introduced on 7 August 2014. The Russian Federation was till then the largest export market for milk and dairy products from the European Union. Currently, the Russian embargo is extended until 31 December 2019. The unfavorable situation in the given period was compounded also by the weakening demand from China side, which is the world's largest importer of dairy products, after dried cow's milk from European production.

The development of prices in dairy sector was also affected by the abolition of the milk quota system in the European Union, which ended on 1 April 2015. The abolition of milk quotas enabled, in particular, the dominant European milk producers (e.g. Germany, France, the Netherlands, Belgium) to increase their production. Higher milk production and a drop in demand for the above reasons led to the accumulation of milk in the internal market of the European Union. The high milk surpluses on the European market subsequently led to the decline in the purchase prices of raw cow's milk.

The persistent unfavorable situation on the dairy market in the Slovak Republic started to stabilize in the second half of the year 2017, when the average purchase price of raw cow's milk exceeded the threshold of 30 eurocents per kilogram. The milk purchase price reached the level of 30,49 Eur/100 kg in July 2017, it means a year-on-year increase by almost one-third in comparison with the July of the previous year (growth coefficient = 1,32). The price increase continued and in December 2017, the price of raw cow's milk was higher by 3,48 Eur/100 kg, that means the increase by 11,41 percent since July.

3.2 Comparison of the development of the purchase prices of raw cow's milk in the Slovak and Czech Republic

The comparison of the development of the average purchase prices of raw cow's milk in the Slovak and Czech Republic for the period 2008-2017 is presented by using the graph in Figure 5.

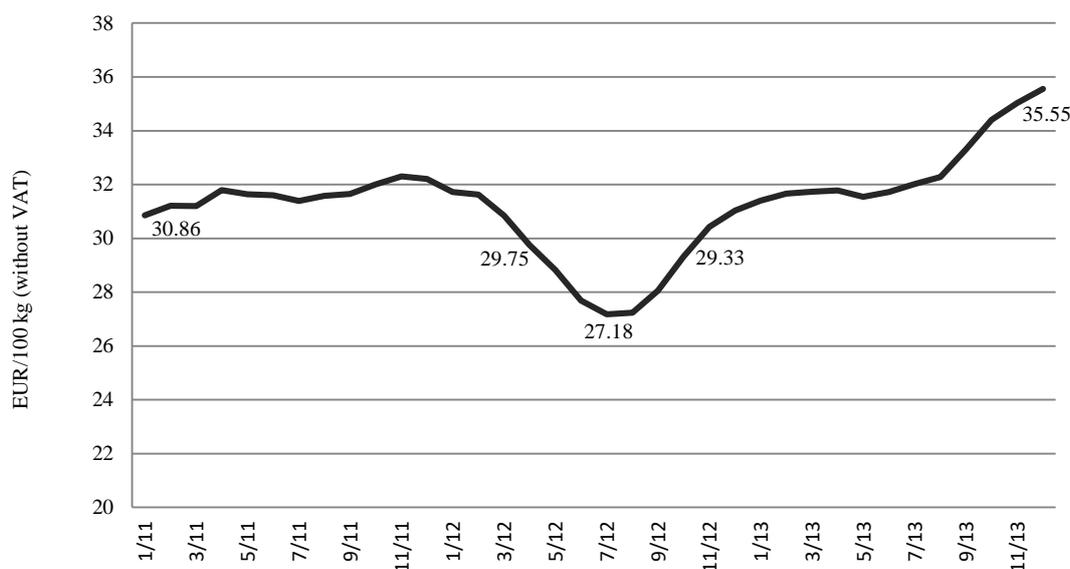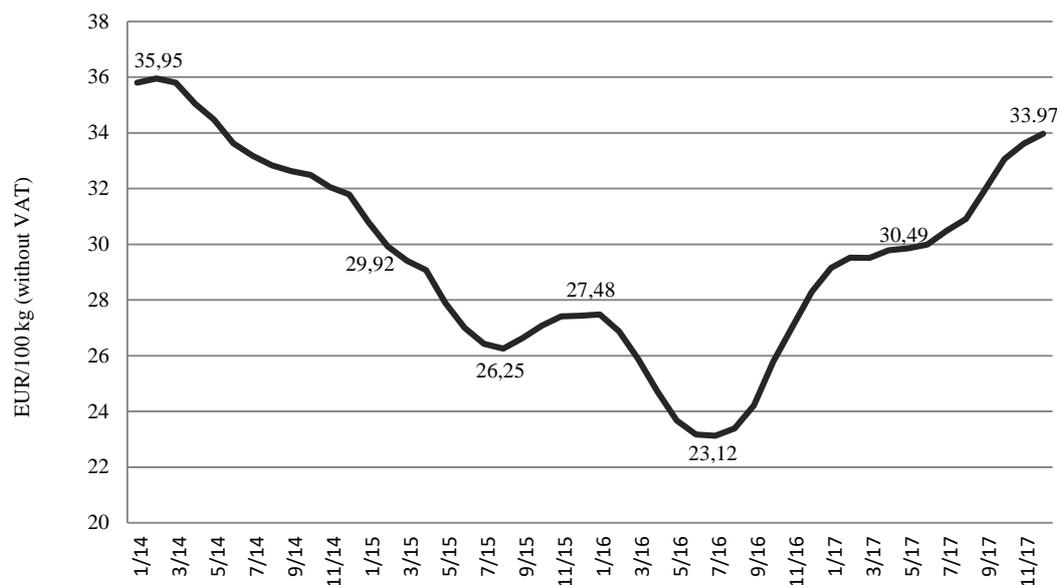**Figure 5** Development in purchase prices of raw cow's milk in the Slovak and Czech Republic (Eur/100 kg)
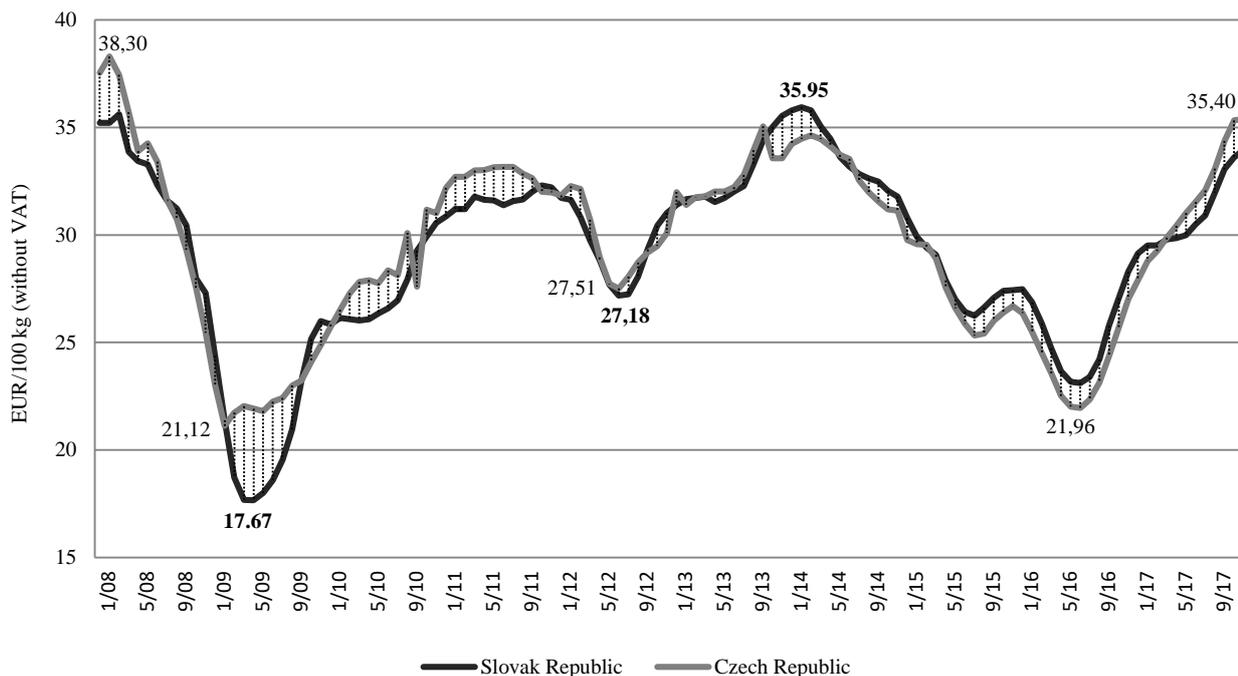
Source: Own processing pursuant to the Monthly reports on purchase of milk and cream and production of milk products (MARD SR) and Eurostat database

Based on the curve in the graph, it can be stated that, in the Slovak Republic and also in the Czech Republic, the purchase prices of cows' milk are not monotonous. Several extremes can be observed in the monitored period of the years 2008 - 2017. As in the Slovak Republic, three crisis periods can be also identified in the Czech Republic during which the price dropped below 30 eurocents per kilogram. These periods correspond to the crisis periods in the dairy sector of the Slovak Republic. The pan-European dairy crisis in the years 2008 - 2009 also caused a significant drop in the price of raw cow's milk in the Czech Republic. While at the beginning of the year 2008 the milk price reached the historical highs (38,30 Eur/100 kg in February 2008), it fell down by 44,86 percent to the lowest level of the whole observed period 12 months later. While at the worst stage of the "great milk crisis" in the Slovak Republic the price of raw cow's milk dropped to less than 18 eurocents per kilogram of milk, in the Czech Republic, the lowest recorded price was at 21,12 Eur/100 kg, that is by 3,45 Eur/100 kg more than in the Slovak Republic.

The biggest differences in milk prices between the two countries are observed during the "great dairy crisis". In May 2009, the difference between the purchase price of raw cow's milk in the Czech Republic and the lower price in the Slovak Republic was up to 4,36 Eur/100 kg. In the next period, the differences diminished, and the purchase prices of raw cow's milk came close to each other. The next deepening of the differences in the price development of the both countries can be observed at the turn of 2013 and 2014, when the price of raw cow's milk in the Slovak Republic reached its historical highs. The price of raw cow's milk in the Czech Republic was below the price level in the Slovak Republic, with the largest price difference recorded in December 2013 at 1,98 Eur/100 kg.

During the "medium milk crisis" in the years 2015 - 2016, the development of the purchase prices of raw cow's milk in the both countries was comparable and significant price differences did not occur. In the Czech Republic, the milk crisis also caused the drop in raw cow's milk prices below the threshold of 30 eurocents per kilogram for two more years. In 2016, the price of raw cow's milk oscillated approximately between 22 and 27 eurocents per kilogram. As in the Slovak Republic, also in the Czech Republic, the price dropped to a minimum in July 2016, when the milk processors were purchasing cow's milk from primary producers for only 21,96 Eur/100 kg, it means a price lower by 1,16 Eur/100 kg in comparison to minimum achieved in the Slovak Republic. Despite the fact that the prices of raw cow's milk were lower in the Czech Republic during the "middle milk crisis" than in the Slovak Republic, the unfavorable situation on the dairy market began to stabilize a little earlier than in the Slovak Republic. The average purchase price of raw cow's milk exceeded the threshold of 30 eurocents per kilogram in May 2017 and by the end of the year 2017 it grew faster than the price in the Slovak Republic. In December 2017, the purchase price of milk in the Czech Republic reached the level of 35,40 Eur/100 kg, that is by 1,43 Eur/100 kg more than in the Slovak Republic.

As a conclusion of this comparison it can be stated, that during the whole observed period the differences between the purchase prices of raw cow's milk in the both countries were at the level of approximately 1 Euro/100 kg (average value = 1,085 Eur/100 kg, median = 1,055 Eur/100 kg).

4 Conclusions

The aim of the paper was to evaluate the development of the purchase prices of raw cow's milk in the Slovak Republic in the period 2008 - 2017 and to compare it with the development of prices in the Czech Republic. Due to the size and openness of the Slovak economy, the development of supply and demand on the international markets was also necessary to be taken into account during the evaluation.

It can be stated that the purchase prices of raw cow's milk in the observed period of the years 2008 - 2017 show high volatility. In the evaluated period, three crisis periods were identified during which the price per kilogram of raw cow's milk fell below 30 eurocents. This price is unbearable for many primary producers, because according to the Slovak Agricultural and Food Chamber, the production costs of raw cow's milk are at the level of 40 - 42 eurocents per kilogram. At such low milk prices and high production costs, even despite the provided support, a loss occurs at many primary producers. The "great dairy crisis" affected the Slovak and Czech primary milk producers in the years 2008 - 2009. The purchase price of raw cow's milk in the Slovak Republic fell below 18 eurocents per kilogram. Because of the high losses in this period, many enterprises have ended up the milk production. During the next milk crisis in the years 2015 - 2016, Slovak and Czech primary producers achieved low prices of raw cow's milk. In this period, over the long term, the price of raw cow's milk ranged from 23 to 28 eurocents per kilogram, what led to next liquidation in this area of animal production. As of 31 December 2017, there were 435 primary producers of raw cow's milk registered in the Slovak Republic, it means a one-third decrease (absolute value of a percentage of decrease = 0,36) in comparison to the beginning of the observed period with 675 primary producers.

The consumers could also help the Slovak primary producers of raw cow's milk by preferring Slovak products to foreign ones. Slovak milk and dairy products are of high quality and are produced under the constant supervision. However, import of milk and dairy products grow on the Slovak market every year, especially from Germany, Poland and the Czech Republic. In competition with foreign suppliers who, in some cases, deliver supplies at dumped prices, domestic producers do not have a chance. The next problem is the consumption of milk and dairy products per capita, which is relatively low in the Slovak Republic. According to the preliminary data of the Statistical Office of the Slovak Republic, this year's level of consumption of milk and dairy products is estimated at 176,1 kg/person. In comparison to the previous years, the consumption in Slovakia is increasing, but compared to the recommended annual consumption of milk and dairy products, which according to nutritionists is 220 kg, we still have a deficit. The campaigns to promote the consumption of milk and dairy products should therefore also focus on informing consumers about the benefits of their consumption, not only in terms of consumer patriotism.

References

Costa-Font, M., & Revoredo-Giha, C. (2018). An Empirical Analysis of UK Milk Contract Prices 2004-2016. *Agribusiness*, 34(1), 112-141.

Donnellan, T., & Keane, M. (2015). The European Dairy Sector in a new Era. *Proceedings of the 24th International Scientific Conference on Agrarian Perspectives – Global Agribusiness and the Rural Economy Location*, 5-19.

Dreve, V., Calin I., & Bazga, B. (2016). Economical Prospect on Medium Term in the Context of Milk Quota Abolition. *Scientific Papers, Series D, Animal Science* 59, 282-287.

Lajdová, Z., Kapusta, J., & Bielik, P. (2017). Price Analysis and Competitiveness of the Dairy Supply Chain. *Proceedings of the 7th International Scientific Conference on Managerial Trends in the Development of Enterprises in Globalization Era (ICoM)*, 618-629.

Parzonko, A. (2018). Milk Production Costs in Polish and other EU Countries´Dairy Farms – Assessment in 2009-2015. *Proceedings of the2018 International Scientific Conference „Economic Science for Rural Development" No 49,* 154-161.

Pilvere, I., Nipers, A., & Krievina, A. (2016). Analysis of the Factors Affecting Cost Efficiency in the Dairy Industry in Latvia. *Proceedings of the 2016 International Conference „Economic Science for Rural Development" No 41*, 252-259.

Salou, T., van der Werf, H. M. G., Levert, F., Forslund, A. Hercule, J., & Le Mouël, Ch. (2017). Could EU Dairy Quota Removal Favour Some Dairy Production Systems over others? The Case of French Dairy Production Systems. *Agricultural Systems* 153, 1-10.

Schulte, H. D., & Musshoff, O. (2018). Insurance Prospects after European Dairy Quota Abolition. *Agricultural Finance Review*, 78(2), 223-232.

Schulte, H. D., Musshoff, O., & Meuwissen, M. P. M. (2018). Considering Milk Price Volatility for Investment Decisions on the Farm Level after European Milk Quota Abolition. *Journal of Dairy Science*, 101(8), 7531-7539.

Šimo, D., Mura, L., & Buleca, J. (2016). Assessment of Milk Production Competitiveness of the Slovak Republic within the EU-27 Countries. *Agricultural Economics*, 62(10), 482-492. doi: 10.17221/270/2015-AGRICECON

Vargová, L., & Rajčániová, M. (2017). Horizontal Price Transmission of the Milk Market in the Central European Union Countries. *Proceedings of Global Scientific Conference on Management and Economics in Manufacturing Location*, 367-374.

Voneki, E., Mandi-Nagy, D., & Stark, A. (2015). Prospects for the European Union and Hungarian Dairy Sectors after the Abolition of the Milk Quotasystem. *Studies in Agricultural Economics*, 117(1), 1-9.

Slovak Households and Their Demand for Cheese

Lucia Vargová, Martin Jamrich

Abstract: *The dairy production has a longstanding tradition in Slovakia. Cheese represents a wide range of product variations and in recent years the consumption of this commodity has increased together with the consumption of other dairy products. To estimate demand for cheese, we applied Cragg´s double hurdle model, using HBS dataset for years 2006 – 2012 in Slovakia. The findings show that cheese is price inelastic (-0.48). The econometric model also implies that prices of products e.g. the whole, skimmed and dried milk, yogurt, and other dairy products have none or very small effect on the consumption but on the other hand, the income has a significant and positive impact on purchasing activity of consumers. An increase in income by 10 percent leads to an increase in consumption of cheese by 3.4 percent. The study also presents the influence of other socio-demographic characteristics like region, household size or economic status of the household head.*

Key words: Cheese · Price elasticity · Income elasticity · Double hurdle model

JEL Classification: C01 · E21 · Q11

1 Introduction

Milk belongs to the crucial and staple food commodity. The dairy industry has been a part of human lives for ages, contributes to sustainable agriculture in the countries, and active production cycle together with sufficient consumption have a significant position in the development of the economies. On average about one-third of the cow's milk production is used to process the various range of cheeses (Mikkelsen, 2014). The cheese production represents one of the most dynamic dairy segments and in 2016 exceeded 9.7 million tonnes. On the other hand, cheese consumption showed increasing trends over the last decade and reached 18.6 kg of cheese per capita in 2016 (EU-28). These patterns are the results of changes in customer trends as a response to different factors such as the influence of food trends, health perception related to consumption of milk products, the variety of products, as well as flavours and many others.

Many economics researchers have focused on the examination of demand elasticities for a variety of products include Brooker et al. (1994), Lazaridis (2003), Piggott and Marsh (2004) for meat, Torrisi et al. (2006) for wine, Singh et al. (2012) for seafood, Dalhuisen et al. (2003) for water, Liu et al. (2009) for food, Manning et al. (1995) and Gruenewald et al. (2006) for alcohol or also for dairy industry (Gould, 1990; Glaser and Thompson, 2000; Stockton, 2005; Bai, 2008, Bouamra- Mechemache et al., 2008). Schmit and Kaiser (2006) use a partial equilibrium model of the US domestic dairy sector to forecast the retail demand for milk and cheese. Their results indicate that the decline of retail demand for milk will persist but at a reduced rate compared with past years. Andreyeva et al. (2014) examine how price changes affect the demand for various food products including cheese and dairy products by analysing of time series and households' studies on price elasticity. The study of Huang et al. (2007) focuses on the price elasticities for cheese sold at the retail proved that the lower-income consumers tend to be more price sensitive. Much of the literature on dairy products shows that consumer's demographic and socio-economic factors have a significant impact on consumption (e.g. Gould, 1996, Hatirli 2004; Tendero and Bernabéu, 2005; Valli and Traill, 2005;). Identify factors affecting consumer sensitivity prices is crucial to profitable production and sales.

During the last years, the global dairy industry has been expanding mainly due to growing demand. Between the years 2013 - 2017, the average EU milk production increased by 7%, reaching the value of 170 million tonnes in 2017. Compared to EU countries, Slovakia is just a small dairy producer because the production accounted for 0.5% of the EU share and reached 923.4 thousand tonnes of raw milk in 2017. The majority of Slovak milk is produced on the farms. They are

Ing. Lucia Vargová, Slovak University of Agriculture, Faculty of Economics and Management, Department of Economic Policy, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: lucia.vargova63@gmail.com

Ing. Martin Jamrich, Slovak University of Agriculture, Faculty of Economics and Management, Department of Economic Policy, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: martin.jamrich@gmail.com

run as cooperatives or private enterprises (limited company or trading companies) and most of the milk is used for processing by buyers. The number of registered dairy farms was 435 in 2017, 40 dairy companies and organizations operate with direct milk collection from the agricultural holdings but just 10 of them operate with own-milk processing.

According to the Eurostat (2018), over 9.559 million tonnes of cheese were produced in the European Union (in 2017). The most important producer is France followed by Germany, Italy, and the Netherlands. In Slovakia, the cheese production has shown an upward trend since 2010 and reached 40.31 thousand tonnes in 2017 (Figure 1).

Figure 1 Cheese production
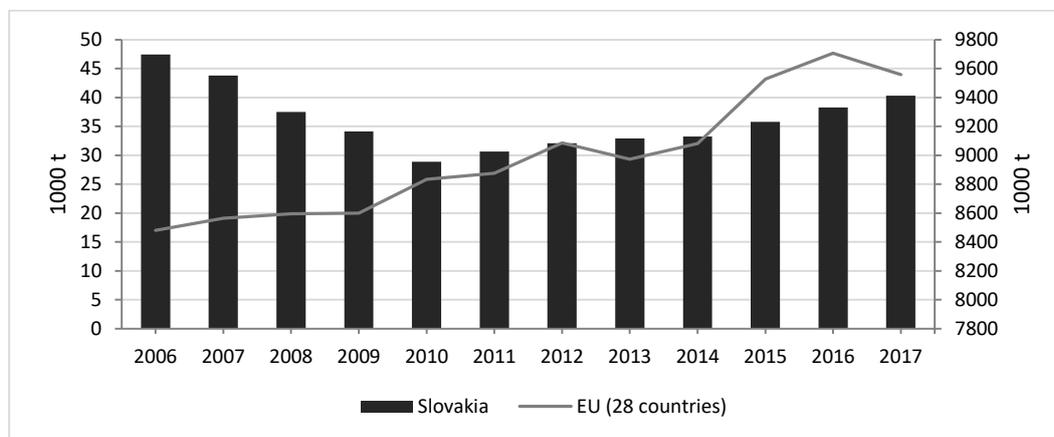
Source: Eurostat, own processing

Trends in consumption per capita for cheese and cow's milk in Slovakia have traced a slightly different path over time. Cheese consumption has increased whereas the consumption of cow's milk has fallen. However, the consumption per capita of dairy products recorded an increasing trend and in 2017 reached value 173.5 kg per capita (Figure 2). These numbers indicate that the consumption milk and dairy products in Slovakia is lower compared to the average of other EU countries or recommended level (220kg per capita).

Figure 2 Consumption of dairy products in Slovakia
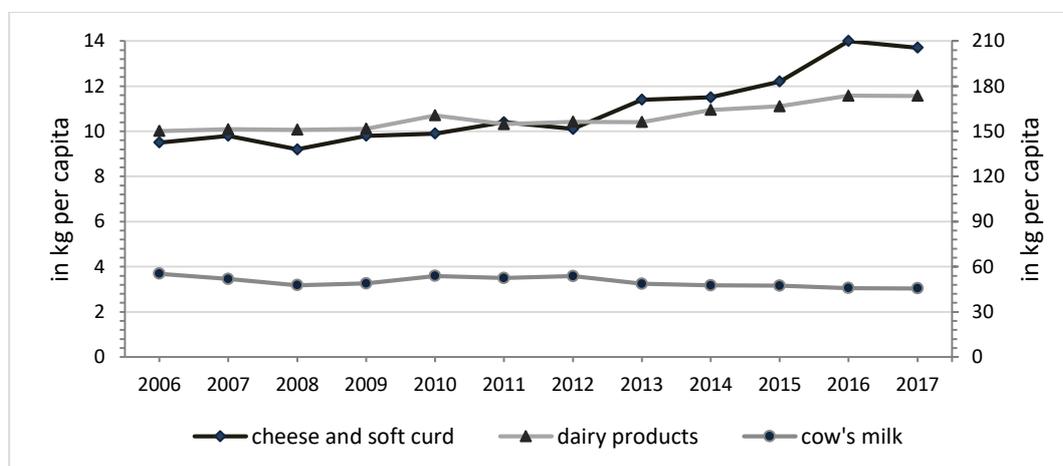
Source: Eurostat, own processing

The issue of demand has an importance to the growth of the dairy industry. Regarding the dairy products, the sour-dairy products and cheese dominated in consumption in the past years in Slovakia and therefore this research focuses on the estimation of price elasticity for cheese. Following sections of this paper present description of the empirical model with data and show the results and conclusions.

2 Methods

The main aim of this paper is to estimate the price elasticity of household's demand for cheese in Slovakia. Due to the significant number of households with zero consumption, we applied the Cragg´s double-hurdle model. Data were obtained from the Household Budget Survey (HBS) of Slovakia. The database includes specific information on household incomes and expenses on food (also on non-food products) as well as the other socio-demographic characteristics of

individual households and covers the time period from 2006 to 2012. The average monthly consumption of cheese per household was used as the main dependent variable. To estimate the price elasticity was essential to determine the prices of cheese because the database did not contain this kind of information. The prices were derived from expenditures and quantities of consumed cheese. For households with zero consumption, we determined the average prices of 8 regions by years and quarters, and missing prices were substituted with new estimated prices. Besides the price of cheese, the prices of the whole, skimmed and dried milk, yoghurt and other dairy products were included in the model.

Table 1 contains the list of variables used in the model based on studies focused on the demand for dairy product, e. g. Heien and Wessells (1988); Dong, Chung et al. (2007); Bouamra-Mechemache, et al. (2008).

Table 1 Variables used in the model

Dependent variable (Y_j)	Definiton
ln_c_cheese	log monthly consumption per household
Explanatory variables (X_j)	*Definiton*
ln_p_cheese	log price of cheese per kg
ln_p_milk_whole	log price of whole milk per l
ln_p_milk_skim	log price of skim milk per l
ln_p_milk_dried	log price of dry milk per kg
ln_p_yogurt	log price of yogurt per kg
ln_p_other_dairy	log price of other dairy products kg
ln_income	log monthly income per household
age_hh	age of head of household
male_hh	dummy variable, gender of head of household, 1 – man, 0 – woman
employed_hh	dummy variable for work status of head of household, 1 – employed, 0 – unemployed or economically inactive person
n_members	number of members of household
sp_household	dummy variable, 1 – single person household, otherwise 0
n_retirees	number of retirees in household
n_teenagers	number of teenagers in household (age 13 – 18)
n_children	number of children in household (age < 12)
region	dummy variables for 8 regions of Slovakia
year	time trend for period 2006 - 2012

Source: Own processing

Estimation of demand by OLS that contains a significant number of zero observations would lead to biased and inconsistent results (Amemiya, 1984). Many researchers e.g. Gao et al. (1995), Burton et al. (1996), Yen and Jones (1997), Sharpe et al. (2001), Newman et al. (2003), Dong et al. (2004), Mabiso et al. (2005), Mutlu and Gracia (2006), Zhang et al. (2008), Wan and Hu (2012) Eakins, 2016 or Cupak et al. (2016) used in their studies for food demand Cragg´s (1971) double-hurdle model.

The double-hurdle model is appropriate if consumers make their decision into two steps. First, hurdle (*participation step*-consumers decide about the participation in the market) is estimated by Probit model and the second one (*consumption decision*-consumer determinates an amount of consumption) with a truncated Tobit model. The participation step is described by equations (1) and (2) and the consumption step by equations (3) and (4).

$$d_j^* = z_j \gamma_j + u_j \qquad\qquad u_j \sim N(0,1) \qquad\qquad (1)$$

$$d_j = \begin{cases} 1 \; if \; d_j^* > 0 \\ 0 \; if \; d_j^* \leq 0 \end{cases} \qquad\qquad (2)$$

Where:

d_j^* unobserved latent variable,

d_j observed binary variable.

$$y_j^* = x_j\beta + v_j \qquad\qquad v_j \sim N(0, \sigma^2) \tag{3}$$

$$y_j = \begin{cases} y_j^* \; if \; d_j = 1 \; and \; y_j^* > 0 \\ 0 \; else \end{cases} \tag{4}$$

Where:

y_j^* unobserved latent variable,

y_j actual expenditure on milk which is equal to y_j^* only in case that this latent variable takes positive values and participation step is equal to 1.

z_j explanatory variable that determine participation hurdle

x_j explanatory variable that determine expenditure hurdle

Estimation of coefficients is made by maximum likelihood function.

3 Research results

Average Slovak household consumes monthly 1.69 kg of cheese. Taking into consideration only households that consume cheese, it is 1.73 kg for price 5.7 EUR per kg. To compute the cross-price effect, the prices of other dairy products were included in the model. Households buy the whole milk for 0.70 EUR, skimmed milk for 0.58 EUR and dried milk 7 EUR per kg. Average expenditures for yoghurt represents 2.61 EUR per kg and for other dairy products 2.55 EUR per kg. Head of household is typically 51 years old, mostly an employed man and the common household consists of 2.82 members and every fifth is a single person household. The proportion of retirees and children under 12 years is similar. Table 2 shows the detailed numbers.

Table 2 Averages (per month and household) of variables used in the model

Variable	c_cheese	income	p_cheese	p_milk_who	p_milk_ski	p_milk_dr	p_yogurt	p_oth_dairy
Full sample	1.692825	1098.213	5.706398	.7023417	.5834664	7.046402	2.614687	2.551348
Positive cheese consumption	1.730073	1107.31	5.706974	.7024248	.5832365	7.047329	2.616038	2.55176

Variable	age_hh	male_hh	em-ployed_hh	n_members	sp_household	n_retirees	n_teeneg-ers	n_children
Full sample	51.8258	.6759555	.6448954	2.822385	.2153742	.339984	.2129066	.3455657
Positive cheese consumption	51.77159	.6789049	.6490905	2.839818	.2083663	.338319	.2152348	.348117

Source: Own processing

Table 3 presents own, cross price and income elasticities of demand for cheese. Based on estimated coefficients, we can conclude that with 10 % growth in the price of cheese we can expect a decrease of consumption by 4.8 % and demand for cheese is price inelastic. Cross price elasticities of other dairy products are mostly insignificant except the price of dried milk. The results of income elasticity indicate that with increasing of income by 10 % we assume the rise of consumption of cheese by 3.4 %.

Table 3 Estimation of price and income elasticities using double hurdle model for cheese

Variable	Coefficient	Std. Err.
ln_p_cheese	-.478***	.0244804
ln_p_milk_skim	-.021	.0285041
ln_p_milk_whole	.012	.034382

ln_p_milk_dried	-.042***	.0155812
ln_p_yogurt	-.0002	.0230082
ln_p_other_dairy	-.018	.0134726
ln_income	.338***	.0125426

Source: Own processing

Note: *10 % significance, ** 5 % significance, *** 1 % significance

Table 4 shows the impact of various socio-demographic characteristics on consumption of cheese. The age of the household head, the number of members in the household and the number of teenagers have a significant and positive effect and on the other hand, the number of children has negative. Dummy variables for eight regions in Slovakia are also significant. In contrast with the Bratislava region, the rest of Slovakia has a lower consumption of cheese. The variable year shows a slight increase in consumption in time.

Table 4 Estimation of price and income elasticity using double hurdle model for cheese

Variable	Coefficient	Std. Err.	Variable	Coefficient	Std. Err.
age_hh	.003***	.0005566	TN	-.077***	.0177477
male_hh	.013	.0118019	NR	-.108***	.0184032
employed_hh	.013	.0148087	ZA	.028	.0174288
n_members	.075***	.0056697	BB	-.117***	.0193786
sp_household	-.129***	.0214114	PO	-.218***	.0197965
n_retirees	-.002	.0097597	KE	-.113***	.0185406
n_teenagers	.038***	.0094217	year	.016***	.0025315
n_children	-.048***	.0085342	_cons	-34.82***	5.080696
TT	-.204***	.0189432			

Source: Own processing

Note: *10 % significance, ** 5 % significance, *** 1 % significance

4 Conclusions

In our study, we adopted the censored demand system approach and examined the cheese demand trends of Slovak households by using the Cragg's double-hurdle model. The HBS data were used and covered a period of seven years. We estimated the own, cross-price and income elasticities of demand for cheese. The findings of econometric analyses suggest that demand for cheese is price inelastic and with a 10 % increase in cheese price, the consumers demand can decrease by 4.8 %. The income factor significantly affects the consumption, i.e. with an increase in income by 10%, the consumption can rise by 3.4%. The other socio-demographic factors like age of head of household, number of household members and teenagers positively influence the consumption of cheese in compared to the number of children in the household which is considered as a factor with the negative impact on consumption of cheese. According to the demographic distribution, the Bratislava region has the highest consumption of this commodity.

Acknowledgement

References

Amemiya, T. (1984). Tobit models: A survey. *Journal of econometrics*, 24(1-2), 3-61.
Andreyeva, T., Long, M. W., & Brownell, K. D. (2010). The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. *American journal of public health*, 100(2), 216-222.

Bai, J., Wahl, T. I., & McCluskey, J. J. (2008). Fluid milk consumption in urban Qingdao, China. Australian *Journal of Agricultural and Resource Economics*, 52(2), 133-147.

Bouamra-Mechemache, Z., Réquillart, V., Soregaroli, C., & Trévisiol, A. (2008). Demand for dairy products in the EU. *Food policy*, 33(6), 644-656.

Brooker, J. R., Eastwood, D. B., & Gray, M. D. (1994). The Impact of Advertising on Consumer Demand for Beef: An Appliation of Scan Data. *Journal of Food Products Marketing*, 2(1), 17-35.

Burton, M., Dorsett, R., & Young, T. (1996). Changing preferences for meat: Evidence from UK household data, 1973–93. *European Review of Agricultural Economics*, 23(3), 357-370.

Bouamra-Mechemache, Z., Réquillart, V., Soregaroli, C., & Trévisiol, A. (2008). Demand for dairy products in the EU. Food policy, 33(6), 644-656.

Chung, C., Schmit, T. M., Dong, D., & Kaiser, H. M. (2007). Economic evaluation of shelf-space management in grocery stores. *Agribusiness: An International Journal*, 23(4), 583-597.

Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica: Journal of the Econometric Society*, 829-844.

Cupak, A., Pokrivcak, J., & Rizov, M. (2016). Demand for food away from home in Slovakia. Finance a úvěr: *Czech Journal of Economics and Finance*, 66(4), 354-369.

Dalhuisen, J. M., Florax, R. J., De Groot, H. L., & Nijkamp, P. (2003). Price and income elasticities of residential water demand: a meta-analysis. *Land economics*, 79(2), 292-308.

Dong, D., Chung, C., & Kaiser, H. M. (2004). Modelling milk purchasing behaviour with a panel data double-hurdle model. *Applied Economics,* 36(8), 769-779.

Eakins, J. (2016). An application of the double hurdle model to petrol and diesel household expenditures in Ireland. *Transport Policy*, 47, 84-93.

EUROSTAT. 2018. Production of cheese. Available at: https://ec.europa.eu/eurostat/web/products-datasets/product?code=tag00040

Gao, X. M., Wailes, E. J., & Cramer, G. L. (1995). A microeconometric model analysis of US consumer demand for alcoholic beverages. *Applied Economics*, 27(1), 59-69.

Glaser, L. K., & Thompson, G. D. (2000, June). Demand for organic and conventional beverage milk. In *Western Agricultural Economics Association Annual Meeting*, June.

Gould, B. W., Cox, T. L., & Perali, F. (1990). The demand for fluid milk products in the US: a demand systems approach. *Western Journal of Agricultural Economic*s, 1-12.

Gould, B. W. (1996). Factors affecting US demand for reduced-fat fluid milk. *Journal of Agricultural and Resource Economics*, 68-81.

Gruenewald, P. J., Ponicki, W. R., Holder, H. D., & Romelsjö, A. (2006). Alcohol prices, beverage quality, and the demand for alcohol: quality substitutions and price elasticities. Alcoholism: *Clinical and Experimental Research*, 30(1), 96-105.

Hatirli, S. A., Ozkan, B., & Aktas, A. R. (2004). Factors affecting fluid milk purchasing sources in Turkey. *Food quality and preference*, 15(6), 509-515.

Heien, D. M., & Wessells, C. R. (1988). The demand for dairy products: structure, prediction, and decomposition. *American Journal of Agricultural Economics*, 70(2), 219-228.

Huang, M. H., Jones, E., & Hahn, D. E. (2007). Determinants of price elasticities for private labels and national brands of cheese. *Applied Economics*, 39(5), 553-563.

Lazaridis, P. (2003). Household meat demand in Greece: a demand systems approach using microdata. Agribusiness: An International Journal, 19(1), 43-59.

Liu, H., & Zhong, F. N. (2009). Food consumption and demand elasticity: Evidence from household survey data. *Journal of Nanjing Agricultural University* (Social Sciences Edition), 9(3), 36-43.

Mabiso, A., Sterns, J., House, L., & Wysocki, A. (2005). *Estimating Consumers' Willingness-to-pay for Country-of-origin Labels in Fresh Apples and Tomatoes: A Double-hurdle Probit Analysis of US Data Using Factor Scores* (Doctoral dissertation, University of Florida).

Newman, C., Henchion, M., & Matthews, A. (2003). A double-hurdle model of Irish household expenditure on prepared meals. *Applied Economics*, 35(9), 1053-1061.

Manning, W. G., Blumberg, L., & Moulton, L. H. (1995). The demand for alcohol: the differential response to price. *Journal of Health Economics*, 14(2), 123-148.

Mikkelsen, P. (2014). World Cheese Market 2000-2020, PM Food Dairy Consulting, Denmark, 700p.

Mutlu, S., & Gracia, A. (2006). Spanish food expenditure away from home (FAFH): by type of meal. *Applied Economics*, 38(9), 1037-1047.

Newman, C., Henchion, M., & Matthews, A. (2003). A double-hurdle model of Irish household expenditure on prepared meals. *Applied Economics*, 35(9), 1053-1061.

Piggott, N. E., & Marsh, T. L. (2004). Does food safety information impact US meat demand?. *American Journal of Agricultural Economics*, 86(1), 154-174.

Schmit, T. M., & Kaiser, H. M. (2006). Forecasting fluid milk and cheese demands for the next decade. *Journal of dairy science*, 89(12), 4924-4936.

Sharpe, D. L., Abdel-Ghany, M., Kim, H. Y., & Hong, G. S. (2001). Alcohol consumption decisions in Korea. *Journal of Family and Economic Issues*, 22(1), 7-24.

Singh, K., Dey, M. M., & Surathkal, P. (2012). Analysis of a demand system for unbreaded frozen seafood in the United States using store-level scanner data. *Marine Resource Economics*, 27(4), 371-387.

Sousa, J (2014): Estimation of price elasticities of demand for alcohol in the United Kingdom. *HMRC Working Paper* 16.

Stockton, M. C. (2005). *Applications of demand analysis for the dairy industry using household scanner data* (Doctoral dissertation, Texas A M University).

Tendero, A., & Bernabéu, R. (2005). Preference structure for cheese consumers: a Spanish case study. *British Food Journal*, 107(2), 60-73.

Torrisi, F., Stefani, & G., Seghieri, C. (2006). Use of scanner data to analyze the table wine demand in the Italian major retailing trade. Agribusiness: *An International Journal*, 22(3), 391-403.

Valli, C., & Traill, W. B. (2005). Culture and food: a model of yoghurt consumption in the EU. *Food quality and preference*, 16(4), 291-304.

Wan, W., & Hu, W. (2012, February). At Home Seafood Consumption in Kentucky: A double-hurdle model approach. In *Southern Agricultural Economics Association Annual Meeting. Birmingham*, AL.

Yen, Steven T., &Andrew M. Jones. "Household consumption of cheese: an inverse hyperbolic sine double-hurdle model with dependent errors." *American journal of agricultural economics* 79.1 (1997): 246-251.

Zhang, F., Huang, C. L., Lin, B. H., & Epperson, J. E. (2008). Modeling fresh organic produce consumption with scanner data: a generalized double hurdle model approach. *Agribusiness: An International Journal*, 24(4), 510-522

The current situation within the soil market and the land price in V4 countries

Jana Ladvenicová, Zuzana Bajusová, Ľubomír Gurčík

Abstract: *Soil is a basic production factor for agriculture, it represents national wealth and belongs to non-renewable natural resources. The problem of the land market development is in very fragmented ownership structure, which means that many owners do not want to sell their land because this situation also affects the market price and if they want to sell it they have to go below the market price. The purchase price of land is a factor that is depended on the creditworthiness and quality of the land, but also on the attractiveness of the locality where it is located. The pace of agricultural land market development depends on the economic situation in the country. The price of land in the V4 countries is different. At present, the land price is increasing in all V4 countries. In Slovakia, the rental market is more developed than the agricultural land market. Approximately 90% of the land is leased. The average market price of agricultural land was 7, 600 € / ha in 2015. In the Czech Republic, the average market price of agricultural land is growing year-on-year, reaching a level roughly twice as high as in 2011 in 2017. The average market price of land in Poland had growing tendency until 2015, but in 2016 was recorded a fall of 120 € / ha. Hungary has a favorable geographical location, it is an agricultural landscape. According to the participants in the agrarian market, the price of agricultural land increased in the period 2010-2014 to double. In 2016, the price of agricultural land climbed to 4,182 € / ha.*

Key words: Soil · Soil price · V4 countries · Soil market

JEL Classification: Q13 · Q21 · Q24

1 Introduction

Worldwide there are more than 570 million farms, mostly are small and family operated. Small farms (less than 2 ha) operate about 12 % and family farms about 75 % of the world's agricultural land (Lowder, Skoet, Raney, 2016). According to Act no. 307/1992, on the protection of the agricultural land fund, the land is an irreplaceable component of the environment and an irreplaceable natural resource. Agricultural land is national wealth, a basic and non-renewable means of production, which is being used in particular to provide a sufficient amount of food for the population's nutrition (Buday et al.,2015). The European landscape is largely dominated by agricultural land uses, in fact, more than 35 % of all land in the EU has an agricultural use. Thus agricultural land uses have a central role in terms of the potential impacts of land uses on the sustainability of the wider European environment (Ustaoglu, Castillo, Jacobs-Crisioni, Lavalle, 2016). The 2003 CAP reform gave priority to subsidies primarily linked to the agricultural land itself (Single Farm Payment), to enhance market orientation. The change from mainly production related subsidies to land subsidy, raised further still the need for reliable and comparable prices on agricultural land. According to the market price concept, the price of agricultural land (arable land, permanent grassland) is the price received/paid by the holder in free trade without deduction of taxes or levies and without the inclusion of subsidies (Eurostat,2016). In the conditions of the Single Payment Scheme there is petrifaction of the structure of agricultural land and an upward trend in prices on the market for agricultural land should not be expected to continue in the long term. The position in the market for agricultural land is different. After 2004 as a result of Poland's accession to the EU, prices of agricultural land of all grades and in all locations rose rapidly and since then a strong upward trend has been maintained (Czyzewski, Przekota, Poczta-Wajda, 2017). The Polish market is divided into two parts: land owned by the state and privately owned by farms. Dominant in Poland are family and private farms, where the soil is most often inherited. According to Marsk Bielskej (2013) 84.84% of surveyed farmers are

Ing. Jana Ladvenicová, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: jana.ladvenicova@uniag.sk

Ing. Zuzana Bajusová, PhD, Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: zuzana.bajusova@uniag.sk

prof. Ing. Ľubomír Gurčík, CSc. Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: lubomir.gurcik@uniag.sk

harvested from the inherited soil left by their parents. The process of transformation of Polish economy, especially ownership transformations in agriculture and transformation of property rights, mainly related to the liquidation of unprofitable state agricultural holdings, and later inclusion of Poland into mechanism of the Common Agricultural Policy and the emergence of the accompanying additional sources of the land rent have significantly influenced development of the market of agricultural land in Poland (Przygodzka, Mioduszewski, 2016). Market prices of agricultural land in the Czech Republic belong the lowest in the EU. Only Lithuania and Slovakia are listed below. Three times higher prices are in Sweden and five times higher prices are in Germany. These differences are due to the density of the country's population, the fertility of the land, the amount of support to farmers, the fragmentation of land ownership. The rate of fragmentation of ownership in a small plot is one of the highest in the Czech Republic (Sklenička, 2013). Data about land market in Hungary are not sufficient. The land market is in a state of expectation. More and more buyers are well-placed farmers. According to the survey, before access in the EU, prices of land and rent increased proportionally in relation to quality. The rise in land prices is due to the process of price convergence in the EU, and the rise in rental rates is due to the splitting of planned land support between landlord and tenant (Hamzá, Miskó, 2007). The volume of land market is very low. A significant majority of policy makers and scientists in these countries are against total liberalization of land market due to the risk of re-concentration, monopolistic position, the access of more vulnerable groups to land, buy out of land by foreigners (Baranyai, Fekete-Farkas, Pesti, Tóth-Naár, 2010).

Land valuation uses different prices depending on the method and methodology of land valuation. In Slovakia, two types of prices are applied, namely the price according to the cadastral territory stipulated by Act no. 582/2004, which is the official price and the second type is the market price of agricultural land (Hlavačková, 2014). The market for both agricultural and forest land shows significant growth. Most of the land in Slovakia is managed by tenants, and only a small part of the landowners themselves. Problems in trading are caused by inadequate documentation of property-legal relations (Takáč, 2013). Since 1.5.2018, the amendment to Act No. 504/2003, on the lease of agricultural land, agricultural company and forest land, has become valid. As this amendment brought, for example, setting a minimum lease value for land plots, twice the usual rental price, has to be determined by the District Authority. In the case of the lease between the tenant and the renter, the minimum lease price is set for the built-up areas if there is no agreement between them. Also, a period of 2 months is set for rejecting the lease, otherwise it is concluded for an indefinite period of time, the obligation to publish the selected facts related to the change of ownership in the cooperative on the official board of the municipality, the automatic renewal of the contract for the same period, agricultural holdings must keep a list of land parcels, rents and payments, and send the information to the District Authority (Sadovská, 2018).

2 Methods

The aim of the paper is to evaluate the current situation on the soil market in the Visegrad Region - in Slovakia, the Czech Republic, Hungary and Poland. The data used to process the developmet of market prices for agricultural land were obtained from several sources, such as Office of Geodesy, Cartography and Cadastre in Bratislava, Czech Office of Land and Cadastre in Prague, Reports about soil market, FAOSTAT (Food and Agriculture Organization of the United Nations) and Eurostat. Graphical and spreadsheet processing is used to analyze market price trends during the period 2011-2017, but duet he lack of the data in some countries, the period can be adapted to available data. Using a descriptive method, the paper provides a clear comparison about the situation in V4 countries, which reflects the efforts of the countries of the Central European region to work together in a number of fields of common interest within the all-European integration.

3 Research results

Soil is the base of family farming, and although it has a high level of importance, people often do not consider it important. The key tasks of the soil are to ensure food security, promote sustainable development, reduce the effects of climate change and eliminate poverty. For these reasons, actions which are aimed at the development and sustainable protection of soil resources, support for investments in land, should be developed. A single market for goods and services has been created within the EU, but the agricultural land market remains on the national market of each country. Land prices vary from country to country. The pace of the development of the land market depends on the economic situation of the country. Land market prices are formed on the open market on the basis of two determinants: demand and supply. The price of land is influenced by various factors such as, for example, location of the plot, its size, distance from social facilities. The European Commission issued guidelines in 2017, to help Member States protect their land against price speculation and property speculation. The key elements of the guidelines include, for example: the prior authorization of national authorities for land acquisition, the determination of the maximum size of the land which may be acquired, the right of pre-emption for tenant farmers, neighbors, co-owners, state and price intervention by the state.

3.1 The current situation on the soil market in Slovakia

Although the agricultural land market is growing in Slovakia in recent years, more than the market itself, is developed rental market, because most landowners do not manage but rent. Only a small part of the land is privately owned in Slovakia. Ownership has a negative role in the development of the land market because a large part of the land has many co-owners and the owner's structure is characterized by a high fragmentation. This leads to the situation, that landowners do not want to sell, and if they sell it, they have to put it under price. In Slovakia, a new law was adopted in 2014, which limited the acquisition of land ownership, in particular transfer, sale, purchase, exchange and donation. The aim of this law is to give priority to local farmers and start-up farmers when buying land for cultivation, while at the same time aiming at avoiding speculative land purchases, which are mainly used by foreign investors who still have good access to Slovak soil.

The area of SR is virtually unchanged and is at the level of 4 903 thousand. ha. Agricultural land is slightly lower than non-agricultural land. The average area of agricultural land is 2 406 thousand. ha and area of non-agricultural land is 2 498 thous. ha. Most of the land is rented. Agrarian businesses are currently renting 4/5 of the land used.

Rental rates depend on location, ranging from € 3.92/ha to € 135.43/ha. An increase in rent for land is expected, estimated at about 4.2% in 2017. A similar trend is also estimated in 2018, where an increase in rent for agricultural land is expected to be 3.6%. Since May 2018, an amendment to the Land Lease Act has entered into force. This amendment should make easier access the land for the farmers. The official land price serves in particular to express the value of arable land in order to determine the real estate tax, to apply property rights and levies. The highest official land price is in Slovakia in regions with better natural conditions are in the southern part of the country, in Bratislava, Nitra and Trnava, with an official price of around 2 000 €/ha. Lower official prices are achieved in regions with worse natural conditions operating in the northern, north-eastern part of the country, where the official price ranges from 500 to 1 000 €/ha. As can be seen from tab. 1, the average market price of agricultural land in Slovakia decreased compared to 2011 to 2015. The highest value was reached 2011 at the level 13 600 €/ ha. Agricultural land includes arable land, vineyards, orchards and permanent grasslands. The average price of all the above-mentioned indicators decreased in addition to the parcels, whose average market price increased by 11 700 € / ha in the monitored period.

Table 1   Average market price of land in € / ha

Land type / year	2011	2012	2013	2014	2015	15-11
Agricultural land	13 600	11 900	10 700	4 100	7 600	-6 000
Arable land	17 000	14 300	12 600	5 300	9 100	-7 900
Vineyards	26 900	22 500	19 500	16 200	11 100	-15 800
Orchards	11 800	10 000	6 800	25 200	23 500	11 700
Permanent grasslands	7 200	7 000	7 100	3 100	5 200	-2 000

Source: www.eagri.cz, own processing

3.2 The current situation on the soil market in the Czech Republic

In the Czech Republic, agricultural land prices have increased significantly in recent years and continue to grow, mainly due to growing demand for land. The rise in prices was caused by the fact that the state sells no longer any land. The current situation on the agricultural land market is marked by the interest of investors seeking to reimburse farmers to land for their business purposes. This means that in the Czech Republic, each year, approximately 2.5% of the total agricultural land, changes its owner. Less is also the number of landowners - persons and ownership of the land is transferred to legal entities. The total number of owners of agricultural land is at the level of 1.82 million, who own land with the amount of 4.03 mil. ha. Land prices in the Czech Republic are relatively cheap, but growth is not yet at the end, so it is not appropriate to sell it at the moment. The land in the Czech Republic is mainly purchased by farmers who use it for its primary purpose, which is agricultural activity. However, with rising prices, interest in the land and those who have hired it so far have grown, as there has been a significant increase in land rent. The biggest interest in Czech soil is from foreign investors from Germany and significantly less from other European Union countries like Austria, Belgium and the Netherlands. The highest demand is for plots with a medium size of 5 - 50 ha. The most liquid are parcel of 5 - 10 ha. Purchase of land is supported by PGRL, which has allocated credits of 6.15 billion Czech crowns since 2004. Two programs to support the purchase of non-state farmland have been in place since 2015, namely Purchase Promotion, and the second program is Land Purchase Loans, where a loan of approximately 5 million Czech crowns can be obtained, with a maturity of 20 years. Subsidies also play an important role. Farmers receive subsidies for each cultivated hectare

of land. Without subsidies, most businesses would be loss-making, and farmers would hardly be competitive with their overseas farmers.

The area of the Czech Republic is about 1.5 times higher than the area of the SR. The average area of the country is 7 887 thousand. ha. The area of agricultural land is higher than non-agricultural land. The average area of the agricultural land is 4 212 thousand ha. The average market prices of Czech soil have been increasing in years, as is shown in Figure 1. Average prices of agricultural land by 2017 compared to 2011 have increased double, while in 2011 the average price of agricultural land was of 4 324 €/ha and in 2017 climbed to 9 404.44 €/ha. The highest market prices are in the vicinity of the capital city of the Czech Republic, but also in the regions where there is quality arable land (Hradec Králové Region, Mala-Vysocina Region, South Moravia, etc.). In addition to market prices, in the Czech Republic, similar to Slovakia, are set official prices by the Ministry of Finance and Ministry of Agriculture, which are rather informative.

Figure 1 Development of the average price of agricultural land in € / ha
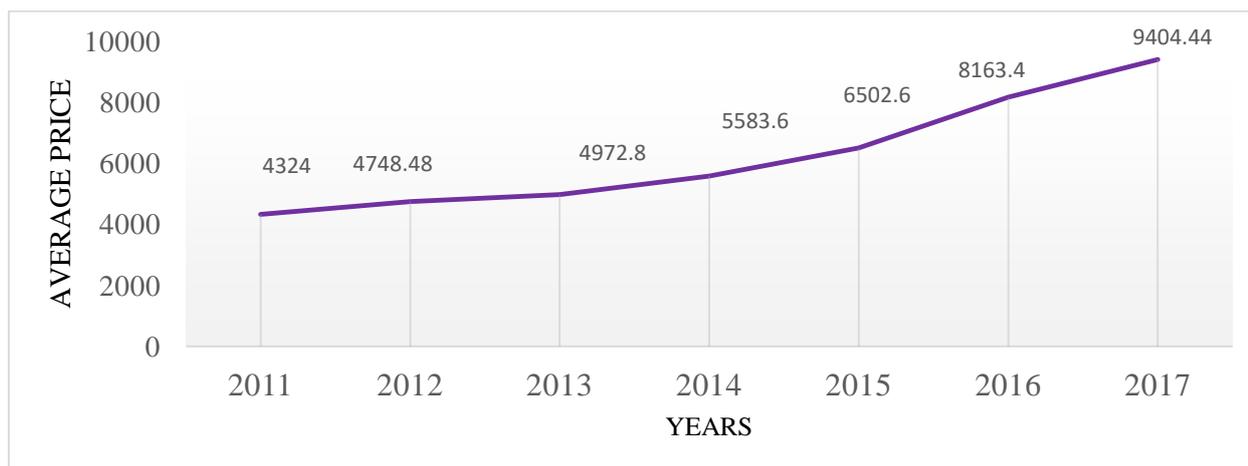
Source: own processing, Report on the land market

3.3 The current situation on the soil market in Poland

Polish agriculture is characterized by the fragmentation of arable land. In Polish agriculture there are more than 1.5 million farms. In Poland, in 2003, the "Agricultural System Formalities" Act was signed to improve the structure of farms, avoid over-concentration of production and improve the quality of farm management. As regards the sale of Polish land to foreigners, it can be purchased by natural and legal persons who are married or, therefore, taken out to a Polish citizen and have a permanent residence in Poland for at least two years. The condition is that the acquired property must be taken jointly, ie the property becomes jointly owned by the spouse and husband. They can also get land even through they work in Poland for at least 5 years but the condition is also a permanent residence. Since joining the European Union in 2004, all EU citizens are able to buy different types of property, but in the case of agricultural land or forestry properties authorization is required. This is not required from people who have permanent residence in Poland. From 2016, all authorization requirements for EEA and Swiss nationals were abolished. For citizens outside of the EEA or Switzerland, the permit condition remains with the Minister for Justice and Administration.

Figure 2 Average market price of land in € / ha
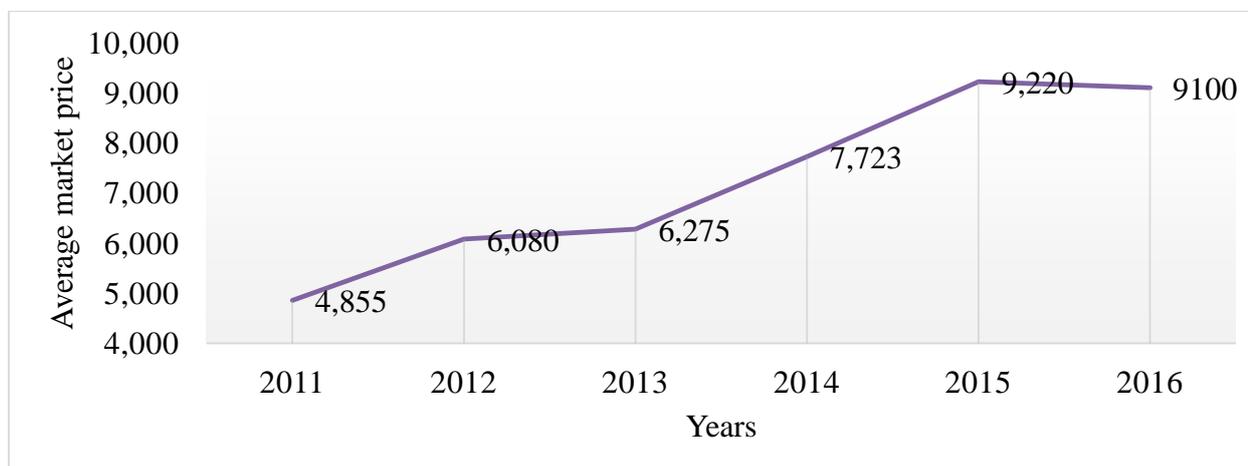
Source: own procesing, FAOSTAT

Land can be purchased without permission in certain cases, when a person has a permanent residence in Poland for more than 5 years, a permanent residence in Poland for more than two years for persons is married to a Polish citizen and have property in a common ownership of land, foreigners who have inherited land, foreign legal entities who buy undeveloped real estate (no more than 0.4 ha). Poland has an area of agricultural land much larger than Slovakia and the Czech Republic. The average area of agricultural land is 14 494 thous. ha. The highest representation has arable land, which accounts for 76% of all agricultural land. Average prices of hectares of agricultural land are higher than in France and Germany, and prices are rising steadily. For example, a record transaction has been recently recorded in Poland, which sold 150 hectares of farmland to a local farmer for 1 907,942 €. The main factors affecting the price of agricultural land are the place in relation to rural settlements, soil quality, fragmentation of land. Figure 2 illustrates development of the average market price of land in Poland in €/ha. Average market prices for Polish soil have been growing steadily until 2015, and in 2016 it decreased by at least 120 € to a level of 9 100 €/ha compared to the previous year.

3.4 The current situation on the soil market in Hungary

Hungary is an agricultural land, where agriculture belongs to one of the great possibilities, because it has a good geographic location for agriculture. It is a producer of quality products of crop production. In Hungary, the crisis is causing many damage, but it also brings many important opportunities, such as the assessment of agriculture and food.

Hungary, with regard to the use of agricultural land, did not comply the European Union's rules on investor rights and was sued. However, this was not the first action that Hungary faced. It has previously faced a disciplinary action for land sales rules to foreign investors. The reason for the action was that Budapest had not yet taken any action to remedy the current situation. Acquisition of land in Hungary is possible only with the prior official authorization of the agricultural administration. Land may also be acquired only by persons who are farmers. For a long time, the land in Hungary was of low risk and high turnover, but the government decided to intervene. It has enacted the Land Turns Act and other land-related restrictions. This means that the people who are actually working on it, also get it. Under the new conditions, it is up to the local soil committee or the agricultural chamber, to allow or not to allow such a transaction. The government has limited range of potential prospective investors to such an extent that within a permitted range of 20 kilometers, no licensed farmer is found.

Figure 3 Development of average market price of land in € / ha
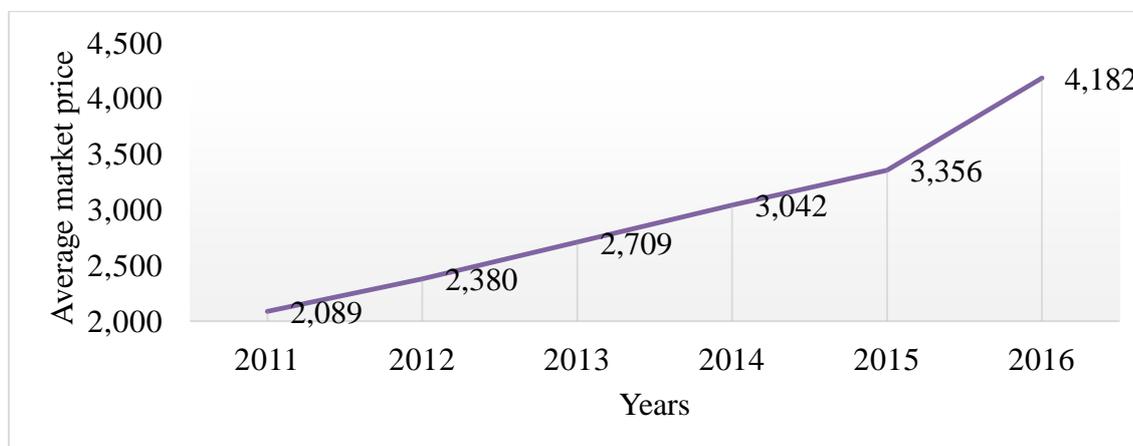
Source: Own processing, FAOSTAT

Hungary has approximately the same area of agricultural land as the Czech Republic. The area of agricultural land is on average 5 342 thousand ha. The largest part consists of arable land, which accounts for approximately 82% of the agricultural land. In 2017, agricultural holdings managed a total of 1 907.5 ths. ha of agricultural land, private farms 3 156.4 ths. ha.

In response to market demand, arable land prices are rising steadily from year to year. Therefore, additional restrictions on the purchase of agricultural land will have to be made again. According to market participants, between 2010 and 2014, agricultural land prices have risen, averaging from 2 000 €/ha to almost 4 000 €/ha. As can be seen from FIG. 3, the average market price of land increased from one year to the next, reaching 2 089 €/ha in 2011 and then increasing to 4 182 €/ha by 2016.

4 Conclusions

Land as a basic factor of production belongs to non-renewable resources and is very important for people's lives because it provides sufficient food supplies. It is necessary to adopt and develop measures aimed at protecting it. The total area of the SR is maintained at 4 903 thousand ha., where agricultural land is about 49.31% and the rest is a non-agricultural land fund. On average, more than 71% of the soil is cultivated in Slovakia. In the Czech Republic, the development of the total area is increasing, but as in Slovakia, the area of agricultural land is declining. It's about 74% of cultivated land. Poland has an average area of 14 494 thousand ha. Approximately 75% of agricultural land is cultivated here. The same area of agricultural land as the Czech Republic has Hungary, with most land is cultivated, around 82%. The European Commission is seeking to protect land in the Member States against speculative purchases by different guidelines. The price of agricultural land is different in individual V countries, influenced by climatic conditions, soil conditions, business structure of agriculture, economic level of the region, application of various measures for agricultural land transfers. From the view of Slovakia the most developed market is land lease. Approximately 90% of the land is leased, so thats why an increase in the rent for agricultural land is expected. The problem of land purchase is the high fragmentation of land ownership, which influences the market price. In Czech republic, the price of agricultural land is among the lowest in the EU. In Poland there is the same problem with the fragmentation of the soil as in Slovakia. There are strict rules when buying land by foreigners. From 2016, all permit requirements for EEA and Swiss nationals have been abolished in Poland. Average prices of ha of agricultural land amount to 9 100 €. Hungary has its favorable geographic location to create favorable conditions for agricultural development. Average market prices of agricultural land is at amount 4 182 €/ha.

References

Baranyai, Z., Fekete-Farkas, M., Pesti, C., & Tóth-Naár, Z. (2010). Factors of land value and land price in Hungary. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*. 12, 2010, no. 6, 11-16. ISSN 1508-3535.

Buday, Š. et al. (2015) Rozvoj trhu s pôdou vo vybraných regiónech Slovenska v rokoch 2001 – 2014. In *Ekonomika poľnohspodárstva, Roč. XV.*, č. 4, 2015.

http://eagri.cz/public/web/mze/

EUROSTAT (2016) Agricultural Land Prices and Rents data for the European Union. December, 2016, p.45. Available online: https://ec.europa.eu/eurostat/documents/749240/749310/Research+Paper+-+Agricultural+Land+Prices+and+Rents+data+for+the+European+Union%2C+December+2016/15fad00e-6f46-4ee1-9c36-5bfc325b2384.

Hamza, E., & Miskó, K. (2007). Characteristics of land market in Hungary at the time of the EU accession. *Agricultural Economics Czech*, 53, 2007, (4), 161 – 166. Available online: http://www.agriculturejounrals.cz/publicFiles/00173.pdf.

Hlavačková, Z. (2014) Jako sa určuje cena pôdy. Available online: https://peniaze.pravda.sk/obcan-a-stat/clanok/307567-ako-sa-urcuje-cena-pody.

Lowder, S.K., Skoet, J., & Raney, T. (2016). The Number, Size and Distribution of Farms, Smallholder Farms, and Family Farms Worldwide.*World Development*, Vol.87, November 2016, 16-29. doi:10.1016/j.world-dev.2015.10.041.

Czyzewski, B., Przekota, G., & Poczta-Wajda, A. (2017). The incidence of agricultural policy on the land market in Poland: *Two-dimensional and multilevel analysis. Land Use Policy*, Vol. 63, April 2017, 174 – 185. doi.org/10.1016/j.landusepol.2017.01.016

Marks Bielska, R. (2013). Factors shaping the agricultural land market in Poladn. *Land Use Policy*, Vol. 30, Issue 1, January 2013, 791 -799. Available online: http://www.sciencedirect.com/science/article/pii/S024837712001081.

Przygodzka, R., & Mioduszewski, J. (2016). The agricultural land market in POland and its characteristics. 1315 -1323. Available online: http://sulanet.uniag.sk/sites/default/files/research_publications/publication_0.pdf.

Sadovská, E. (2018) Od 1. mája 2018 nadobudla platnost novela zákona o nájme pôdy. Available online: http://www.agrobiznis.sk/index.php/component/content/article/1-uvod/4143-od-1-maja-2018-nadobudla-platnos-novela-zakona-o-najme-pody.

Situační a výhledová zpráva půda. (2015). Praha: Ministerstvo zemědělství, 2015. 137 s. ISBN 978-80-7434-252-3 Available online: http://eagri.cz/public/web/mze.

Sklenička, P. (2013). Proč jsou ceny zemédělské pudy u nás tak nízké? Available online: http://nazory.ihned.cz/komentare/c1-59702080-proc-jsou-ceny-zemedeslke-pudy-u-nas-tak-nizke.

Takáč, F. (2013). Obchod s pôdou – zaujímavá investícia? Available online: https://www.epravo.sk/top/clanky/obchod-s-podou-zaujimava-investicia-961.html.

Ustaoglu, E., Castillo Perpina, C., Jacobs-Crisioni, C., & Lavalle, C. (2016). Economic evaluation of agricultural land to assess land use changes. *Land Use Policy*, vol.56, November 2016, 125-146. doi.org/10.1016/j.landusepol.2016.04.020.

Act no. 307/1992 on the Protection of Agricultural Soil Fund.

Zpráva o trhu s pudou (2018) Praha, 2018. Available online: http://www.farmy.cz/zprava-2018.

What is the Relationship between Alcohol Use and Cigarette Smoking?

Martin Jamrich, Ján Pokrivčák

Abstract: *Taxation on alcohol and cigarettes is mainly used to reduce consumption and rise revenue. Many studies examine price elasticity of these goods to find out how consumers respond to price change, but there are only few of them focused on cross-price effects in alcohol and cigarette consumption. If there is some mutual effect, it must be analysed, otherwise estimations of alcohol and cigarette demand separately can lead to biased coefficients. It means that effect of higher prices in reducing alcohol and tobacco consumption may be overestimated and possible additional revenue underestimated. This paper uses data from Household Budget Survey in Slovakia for period 2006 – 2012 to estimate price sensitivity of alcohol and cigarette using. We mainly focused on cross-price elasticities between different alcoholic beverages and cigarettes. Results suggest that alcohol taxation can decrease both, the alcohol and the cigarette using, while taxation of cigarettes can increase consumption of some alcoholic beverages.*

Key words: Alcohol · Smoking · Cross-price elasticity · Double hurdle model

JEL Classification: C24 · E21 · Q11

1 Introduction

More than five percent of potential life years are lost due to mortality or disability caused by consumption of alcohol (WHO, 2014). Alcohol is the main cause of 3.3 million deaths annually all around the world what represents 6 % of all deaths. In Slovakia, it is even more (7.5 %). One-fifth of people died because of alcohol poisoning and 17 % were victims of traffic accidents connected with alcohol consumption (Petrovic, 2015). The liver cirrhosis is considered the most commonly occurring disease associated with alcoholism but cancer, cardiovascular, gastrointestinal diseases and more than 200 other illnesses are another potential threats of human health as a result of consuming excessive amounts of alcohol. The consequences of smoking cigarettes and other tobacco products cause serious health damage (WHO, 2015; Jha, 2009; Doll, et al., 2004 and WHO, 2017) and kill almost half of its users. More than seven million people yearly die as the result of tobacco using which includes also indirect using.

Based on data from years 2008 – 2010, Slovaks consumed on average 13 l of pure alcohol per year. According to WHO (2014), in the world ranking of alcohol consumption per capita, Slovakia is ranked 10th place Percentage of smokers in Slovakia had a declining trend till 2014 and since then the number has been steadily rising. Results from Eurobarometer shows that in 2017, 26 % of Slovaks smoked which was equal to the EU average, while in 2014 smoked only 21 % of citizens and in 2006 it was 25 % (Eurobarometer, 2017). These are the main reasons why efforts to decrease alcohol consumption and smoking are growing not just in Slovakia but also around the world.

Medical researchers suggest that consumption of alcohol and cigarette smoking are related to each other (Bien and Burge, 1990) and reason is the wide range of psychological and biological aspects. Walton (1972) found that 97 % of male alcoholic patients were smokers what supports this theory. Jones (1989) proved that tobacco is a complement to alcohol and the strongest complementary relation is between tobacco and spirits. On the other hand, the estimation of cross-price elasticity of demand for cigarettes and for alcohol made by Goel and Morey (1995) suggested that there is a substitution connection. Decker and Schwartz (2000) showed that higher price of cigarettes can increase the prevalence of drinking and the consumption of alcohol. Increasing the price of alcohol can increase the number of smoked cigarettes but decrease smoking prevalence. Based on data from the Spanish Family Expenditure Survey, Jiménez and Labeaga (1994) find out that alcohol taxation may reduce tobacco consumption that is also confirmed by the study of Garcia and Labeaga (1992).

Ing. Martin Jamrich, Slovak University of Agriculture, Faculty of Economics and Management, Department of Economic Policy, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: martin.jamrich@gmail.com

prof. Ing. Ján Pokrivčák, PhD., Slovak University of Agriculture, Faculty of Economics and Management, Department of Economic Policy, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia,, e-mail: jpokrivcak@yahoo.com

Taxation is a key tool used for the reduction of alcohol and tobacco consumption. Numerous studies confirm that higher taxes reduce consumption of both and leads to decreasing of health consequences (Bosanquet, 1992; Godfrey and Maynard, 1988; Townsend, 1994; Farrell, Manning, Finch, 2002; Andrienko, Nemtsov, 2005; Jiang et al., 2016).

The first form of taxation applied by many countries is value added tax on alcoholic beverages (151 countries). This sales tax reaches value on average 16.6 %, with variation from 3 % to 30 % and in Slovakia constitutes 20% (222/2004 Z. z., 2018). Secondly, countries use excise tax either for all alcoholic beverages (beer, wine, and spirits) or just for various combination of them. Also, methods of calculation vary globally (Sornpaisarn et al, 2017). Taxes on tobacco represents about 50 – 60 % of retail prices in high-income countries. In low and middle-income countries, it is usually less than 40 % and that is the reason why cigarettes are cheaper about 70 percent there, in comparison with high-income countries. The quick growth of income in countries with low and middle income causes that tobacco products are more and more affordable (Jha and Peto, 2014). In Slovakia, excise duty stands for 55.2 % on cigarette box that costs 3.70 EUR and value-added tax represents 16.7 % from which it follows that total percentage share of taxes accounts for 72 % (Remeta and Výškrabka, 2016). Amount and types of excise duties in Slovakia are shown in Table 1.

Table 1 Excise duties in Slovakia

Tax bases	Tax in EUR	Note
Spirit (100 % alcohol)	1080/hl	
	540/hl	spirit produced in a fruit growers´ distillery for maximum per quantity of 43 l a. of produced spirit per one grower and his household
Wine		
Still	0	
Sparkling	79.65/hl	
	54.16/hl	an alcoholic strength < 8.5 %
still fermented beverage	0	
sparkling fermented beverage	79.65/hl	
Intermediate product	84.24/hl	
Beer	3.587/hl	
	2.652/hl	beer produced by a small independent brewery
Cigars, Cigarillos	77.37/1000 pcs	
Tobacco and raw tobacco	71.11/kg	
Cigarettes		
specific part	59.50/1000 pcs	minimum tax rate is 91 EUR/1000 pcs
percentage part	23 % of the price	

Source: Financial Administration Slovak Republic, own processing

Taxation is a powerful instrument which might be used to control the consumption of alcohol and tobacco. The focus of this paper is the estimation of the indirect effect of alcohol taxes on cigarette consumption and vice versa. Therefore, we apply models to estimate own-price and cross-price elasticities between alcoholic beverages and cigarettes.

2 Methods

The aim of this paper is to estimate price elasticities of demand for alcohol beverages – beer, wine and spirits and for cigarettes in Slovakia. We used data from the Household Budget Survey of Slovakia for period 2006 – 2012. Due to the nature of the dataset, we used Cragg´s double hurdle model for estimation.

The month consumption of beer, wine, spirits and cigarettes per household were used as the main dependent variables entering the models. For capturing the fact that higher income increases the affordability of alcohol, but also at the same time a higher number of people in the household decrease disposable income per head, we need to use equalization. We followed OECD-modified equivalence scale, therefore to the household head was assigned a value of 1, to each additional adult member 0.5 and a value of 0.3 to each child. Equalization was used on income, consumption of spirits, wine, beer, and cigarettes. This method is also applied in alcohol and tobacco demand studies by Aristei and Pieroni (2008) and Moshoeshoe (2012).

To estimate the price elasticity was essential to determine the prices of these products because dataset did not contain this information. By following Sousa (2014), the prices were derived from expenditures and quantities of consumed milk

and simultaneously showed differences of each household. For households with zero consumption, we calculated the average prices of 8 regions by years and quarters, and missing prices were substituted with new estimated prices which were also used as the main explanatory variables. Models also contained variables representing household characteristics and time trend. Variables entering the model:

ln_c_cig_pae	log of monthly consumption per adult equalised in pcs;
ln_c_spirits_pae	log of monthly consumption per adult equalised in litres;
ln_c_wine_pae	log of monthly consumption per adult equalised in litres;
ln_c_beer_pae	log of monthly consumption per adult equalised in litres;
ln_p_cig	log of price of cigarettes per pc;
ln_p_spirits	log of price of spirits per litre;
ln_p_wine	log of price of wine per litre;
ln_p_beer	log of price of beer per litre;
ln_income_pae	log of monthly income per adult equalised;
age_hh	age of head of household;
male_hh	dummy variable, gender of head of household, man – 1, woman – 0;
employed_hh	dummy variables for work status of head of household, employed – 1, unemployed and economically inactive person – 0;
n_adults	number of family members older than 18 years (national legal minimum age for sales of alcoholic beverages and cigarettes);
sp_household	single person household;
n_retirees	number of retired persons in household;
regions	dummy variables for 8 regions of Slovakia;
year	trend for period 2006 – 2012;
d_drinking	dummy variable for drinking, 1 – positive amount of consumption of beer/wine/spirits, otherwise 0;
d_smoking	dummy variable for smoking, 1 – positive amount of consumption of cigarettes, otherwise 0.

The problem of the censoring shows particularly in the studies using microeconomic data. The used database contained a significant number of households with zero expenditures on alcoholic beverages or cigarettes which might be caused by several reasons: the period of research is short; households never buy alcohol/cigarettes or households never buy alcohol/cigarettes at the given prices or income.

Estimation of demand by OLS at these circumstances would lead to biased and inconsistent results (Amemiya, 1984). Studies analysing the demand for food often use the Cragg´s (1971) double hurdle model, for example, the earliest studies of Atkinson et al, 1984; Jones, 1989; Pudney, 1989 estimated tobacco demand in the UK. Later, the researchers like Jones (1992), Blaylock and Blisard (1993), Gao et al. (1995), García and Labeaga (1996), Yen and Jensen (1996), Abdel-Ghany and Silver (1998), Labeaga (1999), Sharpe et al. (2001), Aristei and Pieroni (2008), Ground and Koch (2008) dealt with the issues of demand for smoking and alcohol drinking.

The double-hurdle model is appropriate to use if consumers make decisions in two steps – hurdles: participation and consumption decision. The first hurdle is estimated by Probit model and second one with a truncated Tobit model. The participation step is described by equations

$$d_j^* = z_j \gamma_j + u_j \qquad\qquad u_j \sim N(0,1) \qquad\qquad (1)$$

$$d_j = \begin{cases} 1 \ if \ d_j^* > 0 \\ 0 \ if \ d_j^* \leq 0 \end{cases} \qquad\qquad (2)$$

where d_j^* represents unobserved latent variable and d_j is observed binary variable. The second step – how much household consume is described by equations

$$y_j^* = x_j\beta + v_j \qquad\qquad v_j \sim N(0, \sigma^2) \tag{3}$$

$$y_j = \begin{cases} y_j^* \; if \; d_j = 1 \; and \; y_j^* > 0 \\ 0 \; else \end{cases} \tag{2}$$

where y_j^* is unobserved latent variable and y_j is actual expenditure on milk which is equal to y_j^* only in case that this latent variable takes positive values and participation step is equal to 1. Explanatory variables that determine participation and expenditure hurdles are label as z_j and x_j. Estimation of coefficients is made by maximum likelihood function.

3 Research results

Between 2006 and 2012, the average monthly spending on alcohol and cigarettes were 24 EUR, with the minimum value in 2006 (20.8 EUR) and maximum in 2010 (26.40 EUR). More than half of these expenditures represent the costs on cigarettes then spirits, beer and lowest share is spent on wine. In absolute values, a common Slovak household spends 12.50 EUR per month on cigarettes, 4.60 EUR on spirits, 3.90 EUR on beer and 3 EUR on wine. Detailed information is provided in Figure 1.

Figure 1 Monthly household´s expenditure on alcohol and cigarettes
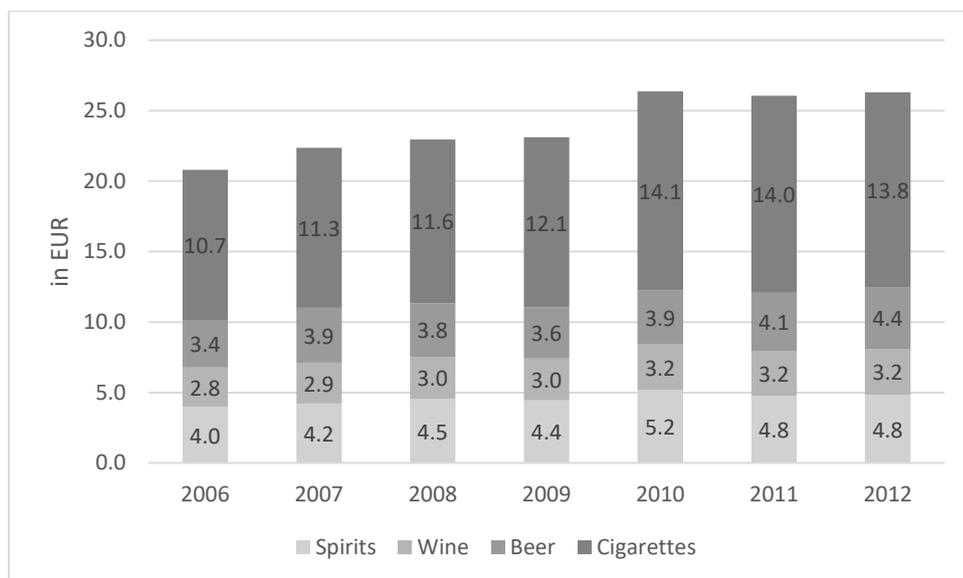
Source: Own processing

Estimated coefficients suggest that only demand for cigarettes is price elastic (Table 1). Demand for spirits, wine, and beer shows the price is inelastic and all own price elasticity coefficients are significant. In other words, the highest response to change in prices is proved in the demand for cigarettes, where a 1 % increase in price can cause a 1.29 % decrease in consumption. Increase in the price of spirits by 1 % can decrease consumption of its by 0.79 %, in the case of wine the own-price effect is comparable (-0.72 %) and in the case of beer the consumption can decrease by -0.66 %.

Table 2 Own and Cross price elasticities of demand for cigarettes and alcoholic beverages

Models →	1. Cigarettes		2. Spirits		3. Wine		4. Beer	
Prices ↓	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Cigarettes	**-1.29***	.061	.577**	.244	.189*	.114	-.129	.079
Spirits	-.127***	.047	**-.792***	.111	.043	.051	.009	.038
Wine	-.082***	.0275	-.114*	.066	**-.716***	.028	-.084***	.022
Beer	-.005	.046	.367***	.111	.128***	.049	**-.656***	.032

Source: Own processing

Note: * p<0.10, ** p<0.05, *** p<0.01

Higher prices of all alcoholic beverages can also decrease consumption of cigarettes (1. Model - Cigarettes) what suggest the complementarity. The significant cross-price effect on demand for cigarettes has shown in the price of spirits (-0.13) and price of wine (-0.08). The coefficient for beer price is insignificant. The opposite effect can be observed in how the price of cigarettes influences the consumption of alcoholic beverages. Increase in the price of cigarettes can increase the consumption of spirits (0.58) and wine (0.19) and therefore, there is a substitutional relationship. The coefficient of beer consumption is again negative and insignificant.

4 Conclusions

Many previous studies have focused on the estimation of price elasticity of demand for cigarettes or alcohol separately but recently there have been an increasing trend confirming that there might exists significant cross-price effect between both goods. The main aim of our research was examining relations between cigarettes, spirits, wine and beer.

All own price elasticities were shown as significant. The results indicated that demand for cigarettes with the coefficient -1.29 was the price elastic and demand for alcoholic beverages was shown as inelastic (-0.79) for spirits, wine (-0.72) and as well as for beer (-0.66). Cross-price elasticities suggested that an increase in prices of spirits, wine, and beer can decrease the both, consumption of these beverages and cigarettes. On the other hand, smoking can be effectively reduced by raising the price of cigarettes but at the same time, there exists a risk of increasing the consumption of alcohol, especially spirits.

These results prove the cross-price effects between cigarettes and alcoholic beverages which can provide an important information for policymakers, however, they must be viewed with caution and should be confirmed by additional evidence

References

Abdel-Ghany, M., & Silver, J. L. (1998). Economic and demographic determinants of Canadian households' use of and spending on alcohol. *Family and Consumer Sciences Research Journal*, 27(1), 62-90.

Amemiya T (1984): Tobit models: a survey. *Journal of Econometrics*, 24(1-2):3-61. ISSN 0304-4076.

Andrienko Y, & Nemtsov A. (2005*). Estimation of individual demand for alcohol. Economics Education and Research Consortium*. ISSN 1561-2422.

Aristei, D., & Pieroni, L. (2008). A double-hurdle approach to modelling tobacco consumption in Italy. *Applied Economics*, 40(19), 2463-2476.

Atkinson, A. B., Gomulka, J., & Stern, N. (1984). Household expenditure on tobacco 1970-1980: evidence from the family expenditure survey (No. 57). *ESRC Programme on Taxation, Incentives and the Distribution of Income*.

Bien, T. H., & Burge, R. (1990). Smoking and drinking: a review of the literature. *International Journal of the Addictions*, 25(12), 1429-1454.

Blaylock, J. R., & Blisard, W. N. (1993). Women and the demand for alcohol: Estimating participation and consumption. *Journal of Consumer Affairs*, 27(2), 319-334.

Bosanquet, N. (1992). Europe and tobacco. *BMJ: British Medical Journal*, 304(6823), 370.

Cragg, J. G. (1971). Some statistical models for limited dependent variables with application to the demand for durable goods. *Econometrica: Journal of the Econometric Society*, 829-844.

Decker, S. L., & Schwartz, A. E. (2000). Cigarettes and alcohol: substitutes or complements? (No. w7535). *National bureau of economic research*.

Doll, R., Peto, R., Boreham, J., & Sutherland, I. (2004). Mortality in relation to smoking: 50 years' observations on male British doctors. Bmj, 328(7455), 1519.

Eurobarometer, E. C. (2017). Attitudes of Europeans towards tobacco and electronic cigarettes. *TNS Opinion Social*, 458.

Farrell S, Manning W, & Finch M (2002): Alcohol dependence and the price of alcoholic beverages. *Journal of Health Economics*, 22(2003) 117-147. ISSN 1618-7598.

Gao, X. M., Wailes, E. J., & Cramer, G. L. (1995). A microeconometric model analysis of US consumer demand for alcoholic beverages. *Applied Economics*, 27(1), 59-69.

Garcia, J., & Labeaga, J. M. (1992). A Cross-Section Demand Model with Zeros: An Application to the Demand for Tobacco in Spain. WP, *Universität Pompeu Fabra*, Barcelona.

García, J., & Labeaga, J. M. (1996). Alternative approaches to modelling zero expenditure: an application to spanish demand for tobacco. *Oxford Bulletin of Economics and statistics*, 58(3), 489-506.

Godfrey, C., & Maynard, A. (1988). Economic aspects of tobacco use and taxation policy. *BMJ*, 297(6644), 339-343.

Goel, R. K., & Morey, M. J. (1995). The interdependence of cigarette and liquor demand. *Southern Economic Journal*, 451-459.

Ground, M., & Koch, S. F. (2008). Hurdle Models of Alcohol and Tobacco Expenditure in South African Households 1. South African *Journal of Economics*, 76(1), 132-143.

Jha, P. (2009). Avoidable global cancer deaths and total deaths from smoking. *Nature Reviews Cancer*, 9(9), 655.

Jha, P., & Peto, R. (2014). Global effects of smoking, of quitting, and of taxing tobacco. *New England Journal of Medicine*, 370(1), 60-68.

Jiang, H., Livingston, M., Room, R., & Callinan, S. (2016). Price elasticity of on-and off-premises demand for alcoholic drinks: A Tobit analysis. *Drug and Alcohol Dependence*, 163, 222-228.

Jiménez, S., & Labeaga, J. M. (1994). Is it possible to reduce tobacco consumption via alcohol taxation?. *Health Economics*, 3(4), 231-241.

Jones, A. M. (1989). A double-hurdle model of cigarette consumption. *Journal of applied econometrics*, 4(1), 23-39.

Jones, A. M. (1992). A note on computation of the double-hurdle model with dependence with an application to tobacco expenditure. *Bulletin of economic Research*, 44(1), 67-74.

Labeaga, J. M. (1999). A double-hurdle rational addiction model with heterogeneity: estimating the demand for tobacco. *Journal of econometrics*, 93(1), 49-72.

Moshoeshoe, R. (2012). Consumer demand for alcoholic beverages and tobacco in Lesotho: *A double-hurdle approach* (No. 315).

Petrovic, Jan. (2015). Alkohol zabíja príliš veľa Slovákov. Potvrdily to pitvy. In *Aktuality*. Available at: https://www.aktuality.sk/clanok/276955/alkohol-zabija-prilis-vela-slovakov-potvrdili-topitvy/

Pudney, S. (1990). Modelling individual choice, the econometrics of corners, kinks, and holes. *Manchester School of Economic and Social Studies*, 58, 96-97.

Remeta, J. & Výškrabka, M. (2016). Ideálny čas pre adresnejšie zdanenie fajčiarov. Inštitút finančnej politiky Available at: http://www.finance.gov.sk/Default.aspx?CatID=10696

Sharpe, D. L., Abdel-Ghany, M., Kim, H. Y., & Hong, G. S. (2001). Alcohol consumption decisions in Korea. *Journal of Family and Economic Issues,* 22(1), 7-24.

Sornpaisarn B, Shield KD, & Österberg E, Rehm J, editors. Resource tool on alcohol taxation and pricing policies. Geneva: *World Health Organization*; 2017. Licence: CC BY-NC-SA 3.0 IGO.

Sousa, J (2014): Estimation of price elasticities of demand for alcohol in the United Kingdom. *HMRC Working Paper 16*.

Townsend, J., Roderick, P., & Cooper, J. (1994). Cigarette smoking by socioeconomic group, sex, and age: effects of price, income, and health publicity. Bmj, 309(6959), 923-927.

Walton, R. G. (1972). Smoking and alcoholism: a brief report. American Journal of Psychiatry, 128(11), 1455-1456.

World Health Organization, and World Health Organization. Management of Substance Abuse Unit. (2014). Global status report on alcohol and health, 2014. *World Health Organization*.

World Health Organization. (2015). WHO report on the global tobacco epidemic 2015: raising taxes on tobacco. *World Health Organization*. ISBN 978-92-4-150912-1.

World Health Organization. (2017). WHO report on the global tobacco epidemic, 2017: monitoring tobacco use and prevention policies: executive summary.

Yen, S. T., & Jensen, H. H. (1996). Determinants of household expenditures on alcohol. *Journal of Consumer Affairs*, 30(1), 48-67.

Zákon č. 222/2004 o dani z pridanej hodnoty.

Consumer Behaviour on the Market with Milk and Dairy Products in the Slovak Republic

Veronika Svetlíková, Zuzana Poláková, Alexandra Ferenczi Vaňová, Renáta Krajčírová

Abstract: *The consumer basket is dependent on many factors. One of the key determinants is income. The paper is aimed at detecting dependence between household incomes and consumption and expenditures on milk and dairy products in the Slovak Republic. The method of regression and correlation analysis, nonlinear models - power and parabolic model was used to solve the problem. The analysis was conducted over the period 2004 to 2016. Despite the fact that the monetary income of the population increased over the period under review, the consumption of milk and dairy products and expenditures on this commodity did not increase significantly. The paper is a part of the research project APVV-16-0244 "Qualitative factors affecting the production and consumption of milk and cheese", solved at the Department of Marketing and Trade, Faculty of Economics and Management, Slovak University of Agriculture in Nitra.*

Key words: Milk · Dairy products · Regression and correlation analysis · Nonlinear models

JEL Classification: C10 · Q10

1 Introduction

In recent years, the economic results in the Slovak Republic have proved a slight increase in gross domestic product per capita, which is reflected in the increase in nominal and real net cash income. Growth of income per capita is associated with slower growth in food expenditures (Kubicová and Kádeková, 2016). The Central Europe is a region with long tradition of production and consumption of milk and milk products (Špička, 2015).

Milk processing industry is one of the most important branches in the food industry because milk and milk products are essential parts of the human diet. Consumption of milk is increasing all over the world (Gulaeva and Trystsina, 2010).

Consumption of dairy products by Slovak consumers is very low compared to other countries in European Union and the world what results in a negative impact on businesses in this sector. One of the main reasons is low demand of consumers (Kurajdová et al., 2015).

Raw cow milk represents one of the most important commodity in the agricultural market. The comparison of the milk and milk products consumption in the Slovak Republic and recommended food doses showed a significant deficit of the overall consumption of dairy products and liquid milk (Šimo et al., 2016).

The successful adaptation of the dairy industry is critical to addressing the global challenge of providing a secure supply of food globally (Buys et al., 2014).

European vertical of milk production and processing is influenced by the Common Agricultural Policy (Špička and Kontsevaya, 2016).

The relationship between the producers, wholesale and retail prices provides insights into the marketing channel efficiency and the degree of market competition. The milk pricing system in the Slovak Republic has stimulated a public debate on the milk price formation and on the price transmission along the milk marketing channel (Weldesenbet, 2013).

Ing. Veronika Svetlíková, Slovak University of Agriculture, Faculty of Economics and Management, Department of Statistics and Operations Research, Tr. Andreja Hlinku 2, 949 76 Nitra, Slovakia, e-mail: svetlik.veron@gmail.com

doc. Ing. Zuzana Poláková, PhD., Slovak University of Agriculture, Faculty of Economics and Management, Department of Statistics and Operations Research, Tr. Andreja Hlinku 2, 949 76 Nitra, Slovakia, e-mail: zuzana.polakova@uniag.sk

Ing. Alexandra Ferenczi Vaňová, PhD., Slovak University of Agriculture, Faculty of Economics and Management, Department of Accounting, Tr. Andreja Hlinku 2, 949 76 Nitra, Slovakia, e-mail: alexandra.vanova@uniag.sk

Ing. Renáta Krajčírová, PhD., Slovak University of Agriculture, Faculty of Economics and Management, Department of Accounting, Tr. Andreja Hlinku 2, 949 76 Nitra, Slovakia, e-mail: renata.krajcirova@uniag.sk

The milk prices in dairy industry within the food vertical in the territory of Slovakia is developed also by Kadlečíková et al. (2012), Brodová (2013), Matošková and Gálik (2014) and Božík et al. (2016).

At the international level, trends in milk consumptions are considered by Chatellier (2016), Collantes (2014) and Zjalic et al. (2001).

2 Methods

The paper aimed at assessing the dependence between the net monthly income of the Slovak Republic consumers and food expenditures, especially milk and selected dairy products. In this context, the correlation between revenues and consumption of selected commodities is evaluated, with a method of regression and correlation analysis being chosen. The following nonlinear models were used for evaluation (Obtulovic, P., 2010):

- power (Cobb-Douglas production function)

$$y'_j = c_0 . x_j^{b_1}$$

After a suitable transformation to compute the parameters, the least squares method can be used:
- second degree parabola

$$y'_j = b_0 + b_1 . x_j + b_2 . x_j^2$$

The determinant coefficient was used to calculate the variable variability of the dependent variable

$$R^2 = \frac{V}{C} = \frac{\sum_{j=1}^{n}(v'_j - \bar{y})^2}{\sum_{j=1}^{n}(v_j - \bar{y})^2}$$

3 Research results

In the present paper we discussed the consumption of milk and dairy products by consumers in the Slovak Republic. In the Slovak Republic dairy cows are declining for a long time. While in 1990 there were dairy cows at the level of 524 644 pieces, as of 30 June 2016 the number of dairy cows was 138 436, which is a decrease of 386 208 dairy cows (73.6%). A positive factor is the increase in the average yield, which has increased from 5769.80 kg / dairy to 7013.60 kg / dairy cow (increase by 21.56%). The situation in the dairy sector is currently tense in the Slovak Republic, given the purchase prices of raw cows' milk and its overage (caused by imports from the European Union member states). According to data from the Union of Milk Producers of Milk, about 850 million kilograms of dairy products and milk were produced and placed on our market in 2015. Roughly in such volume, they are also acquired from the other European Union countries. The export of milk and dairy products from the Slovak Republic remains the same. It is about 550-600 million kilograms a year (Čímová, 2015). The price of milk per 1 litter was on average 0.65 € in 2004 and 0.64 € in 2016. The price of cheeses in 2004 was on average at 5.73 € per 1 kg, in 2016 5.71 € per 1 kg. The price of curds in 2004 ranged at 3.68 € per kilogram, in 20.44 € per kilogram (ŠÚ SR, 2018).

Whereas the consumption of food, not excluding milk and dairy products as a basic foodstuff for healthy human development, is influenced inter alia by household incomes, Figure 1 presents the development of net monthly incomes per person for the period 2004 to 2016.

Figure 1 Income in total
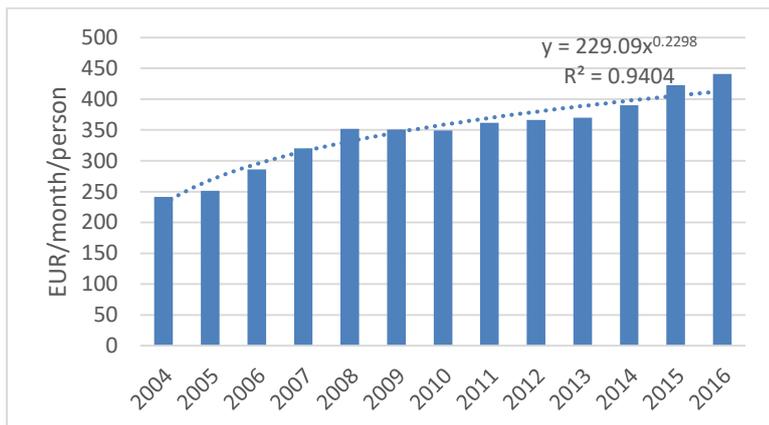
Source: ŠÚ SR, own processing

Between 2004 and 2016, net monthly consumer income is rising. While 2004 net monthly income was around 241 € per person, an increase of 82.98% to almost 441 € per person could be seen in 2016, an increase of 200 € on average. A slight drop in income can only be seen in the economic crisis in 2009 and 2010. Figure 2 shows the development of household food expenditures, as well as selected dairy products, such as milk, cheese and eggs, between 2004 and 2016.

Figure 2 Expenditures of households
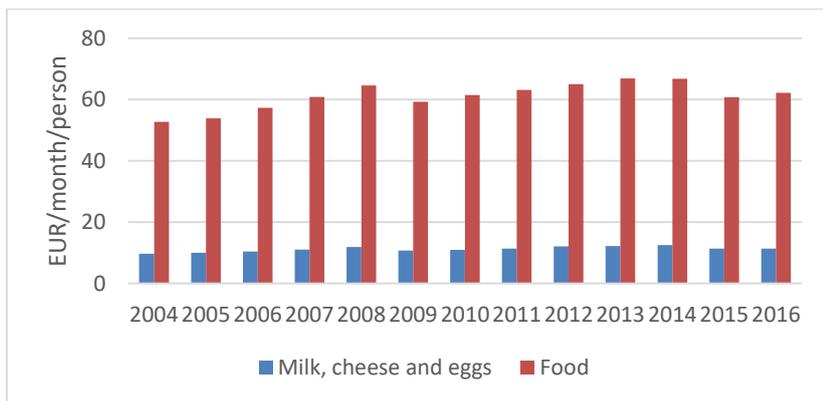
Source: ŠÚ SR, own processing

Household food expenditure over the years 2004 to 2016 has a fluctuating trend that has gradually increased over the period under review, as well as food, milk, cheese and eggs. Household consumption per capita is significantly influenced by consumer behavior and the consumer's shopping basket. Consequently, the contribution assesses the correlation between consumer income and consumption of the commodities concerned. Figure 3 presents the dependence of food expenditures on net monthly consumer income

Figure 3 Dependence of food expenditures on income
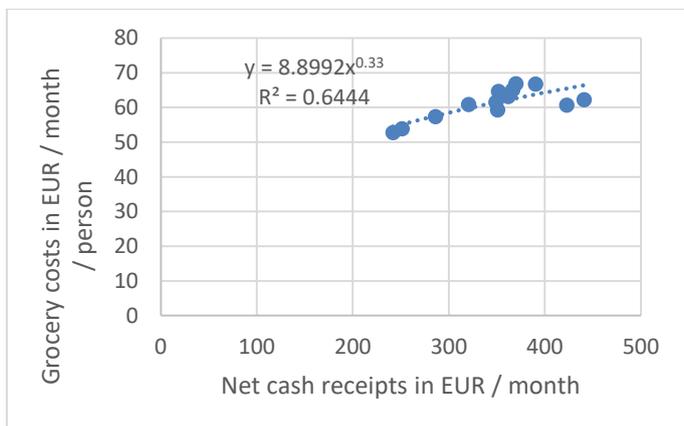
Source: ŠÚ SR, own processing

The net monthly monetary income of consumers, ranging from 240 € to 441 €, and monthly food charges ranging from 52 € to 63 € per person per month can be seen as a significant statistical dependence. It is possible to assume that with a 1% increase in net cash payments to consumers, monthly food expenditures will increase by approximately 0.33%. The dependence of food expenditure on net monthly consumer incomes shows a power relationship that is characterized by the $y = 8.899x^{0.33}$ equation. The percentage of explained variability is 64.44%.

Figure 4 illustrates the dependence of expenditures on milk, cheese and eggs on consumer income.

Figure 4 Dependence of expenditures on milk, cheese and eggs from income
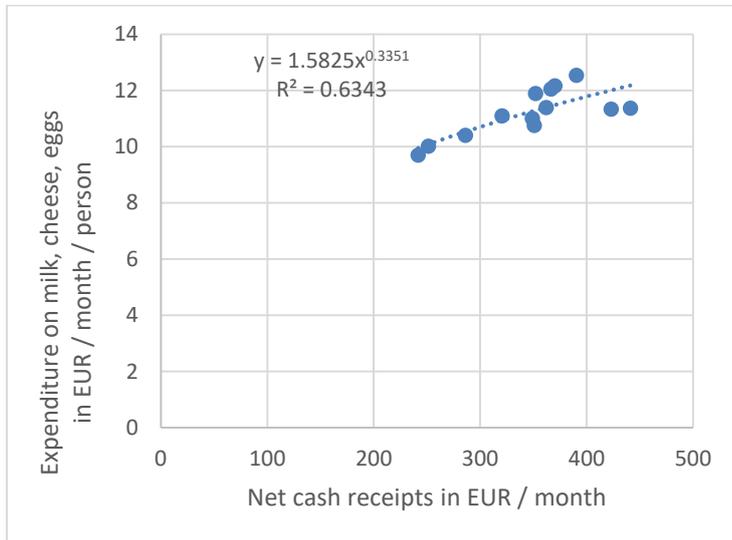
Source: ŠÚ SR, own processing

Based on the analysis, there is a significant relationship between net monetary income of consumers and monthly milk expenditure and selected dairy products ranging from 9 € to 13 € per person per month. With an increase of 1% in net cash per person, an increase in monthly expenditures on milk and selected dairy products is expected to be about 0.33%. This dependence is described by a power relation, which is characterized by the equation $y = 1.58x^{0.34}$. The percentage of explained variability is 63.43%.

Figure 5 shows the consumption of milk and dairy products together (in weight / person) and the consumption of cheeses and curds together during the period of 1990 to 2016.

Figure 5 Consumption per person
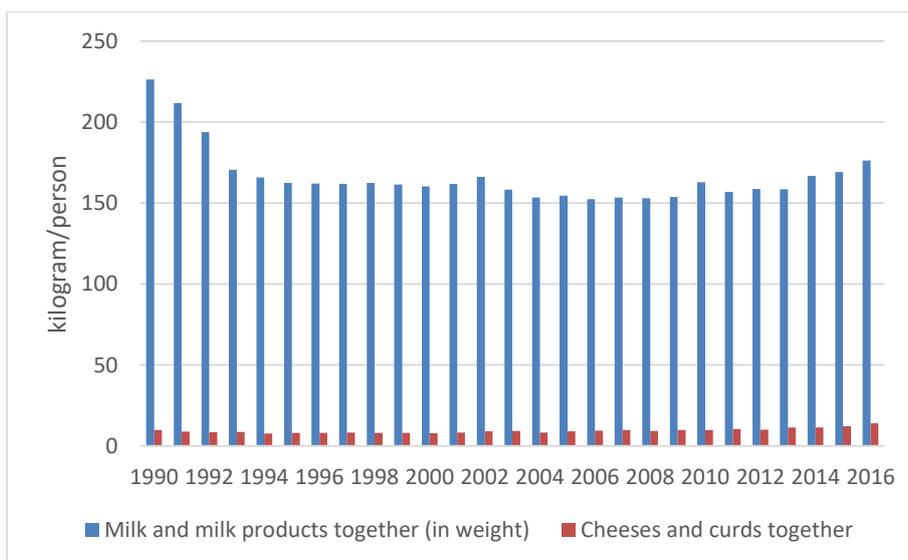
Source: ŠÚ SR, own processing

Consumption of milk and dairy products, as well as consumption of cheeses and curds between 1990 and 2009, has a decreasing character. Likewise, dairy cows are declining in the monitored period. In 1990, the consumption of curds was

19 667 tonnes, which until 2009 and 2010 was characterized by a decrease to 11 108 tonnes, which represents a reduction of 8 559 tonnes (43.51%). Milk and dairy products also show a decreasing tendency in the period 1990 to 2009 from 1 199 173 tonnes to 833 397 tonnes, a decrease of 365 776 tonnes (43,88%). After a period of economic crisis, we see a slight increase in the consumption of milk and dairy products to 956 891 tonnes in 2016, an increase of 123 494 tonnes (14.81%) compared to 2009. In 2016, 14 070 tonnes of curd was consumed, by 2 962 tonnes (26.66%) compared to 2009. Net monthly cash per capita and consumption of milk and dairy products per person per month show interdependence described by a parabolic relationship characterized by the equation $y = 8E\text{-}05x^2 - 0.046x + 19.195$. The percentage of variability explained is 87.51%. It can be said that with higher consumer income, the consumption of milk and dairy products is significantly increasing (Figure 6).

Figure 6 Dependence of consumption of milk and dairy products on income
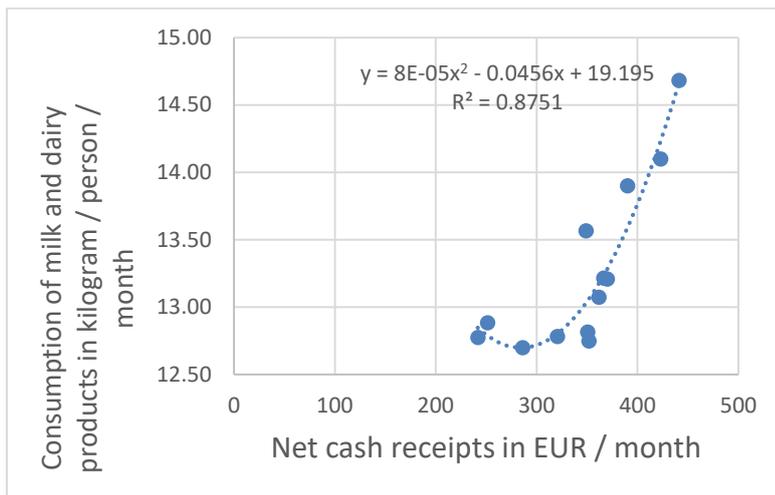
Source: ŠÚ SR, own processing

With the increase in net monthly income of the consumer, the consumption of cheeses and curds in kilograms per person per month also increases. The dependence of consumption of cheese and curd in kilograms on net monthly consumer income shows a parabolic relationship characterized by the equation $y = 1E\text{-}05x^2 - 0.0059x + 1.49$. The percentage of variability explained is 89.12%. It is clear from the interdependence that low-income households have significantly lower cheese consumption than households with higher income (Figure 7).

Figure 7 Dependence of cheeses and curds consumption on income
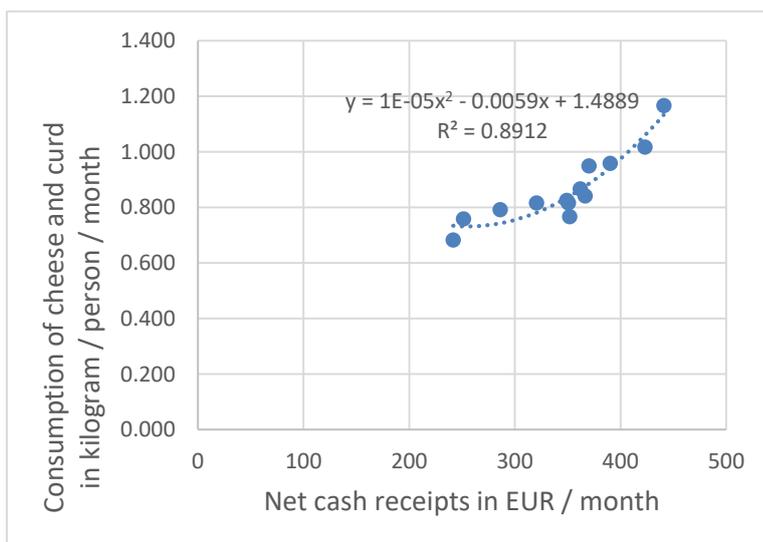
Source: ŠÚ SR, own processing

4 Conclusions

Consumer behaviour is influenced by many factors. In the first place, it is the income of the population that affects consumption. An important factor is the development of food prices. After 1990 there were significant changes in livestock

breeding, the number of dairy cows decreased significantly in the Slovak Republic. This fact also affected the consumption of milk and selected dairy products. According to Gurčík et al. (2016) in the Czech Republic and the Slovak Republic remains a long-term economic imbalances (loss) for breeding dairy cows, which affects the continuing reduction of livestock number. Farmers are replacing the reduction in number of dairy cows by a higher efficiency of dairy cows, which ensures adequate milk production for each country. Density of livestock at the level of the EU average is achieved only in Poland, which has become a major exporter of animal products; Hungary and the Czech Republic come to about half of the level of the EU-28 and at the end comes the Slovak Republic with a continuous decline in recent years (Szabo et al., 2018). The contribution assesses the dependence of consumption of milk and selected dairy products on net monetary income of consumers and the volume of expenditures on these commodities, depending on the income of the Slovak population. It can be stated that in the monitored period since 2004 the income of the Slovak population increased by about 83%, their stagnating situation was manifested in the economic crisis of 2009 and 2010. The dependence of food expenditures on net monthly consumer incomes was characterized by a power model, when increasing net cash? a 1% increase in monthly food expenditures may be assumed to be about 0.33%. Kubicová and Kádeková (2016) concerned that households responded to the annual increase in revenue by slight increase in consumer expenditures. While food expenditures have increased, their share in total expenditures in the countries of the EU were falling more sharply than in the Slovak Republic. The relationship between net monetary income of consumers and the monthly expenditures on milk, cheese and eggs shows a significant relationship. With an increase of 1% in net cash per capita, an increase in monthly expenditures on milk, cheese and eggs by about 0.33% can be expected. This dependence characterizes the power relationship. Consumption of milk and dairy products, as well as consumption of cheese and curd in the period 1990 to 2009, has a decreasing character. This is confirmed by Kubicová and Kádeková (2016) who characterized the negative trend in the consumption of milk and dairy products in the Slovak Republic, where is the long-term decrease in consumption of milk. In 1990, the consumption of curds was 19 667 tonnes, which until the period of the economic crisis had a decreasing tendency to 11 118 tonnes, a decrease of 8 559 tonnes (43.51%). Milk and milk products register a decreasing tendency from 1990 to 2009 from 1 199 173 tonnes to 833 397 tonnes, a decrease of 365 776 tonnes (43.88%). After a period of economic crisis, a slight increase in the consumption of milk and dairy products can be observed to 956 891 tonnes in 2016, an increase of 123 494 tonnes (14.81%) compared to 2009. In 2016 14 070 tonnes of curds were consumed, represents an increase of 2 962 tonnes (26.66%) compared to 2009. Net monthly per person cash and consumption of milk and dairy products per person per month show interdependence as described by parabolic relationship. With an increase in net monthly income for consumers, consumption of cheeses and curds in kilograms per person per month is also increasing. The subject dependence is characterized by a parabolic relationship. On the basis of the analysis, it is possible to establish a significant dependence between the income of the population and the consumption as well as the expenditures of the inhabitants for milk and dairy products.

Acknowledgement

References

Božík, M., Uhrinčaťová, E., Chrastinová, Z., & Krížová, S. (2016). Analýza agropotravinovej vertikály z hľadiska transmisie cien poľnohospodárskych komodít do cien potravinárskych výrobkov a spotrebiteľských cien. *Ekonomika poľnohospodárstva*, 2016(1), pp. 27-44.

Brodová, M. (2013). Cenový vývoj vo vertikále výroby a spotreby živočíšnych komodít v rokoch 2008-2012. *Ekonomika poľnohospodárstva*, 2013(3), pp. 23-35.

Buys, L., Mengersen, K., Johnson, S., van Buuren, N., & Chauvin, A. (2014). Creating a Sustainability Scorecards a predictive tool for measuring the complex social, economic and environmental impacts of industries, a case study: Assessing the viability and sustainability of the dairy industry. *Journal of Environmental Management*, Vol. 133, January 15, pp. 184-192.

Čímová, D. (2015). Dovoz mlieka a mliečnych výrobkov už u nás dobieha domácu výrobu. https://dennikn.sk/175746/dovoz-mlieka-a-mliecnych-vyrobkov-uz-u-nas-dobieha-domacu-vyrobu/

Collantes, F. (2014). Trends in the consumption of dairy products in Spain, 1952-2007. *REVISTA DE HISTORIA INDUSTRIAL*, Issue: 55, pp. 103-134.

Gulaeva, T., & Trystsina, N. (2010). The condition and development prospects of dairy cattle breeding and dairy market. *Vestnik OrelGAU (Вестник ОрелГАУ)*, 5(6), pp. 81-85.

Gurčík, Ľ., Dobošová, Ľ., Richter, M., Kubicová, Ľ., & Dobák, D. (2016). Controlling as a management system of milk production and consumption in Slovakia and the Czech Republic. *The agri-food value chain: challenges for natural resources management*

and society: International Scientific Days 2016, May 19-20, 2016, Nitra, Slovak Republic, conference proceedings (pp. 329-338). Nitra: Slovak University of Agriculture.

Chatellier, V. (2016). International, European and French trade in dairy products: trends and competitive dynamics. *INRA PRODU-CTIONS ANIMALES*, 29(3), pp. 143-162.

Kadlečíková, M., Kapsdorferová, Z., Filo, M. and Malejčíková, A. (2012). Trendy vo vývoji cien, v produkcii a v spotrebe potravín vo vybraných krajinách a v Slovenskej republike. *Ekonomika poľnohospodárstva*, 2012(2), pp. 41-51.

Kubicová, Ľ., & Kádeková, Z. (2016). Development and level of consumption of chosen foods in Slovakia and Austria. *The agri-food value chain: challenges for natural resources management and society: International Scientific Days 2016, May 19-20, 2016, Nitra, Slovak Republic, conference proceedings* (pp. 777-782). Nitra: Slovak University of Agriculture.

Kurajdová, K., Táborecká-Petrovičová, J., & Kaščáková, A. (2015). Factors Influencing Milk Consumption and Purchase Behavior - Evidence from Slovakia. Business Economics and Management 2015 Conference, BEM2015, Tech Univ Zvolen, Izmir, Turkey, Apr 30-May 02, 2015 (pp. 573-580). Procedia Economics and Finance, 34(2015).

Matošková, D., & Gálik, J. (2014). Dodávateľsko-odberateľský reťazec v sektore mlieka. *Ekonomika poľnohospodárstva*, 2014(2), pp. 23-35.

Obtulovič, P. (2010). *Bioštatistika*. 4. vyd. Nitra: Slovenská poľnohospodárska univerzita.

Szabo, Ľ., Grznár, M. and Zelina, M. (2018). Agricultural performance in the V4 countries and its position in the European Union. *Agricultural economics,* 64(8), pp. 337-346.

Šimo, D., Mura, L., & Buleca, J. (2016). Assessment of milk production competitiveness of the Slovak Republic within the EU-27 countries. *Agricultural economics,* 62(10), pp. 482-492.

Špička, J. (2015). The Efficiency Improvement of Central European Corporate Milk Processors in 2008 - 2013. *Agris on-line Papers in Economics and Informatics*, VII(4), pp. 175-188.

Špička, J., & Kontsevaya, S. R. (2016). Differences of Financial Management Strategy of Central European and Russian Milk Processors. *Agris on-line Papers in Economics and Informatics*, VIII(1), pp. 89-102.

ŠÚ SR. (2018). http://datacube.statistics.sk

Weldesenbet, T. (2013). Asymmetric Price Transmission in the Slovak Liquid Milk Market. *Agricultural Economics,* (59)11, pp. 512-524.

Zjalic, M., Habe, F., & E. (2001). Situation and trends in milk and meat production in Central and Eastern Europe as a base for the assessment of protein feed requirements. Conference: Workshop on Protein Feed for Animal Production in Europe, Rennes, France, Jun 30-Jul 01, 2000 (pp. 65-73). EAAP EUROPEAN ASSOCIATION FOR ANIMAL PRODUCTION TECHNICAL SERIES, Issue: 1.

Assessment of demand for multiple agricultural public goods in the evaluation of rural development projects

Simona Miškolci

Abstract: *The aim of the paper is to discuss the main issues involved in building an evaluation framework for changes in multiple agricultural public goods and policy-relevant trade-offs of rural development projects. In particular, the valuation of multiple public goods delivered by rural development projects requires careful consideration of empirical demand-side issues. The holistic top-down valuation approach (combination of Analytic Hierarchy Process and Contingent Valuation methods) to explore more general (stable) public preferences for basic attributes of multiple public goods of agriculture in the Czech Republic was employed to overcome the main methodological and practical drawback regarding existing valuation studies. The existence of social demand for a defined complex of non-commodity outputs whose production is to be supported has been demonstrated by the results of the questionnaire survey (n=835). The proposed valuation framework may enable policymakers to address the public preference trade-offs that are required to assess different policy options for the provision of multiple public goods of agriculture in rural development.*

Key words: Rural development policy · Agriculture · Public goods · Public demand

JEL Classification: Q01 · Q51· Q18

1 Introduction

Information on current and future social requirements for public goods is essential to optimally balance supply and demand for these goods in rural development. However, due to the complexity of the societal requirements for public goods provided by agriculture and the methodological problems of individual approaches to their definition, there is still a lack of relevant knowledge that would allow for rational decision making and the setting of a socially optimal level of their production (Hodge and Reader 2007).

Recently there has been a rapid increase in the number of scientific literature focusing on the discourse of the economic assessment of agricultural non-commodity benefits in rural development but, on the other hand, it is very difficult to find cases where the economic assessment of non-market outputs was actually applied in political decision-making. Further development of the theoretical-methodological framework and application of non-market valuation across different types of rural regions in different contexts should go beyond clarifying how this information can be used to support decision-making. Generally speaking, there is a growing feeling in the scientific community that more attention should be given to the use of impact assessments on the level of delivery of ecosystem services, and that the "implementation gap" should be overcome between the possibilities for use and practical use in decision-making and policy.

The aim of the paper is (1) to summarize the results of the evaluation research aimed at identifying the social demand for non-commodity outputs (NCOs)/public goods produced by agriculture, and (2) to focus on the possibilities of their use in support of political decision-making on the sustainable development of agriculture and rural areas.

2 Methods

Policymakers demand understandable scientific information and terminology that can be used to assess the possible impacts of their decisions on social welfare. Non-market valuation methods today represent a well-developed and politically recognized yet widely discussed tool to support political decision-making. Recommendations for the further development of this theoretical and methodological framework therefore require a critical assessment of existing knowledge of the benefits and constraints on which to look for strategies to overcome the weaknesses and increase the possibilities of applying these methods in an integrated framework to support decision-making on the sustainable development of agriculture and rural areas.

Ing. Simona Miškolci, PhD., Mendel University in Brno, Department of Regional and Business Economics, Faculty of Regional Development and International Studies, Zemědělská 1, 613 00 Brno, e-mail: motyl@mendelu.cz

The main societal importance of non-market valuation can be seen as a contribution to improving social decision-making on alternative options for agricultural and rural development. It allows the economic visibility of non-market agricultural outputs and their taking into account when deciding to optimize the use of resources in rural areas. At the same time, it allows to detect the differences and the unique nature of the conditions (natural, production, socio-cultural) of different rural areas and to take them into account when optimizing the structure and forms of state support (correct setting, targeting and comparing of alternatives). Moreover, the employment of the Ecosystem Services approach supports the integration of environmental discourse and spatial approach to support rural development planning or strategic sustainability assessments. It can also foster sector-wide debate but still requires the development of robust and workable tools for practice.

A number of scientific studies have been focused on the assessment of the societal demands placed on the agricultural sector over the last decades. Considerable attention was paid to the evaluation of public goods provided through the agricultural policy programs, particularly in the United States (see for example Variyam et al. 1990 - national survey of preferences concerning the role of the public sector in the protection of family farms; Hellerstein and Nickerson 2002 - public preferences for Farmland Protection Programs outputs; Moon and Griffith 2011 – public preferences for multi-functional agriculture). The Eurobarometer regularly publishes studies on the opinions and requirements of the European society. However complex studies are rather rare in Europe (Yrjölä and Kola 2004; Kallas et al. 2006). The main advantages of a complex NCOs valuation are seen in the fact that it eliminates the problem of different understandings of an attribute between the individual and the researcher and the problem of multiple counting of overlapping values during aggregation (Madureira et al. 2007). At the same time, the methods have the potential to improve the link of evaluation to a particular space and activity, which is particularly important for land-based services and rural development decision-making.

The objective of the paper is to contribute to the debate on the integration of social demand for multiple agricultural public goods into the evaluation of rural development project. The first part summarises the results of the complex evaluation study aimed at identifying the social demand for non-commodity outputs (NCOs)/public goods produced by agriculture. The second part suggests the way, how to use the valuation study results in the Cost-Benefit Analysis (CBA) of rural development project.

A methodological framework for the assessment of demand for multiple agricultural public goods in the Czech Republic was based on the research of public preferences for a defined complex of non-market outputs provided by agriculture. The realization of the evaluation study was divided into the following steps:

1. *Definition of the valued complex/basket of public goods and its hierarchical structure (based on literature review, policy documents analysis, CICES - The Common International Classification of Ecosystem Services approach).* Complex hierarchical structure of non-commodity outputs of agriculture was designed and explained in three levels: the complex basket of public goods (beneficial non-commodity outputs) of agriculture at the highest level of the structure, types of public good/output according to three main sustainability/ecosystem functions (production, environmental, socio-cultural) at an intermediate level and main attributes/non-commodity outputs of each function forming the base of the structure.

2. *Investigation of public preferences for non-commodity outputs and their relative importance/weight (AHP – Analytic hierarchy process method).* This preference structure was based on cognitive hierarchies (Sauer and Fisher 2010) and assumption that situation-specific cognitions and behaviour are well embedded in systems of fundamental values, beliefs and generalised attitudes to multifunctional agriculture. Therefore, the participants of the evaluation survey derive their preferences for specific non-commodity outputs from fundamental values, believes and pre-existing attitudes toward multifunctional agriculture. In order to determine the relative importance (weightings w_i) assigned to each of the evaluated non-market output, the respondents were asked for pairwise comparisons of the types and subsequently relevant attributes of non-commodity outputs. The pairwise comparisons were framed in the form of questions about the relative importance of the agricultural NCOs at two levels (type/attributes), and coded along a nine-point scale. Four Saaty's matrices A were generated for each respondent (Saaty 1991), where a_{ij} represents the score obtained from comparing NCO type/attribute i and NCO type/attribute j:

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}; \tag{1}$$

The score given by the pairwise comparison actually represents the proportions between the weights assigned by the corresponding sub-criteria to a perfectly rational decision-maker for all outputs i and j: $a_{ij}=w_i/w_j$. The individual weights (w_{ik}) were aggregated for all respondents using the following expression:

$$w_i = \sqrt[m]{\prod_{k=1}^{k=m} w_{ik}} \quad \forall i. \tag{2}$$

The normalized relative weights are equivalent to the relative weight of attribute i, divided by the sum of all non-commodity outputs were obtained through:

$$w_i^{'} = \frac{w_i}{\sum_{j=1}^{j=n} w_j} \quad \forall i. \tag{3}$$

3. *Estimation of Willingness To Pay (WTP) to support the provision of agricultural public goods (CV OE – open-ended contingent valuation method)* and its subsequent decomposition using weights of preferences for individual non-commodity outputs:

$$WTP_{A_i} = w_i WTP_{NCO}. \tag{4}$$

While the more abstract and fundamental values of multifunctional agriculture are relatively stable, the attitudes toward behaviours and intentions (such as stated WTP) can change relatively fast.

In order to consider different conditions (natural, production, socio-cultural) of different rural regions the survey sample was divided into two categories:

- residents of the region with prevailing intensive agriculture (South Moravia);

- residents of the region with a higher share of Less Favoured Areas (LFAs) (Vysocina).

The survey was administered in face-to-face interviews, assisted filling in the questionnaires and personal collection. The questionnaire survey was realized mid-term of the 2014–2020 Program (January - April 2017): 1000 questionnaire distributed/835 fully completed (62 % South Moravian Region, 44 % Vysocina Region). The survey sample can be described by the following characteristics: 52 % females, 60 % living in urban municipalities, younger respondents between 24 and 43 years of age were the majority (46 %), 49 % were economic active employees, educational level of the respondents was relatively high (secondary education 39 %, university education 34 %).

3 Research results

The assessment of the demand for multiple agricultural public goods has two basic functions in the evaluation of rural development projects:

- *legitimizing/justifying the intervention* for political representation (parliament) and the general public, and

- *increasing the effectiveness* of the intervention in order to maximize the positive effects resulting from the implementation of the program or policy.

The evaluation survey of public opinions indicated the long term consensus (78 % of respondents) in the opinion that *agriculture supplies a number of public goods that increase the well-being of society* and 68 % of respondents agreed to the *need to compensate farmers for the provision of these public goods.* The slightly lower level of agreement, that agriculture produces socially beneficial public goods and willingness to support, was indicated by respondents from the region with favourable conditions for intensive agricultural production (South Moravian Region).

The weight of preferences (relative importance) for NCOs were determined by the AHP methodology in the hierarchical structure, when the respondents first expressed preferences for types of NCO (production, environmental and socio-economic), and subsequently respondents performed pair-wise comparisons of each NCO attribute. Preferential weights were aggregated for the whole sample and both regions surveyed. Results of the AHP method are summarized in Table 1. From these results it is obvious that respondents indicated as the most significant the NCOs of production function (w´= 0.49), followed by environmental NCOs (w´= 0.26), and socio-economic NCOs (w´= 0.25). These results could be interpreted for the purpose of policy evaluation so that respondents would allocate 49 % of the total amount to support NCOs of production functions, 26 % NCOs of environmental and 25 % NCOs of the socio-economic function of agriculture. Respondents living in South Moravian Region (suitable for intensive agricultural production) expressed slightly higher preferences for the food safety, protection of natural resources and food security, while respondents living in Vysocina Region (with higher share of LFA) indicated slightly higher preferences for ensuring adequate income and competitiveness of farms, protection of rural landscape, ecosystem biodiversity and animal welfare.

Using the hypothetical scenario, the respondents were then asked to express the WTP to ensure a non-declining level of NCOs provision. The basic statistical characteristics of the WTP sample are shown in Table 2. The willingness to pay to support the provision of agricultural NCOs (WTP> 0) was expressed by the majority of sample respondents (51 %).

Table 1 Relative importance of non-commodity outputs attributes (n = 835)

Non-commodity outputs Type of function/attributes	Normalized preference weight (w´)		Normalised preference weigh in region* – overall (w´)		Overall AHP preference rank	
	Attrib.	Overall	SM	V	Func.	NCO
Production functions	**0.4864**		**0.4874**	**0.4847**	**1**	
Production of food for reasonable prices, ensuring adequate income and competitiveness of farms	0.3667	0.1784	0.1988	0.2001		2
Guarantee of safe and healthy food	0.4342	0.2112	0.2073	0.1906		1
Utilization of agricultural production base for non-food production and contribution to rural employment	0.1991	0.0968	0.0814	0.0940		5
Environmental functions	**0.2589**		**0.2576**	**0.2609**	**2**	
Protection of natural resources using practices compatible with environmental conservation	0.4390	0.1136	0.1147	0.1118		4
Maintenance and protection of ecosystems, biodiversity, and valuable natural habitats	0.3263	0.0845	0.08340	0.0853		6
Contribution to the formation and maintenance of rural landscape	0.2347	0.0607	0.0589	0.0639		9
Socio-economic functions	**0.2547**		**0.2550**	**0.2544**	**3**	
Guarantee long-term national food security	0.4551	0.1159	0.1169	0.11430		3
Guarantee animal welfare	0.3040	0.0774	0.0769	0.0783		7
Maintenance and improvement of the rural quality of life and conservation of rural cultural heritage	0.2409	0.0614	0.0612	0.0617		8

Source: Own processing, * SM – South Moravian Region with favourable conditions, V – Vysocina Region with less favourable conditions

Table 2 Contingent valuation results – basic statistical characteristics (n = 835)

Characteristics	Region		Total sample
	South Moravian	Vysocina	
Number of respondents (n)	518	317	835
Respondents WTP > 0	246	184	430
Share of resp. WTP > 0	47%	58%	51%
Respondents WTP = 0	272	133	405
Share of resp. WTP = 0	53%	42%	49%
Respondents protest WTP	203	107	310
Share of resp. protest WTP	39%	34%	37%
Share of resp. WTP > 0 (n-protest)	78%	87%	81%
Mean WTP (n) [CZK/person/month]	117	179	140
Mean WTP > 0 [CZK/person/month]	**245**	**309**	**273**
Mean WTP (n-protest)*	**192**	**271**	**223**

Standard deviation [CZK/person/month]	232	282	254
Max WTP [CZK/person/month]	1500	1500	1500

Source: Own processing * Respondents stated genuine zeros WTP and positive WTP bids

The higher proportion of respondents with the positive WTP was indicated in the region with a higher share of LFAs (Vysocina Region – 58 %). In order to refine the WTP estimation, protest responses should be excluded, because no information has been obtained about NCO values from these respondents, and their bids should not influence the average WTP of the sample. The total share of protest bids was 37 %. The genuine zero value of non-market benefits of agriculture was expressed by 17 % of respondents. Thus estimation of average WTP to support NCOs provided by agriculture was 223 – 273/person/month (8.25 – 10.10 EUR/person/month). The higher average WTP bids to support farmers for provision of NCOs were stated by respondents from the Vysocina Region (271 – 309 CZK/person/month; 10 – 11.44 EUR/person/month).

A key element of the rural development program efficiency is the selection of the best projects that have a significant positive socio-economic impact on the development of rural areas. Within this framework, a cost-benefit analysis (CBA) is explicitly required, which is a mandatory starting point when deciding on the co-financing of major EU projects. The objective of a cost-benefit analysis is not to find possible alternatives to investment projects but to allow more efficient allocation of resources while demonstrating the socio-economic benefits of the intervention for society.

In addition to the comparison of the net social value (overall effect) of the evaluated program/project alternatives, it is possible to use the results of presented evaluation study for weighing the overall social impact of projects within the hierarchical structure of the integrated project evaluation framework. Especially it is in cases where the individual sub-criteria of NCOs provision established for project evaluation are of different importance depending on specific characteristics of local agro-ecosystems. The social preferences and value of NCOs delivered by each alternative can be a valuable input to the policy decision making process.

The resent value of social benefits can be measured using the sum of the WTP for the NCO benefits of the implementation of the policy/project of all the individuals who are affected (G – number of gainers) or alternatively area affected (G – area in ha). The present value of social benefits can be formally expressed as:

$$PV(SB) = \sum_{i,t} WTP_{i,t}^{G} \cdot (1+s)^{-t}$$

(5)

Where $WTP_{i,t}^{G}$ is the individual gainer willingness to pay for the NCO benefits in period t of the implementation of the policy/project; $(1+s)^{-t}$ is the discount factor for the period t, where s is the social discount rate. Thus, the WTP estimates were aggregated and expressed in the WTP/capita/year and WTP/ha/year in order to increase the usefulness of the evaluation study results for the assessment of possible impacts of rural development policy/project on public welfare. Table 3 summarizes the weights of preferences and WTP estimates with the proposed link to potential public goods delivered by the rural development projects.

Table 3 Assessment of demand for multiple agricultural public goods in the evaluation of rural development projects

Function	Evaluated attributes of NCOs provided by agriculture	Weight of preference (w´)	Value estimates per year				Public good linked to policy decisions
			CZK/ha	EUR/ha	CZK/capita	EUR/capita	
Production	Production of food for reasonable prices, ensuring adequate income and competitiveness of farms	0.18	698 - 1 361	26 - 50	302 - 590	11.13 - 21.70	Offer of domestic food for reasonable prices
							Competitiveness of domestic
	Guarantee of safe and healthy food	0.21	814 - 1 588	30 - 58	353 - 688	12.18 - 25.32	Food quality and safety
	Production of food for reasonable prices, ensuring adequate income and competitiveness of farms	0.1	388 - 756	14 - 28	168 - 328	6.18 - 12.06	Rural employment
							Developing economic activities linked to the agricultural base

Environmental	Protection of natural resources using practices compatible with environmental conservation	0.11	427 - 832	16 - 31	185 - 360	6.80 - 13.26	Protection and sustainable use of water
							Protection and sustainable use of soil
							Protection and sustainable use of air and climate
	Maintenance and protection of ecosystems, biodiversity, and valuable natural habitats	0.08	310 - 605	11 - 22	134 - 262	4.95 - 9.65	Protection and support of ecosystems (habitats)
							Protection and support of biodiversity
							Transformation into sustainable farming systems
	Protection of natural resources using practices compatible with environmental conservation	0.06	233 - 454	9 - 17	101 - 197	3.71 - 7.23	Contribution to the formation and maintenance of traditional cultural landscape
Socio-Economic	Guarantee long-term national food security	0.12	465 - 908	17 - 33	202 - 393	7.42 - 14.47	Long-term food sufficiency and safety
	Guarantee animal welfare	0.08	310 - 605	11 - 22	134 - 262	4.95 - 9.65	Ensuring animal welfare by appropriate breeding technology
	Maintenance and improvement of the rural quality of life and conservation of rural cultural heritage	0.06	233 - 454	9 – 17	101 - 197	3.75 - 7.23	Contribution to rural vitality
							Conservation of rural heritage

Source: Own processing

4 Conclusions

The socio-economic evaluation techniques are given increased attention in the field of current policy, especially for their ability to go beyond market values and to investigate the invincible contribution that the natural environment and human activities provide (Klain et al. 2014). The goal of scientific research to support political decision-making at all levels by the formulation of scientifically based arguments to justify and optimize support for the sustainable development of agriculture and rural areas in changing socio-economic conditions.

Due to the numerous limitations of partial approaches and methods of the economic evaluation of non-market agricultural outputs, an appropriate combination of these can be recommended for further research to increase their understanding and usefulness in the political decision-making process. The presented methodological approach was aimed at increasing the applicability of NCO evaluation study results to support decision-making on rural development projects by verifying the existence of social demand for defined types of non-commodity outputs whose production is to be supported. To reduce the risk of distortions in the estimation of the NCOs value, the combination of AHP and CV methods has been used. This approach can increase the consideration of budgetary and substitution constraints (trade-offs). At the same time, it enables interconnection of valuation techniques with methods of multi-criteria evaluation of public investment projects and their variants. AHP results can be used separately as the weight of the social preferences of the MCDA criteria.

The aggregated social demand (WTP to support) for multiple public goods provided by agriculture was estimated at CZK 17.8 to 34.8 billion (EUR 655 to 1278 million) per year. The existence of social demand for defined types of non-commodity outputs whose production is to be supported has been demonstrated. Moreover the results of the evaluation study can be used not only to take account of societal demands in the political decision-making (merit, relevance and effectiveness of public support), but also for:

- revealing the necessity of education and communication of social values associated with agricultural production;

- harmonization of social requirements with the provision of public goods at the regional level;

- input into the analysis of trade-offs in the complex models of territorial development;

- business communication of the agricultural product quality attributes ("added value") and design of marketing strategies for domestic and regional products.

However, only the combination of the demand and production possibilities offers a sufficiently comprehensive view of the value of non-market benefits in all its aspects - especially from the point of view of socially (balanced) supply and demand.

References

Hellerstein, D., & Nickerson, C. (2002). Farmland Protection Programs: What Results Does the Public Want? (2002). *Agricultural Outlook*, 2002(5), 27-30.

Hodge, I., & Reader, M. (2007). Maximising the Provision of Public Goods from Future Agrienvironment Schemes, Final Report for Scottish Natural Heritage, Rural Business Unit, Department of Land Economy, University of Cambridge.

Kallas, Z., Gomez-Limon, J.A., & Hurle, J.B. (2007). Decomposing the Value of Agricultural Multifunctionality: Combining Contingent Valuation and the Analytical Hierarchy Process. *Journal of Agricultural Economics* 58(2), 218-241.

Klain, S.C., Satterfield, T.A., & Chan, K.M.A. (2014). What matters and why? Ecosystem services and their bundled qualities. Institute for Resources, Environment and Sustainability, University of British Columbia, on-line https://s3.amazonaws.com/academia.edu.documents.

Madureira, S., Rambonilaza, T., & Karpinski, I. (2007). Review of methods and evidence for economic valuation of agricultural non-commodity outputs and suggestions to facilitate its application to broader decisional contexts Agriculture, *Ecosystems & Environment*, 120(1), 5-20.

Moon, W., & Griffith J.W. (2011). Assessing holistic economic value for multifunctional agriculture in the US. *Food Policy*, 36, 455-465.

Saaty, T.L. (1991). Response to Holder´s comments on the analytic hierarchy process. *The Journal of the Operational Research Society* 42, 909-914.

Sauer, U., & Fischer, A. (2010). Willingness to pay, attitudes and fundamental values - On the cognitive context of public preferences for diversity in agricultural landscapes. *Ecological Economics*, 70(1), 1-9.

Yrjölä, T., & Kola J. (2004). Consumer Preferences Regarding Multifunctional Agriculture. *International Food and Agribusiness Management Review* 7(1), 78-90.

Variyam, J.N., Jordan, J.L., & Epperson, J.E. (1990). Preferences of Citizens form Agricultural Policies: Evidence from a National Survey, *American Journal of Agricultural Economics*, 72, 257-67.

Development of employment within agro-sector in V4 countries

Zuzana Bajusová, Jana Ladvenicová, Daniela Hupková, Ľudmila Dobošová, Veronika Mihálová

Abstract: *Employment as a concept is used in many ways. It plays an important role in the agricultural sector, which has irreplaceable importance in raw material production, settlement of rural areas and rural development. Employment in agro-sector from a global viewpoint, accounts for up to 39% of total world employment. The number of employees within this sector is decreasing from year to year not only in Slovakia but also in other V4 countries. The bulk of the agro-resourced workers are low-skilled and, after dismissal, have not found adequate work, thus increasing the unemployment rate in the country as new job creation is increasingly challenging for workers' qualifications. The agricultural sector is not an attractive sector for young people who are looking for jobs in other segments. An important role plays the wage, which lags behind the average wage in the national economy. From the point of view of education, citizens with secondary education predominate in agro-sector. The most people are employed by legal entities - business companies. In terms of employment, expressed as a percentage of total employment, the highest average employment for the period 2008-2017 was reached in Poland, where it represented 11.2%. The Czech Republic achieved the lowest employment rate at 2.99%. In terms of the number of persons employed in the agro-sector, Poland is the highest among the V4 countries, which employed an average of 1,731,000 people in the whole analyzed period. Slovakia has the lowest number of employed among the V4 countries.*

Key words: Agriculture · Employment · Wage · V4 countries

JEL Classification: J21 · J31 · J43

1 Introduction

Agriculture is the mainstay of many economies. All over the world, the development of an enduring economy goes hand in hand with agricultural development. Agriculture is considered a catalyst for the overall development of any nation. It is thus a critical sector that drives the economic development and industrialization of the developing nation, and also holds the ace for reducing unemployment. Thus, its' development is critically important for ensuring food and nutritional security, income and employment generation, and for stimulating industrialization and overall economic development of the country (Ogbalubi, L.N., Wokocha, C.C., 2013). Agriculture plays a less important role in the case of the new job-creation. Therefore, the future perspectives of agrarian employment will depend on the rate of the sector modernization, the enhancement of human capital and the diversified utilization of the internal development potential of the rural economy. The agricultural sector will get rid of the non-qualified labor force gradually and will employ more seasonal workers potentially (Buchta, 2013). Approximately 10 million people worked in agriculture in EU in 2015. Employment in this sector represents 4.4% of total EU employment. In 2016, one third of women worked in the agro-sector, accounting for around 35% of the workforce. The largest number of women in this sector is in Austria, Romania, Poland, Greece, while the lowest number is in Ireland and Denmark. Around 60% of workers are people aged 40-64.

Ing. Zuzana Bajusová, PhD., University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: zuzana.bajusova@uniag.sk

Ing. Jana Ladvenicová, PhD., University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: jana.ladvenicova@uniag.sk

doc. Ing. Daniela Hupková, PhD, University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: Daniela.hupkova@uniag.sk

Ing. Ľudmila Dobošová, PhD., University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: ludmila.dobosova@uniag.sk

Ing. Veronika Mihálová. University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia, e-mail: xmihalovav@uniag.sk

The most represented at the age of 64 and more is in Portugal (42%). Employment in agriculture in the EU-28 has a long-term decline, with Poland, Rumania, Italy accounting for the highest share in employment. Slovakia has achieved only half a percentage share.

Since the early 1990s, the number of employed in agriculture has decreased. In our country we have a very low level of indicator, 2,86 people per 100 ha, while the EU average is double the number of 5,65 workers/ 100 ha. EU countries can gain higher employment from 100 hectares of land. In Poland has 13 employees per 100 hectares of land but, productivity is comparable to that of Slovakia (Klimek, 2015). Slovakia's accession to the EU in 2004 brought new opportunities for Slovakia in the form of export of products abroad, work abroad, obtaining grants and subsidies from the EU, but also problems with the production economics and the competitiveness of our products, which resulted in the limitation of production with impact on employment. As basic problems of declining number of workers in the agro-sector can be considered: no interest of young people, low job evaluation, difficult working conditions, unequal distribution of work during the year. (Jamborová, Masár, 2015). Development of unemployment in recent years has been affected by stable economic growth that has created new jobs opportunities. In 1993, each fifth person was registered as unemployed from the Department of Agriculture. This number has been reduced until 2016, when every 25th unemployed person comes from this sector. In agriculture, short-time working contracts are famous. In such way, the businesses reduce labor costs and increase work productivity extensively (Buchta, 2017). From the point of view of employment, from all enterprises in the agricultural sector 94% of workers are employed by enterprises in form of legal person.

Employment in agriculture accounts for 2,18% of total employment in the Slovak economy. In terms of enterprise size, the most, 46% of workers are employed by small enterprises, then medium-sized enterprises employs 44,5% and at least 9,5% of workers are employed by micro enterprises. The average age of workers in agriculture is 46, 7 years (Chrastinová, Belešová, Jamoborová, 2015). Górny, Kaczmarczyk (2018) assess the role of foreign labor in Polish agriculture in the short run and reflect on the sustainability of the supply of foreign labor in the long run. Drawing on registry data on a survey of farmers conducted in 2016 and on a survey of Ukrainian migrants (the largest group of labor migrants in Poland) conducted in 2015, authors document the high reliance of the farm sector on foreign workers in several regions in Poland. Because low-paid and arduous farm work is not too attractive to migrants, they tend to seek employment in other sectors. This assessment implies that polish farms should not only rely on a cheap foreign labor, but need to invest in labor substituting technologies. Reallocation of agricultural labor during transition differs widely between regions and countries. Analysis shows that agricultural labor reallocation in Poland is determined by: the dramatic adjustment of prices and production costs caused by price liberalization and subsidy cuts, regional differences in farm organization and the impact of institutional reforms on these organizations, structural problems constraining intersectoral mobility. Long-term efficiency gains and sustainable rural development are conditional upon reducing such structural constraints and improving the functioning of the labor market (Dries, Swinnen, 2002). In 2013, almost 45,7% of women worked in Hungarian agriculture and the share of employment in agriculture on total employment in the country was 5% in 2016. In comparison with the EU, the agricultural sector of the Czech Republic has an extremely high proportion of hired paid workers, but their share is decreasing, a lower share of working women is approximately 30%, worsening age structure, the decline of young people, the particularly low share of part-time workers (Doucha, Spěšná, Drlík, Ratinger, 2014). Over the past twenty years, the number of agricultural workers has fallen to one third. Outflow of employees has been caused by the massive decline in livestock production in recent years. In the basic variation of agricultural development, the authors assume that production and employment will be affected by the reduction of resources allocated to the EU's common agricultural policy by 2033. The downward trend in employment over the period 2012-2033 is expected to decline year-on-year by 1,4% (Employment Outlook in the Agriculture Sector by 2033).

2 Methods

The aim of the paper is to analyze the development of employment in the agricultural sector. The source of information are the data drawn from the Green Reports of the Czech Republic and Slovak Republic for the years 2008-2016, data from EUROSTAT, from the statistical databases of Poland and Hungary. According to the stated aim of the paper, the methodology used in the paper has mainly descriptive character, using chosen indicators and comparative indicators to provide overview about situation within V4 countries, during period 2008-2017..We've compiled spreadsheets and charts for more accurate data viewing and we quantified the average for the entire analyzed period and the change (Δ), which represents the difference between the last and the first year of the monitored period. We have focused on analysis of the development of employment in agriculture in V4 countries from the total employment in %, on analysis of the development of the number of employed in the agricultural sector in the V4 countries, the structure of workers in agriculture according to education in the SR and the CR, the analysis of the wage in agriculture and in the national economy within V4 countries and their comparison over time. Within the paper, also comparative indicators are used, which were consid-

ered to provide clear picture about situation and compare the development in the chosen countries.   Through these comparative indicators, we quantified the share of employed in agro-sector on hectare of agricultural land and ha of arable land, we also quantified and analyzed the development of agricultural output per one agro-sector worker and the share of gross value added in agriculture per employee in this sector.

3 Research results

Tab. 1 provides overview about development of employment in the agrarian sector in the V4 countries as a percentage share of the total employment in each country. From the point of view of the analyzed countries, the highest percentage is achieved by Poland, where the average share of agrarian employment on total employment reached 11,2% for the whole monitored period, compared to the first and last year, where the indicator decreased by 3,41% between years 2008 - 2017. The second highest value of the share of employment in agro-sector on total employment was achieved in Hungary, where the average value reached 4,78%. From all V4 countries, only in Hungary, the indicator has increased by value 0,66% within the monitored period 2017 to 2008. The lowest share shows Czech Republic with 2,99%. The indicator declined in 2017 in both Czech Republic (by 0,3%) and also in Slovakia (1, 05%).

Table 1 The share of employment in agro-resort on total share in V4 countries in 2008-2018 (in %)

Country/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Δ	Ø
SR	3,96	3,59	3,23	3,08	3,24	3,31	3,5	3,18	2,89	2,91	-1,05	3,29
CZ	3,17	3,12	3,1	2,99	3,05	3,03	2,75	2,93	2,9	2,87	-0,3	2,99
PL	13,97	13,28	13,05	12,91	12,58	12	11,49	11,53	10,58	10,56	-3,41	11,2
HU	4,32	4,61	4,54	4,89	5,06	4,78	4,68	4,9	5,04	4,98	0,66	4,78

Source: The globaleconomy, authors own calculation

In tab. 2 is represented the development of the number of employed persons in agriculture in individual V4 countries. The highest number of people in this sector is employed in Poland, where the average number of employed persons is 1 731 thousand people. For the whole monitored period, the number of workers in the country decreased by 513 thousand people. The lowest number of people working in agriculture is in Slovakia, it is an average of 74,06 thousand. People during the analyzed period. In all V4 countries is recorded the decline in number of workers in this sector (in the Czech Republic by 6 thousand, in Hungary by 31 thousand, and in Slovakia by 9,5 thousand people). Even here, it is evident that this sector is not an interesting for young people, who see their future in other sectors where they are better valued. From a gender perspective, the industry employs more men than women, except Poland, where women predominate over men.

Table 2 Development of number of employed in agriculture in V4 countries in 2008-2017 (in thous.)

Country/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Δ	Ø
SR	81,83	77,6	73,08	73,02	70,56	73,95	72,42	73,35	72,51	72,3	-9,5	74,06
CZ	168,4	167,9	159,1	162,9	165,4	167,1	165,5	163,3	160,9	162,4	-6	164,3
PL	2196	2095	2004	1995	1946	1853	1804	1842	1695	1683	-513	1731
HU	292,6	284,3	287	274,1	284,8	277,7	281,5	270,5	268,9	261,7	-31	278,3

Source: Eurostat, Statistical Office SR, authors own processing

In Slovakia, wages in the agro-sector are lower than wages in the national economy. The average monthly wage in the industry was 653 € within the analyzed period, which is less about 78 € compared to the national economy average wage. The highest decline in wages, over 200 €, was recorded in the last two years, in 2015 and 2016.

Table 3 Comparison of the average monthly wage in the Slovak Republic in the national economy and in the agro- sector (in €)

Sector/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	Δ	Ø
Wage in agro-sector	592	598	601	641	675	673	740	655	702	110	653

Wage in national economy	723	745	769	786	805	824	858	883	912	189	731
Difference	131	147	168	145	130	151	118	228	210	79	78

Source: Statistical Office SR, authors own calculation

The average monthly wage in the Czech agro-sector also lags behind the wage level in the national economy of the country. The average monthly wage is 767 € for the entire analyzed period. The average wage in the national economy is 963 €, what is higher wage by 196 €. The highest wage slump was in 2010 and 2011, where wages decreased from 209 to 220 €. Compared to Slovakia, people in the Czech Republic earn more.

Table 4 Comparison of the average monthly wage in the Czech Republic in the national economy and in the agro- sector (in €)

Sector/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	Δ	Ø
Wage in agro-sector	692	694	711	720	773	796	820	830	865	173	767
Wage in na-tional economy	876	908	920	940	970	971	990	1023	1066	191	963
Difference	183	214	209	220	197	176	170	193	201	18	196

Source: Green Report of Czech Republic 2008-2016, authors own processing

Figure 1 Comparison of the average monthly wage in Poland and Hungary in the national economy and in the agro- sector (in €)
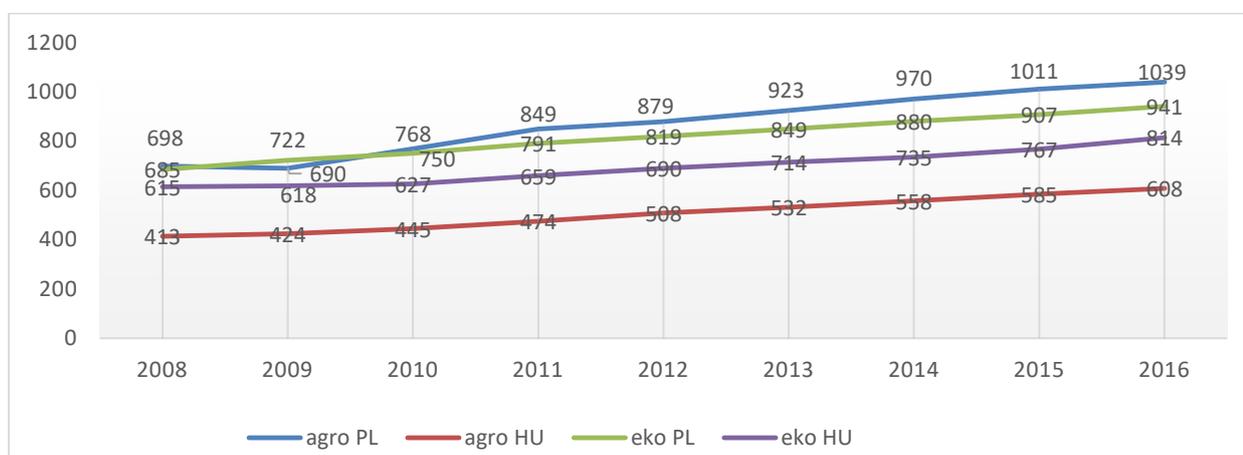
Source: Authors own processing,Statistical Office PL a HU

The wage developments in the national economy and in agriculture in Poland and Hungary are shown in Figure 1. Wages in the Hungarian agrarian sector have increased since 2008 when it reached the level of 413 €, while in 2016 it was 608 €, but compared to Poland, it reached the lowest level. The wage in the national economy of Hungary was higher in each of the years surveyed compared to the wages in the agro-sector of the country, averaging for the whole period at 693 €, which is almost about 188 € more than the average wage in the agricultural sector. Wages in Poland's agro-sector have reached the highest level among the V4 countries, reaching 698 € in 2008, and rising to 1,039 € by the end of 2016. Interestingly, this wage is higher than the average wage in the national economy of that country, whose average value for the whole surveyed period was 816 €.

Tables 5 and 6 represent the educational structure of people working in the agriculture of the Slovak Republic and the Czech Republic. As can be seen, in Slovakia, the most represented group of workers with apprenticeship education is 52% and workers with secondary school education, representing 29% of the total number of workers. At the last place are people with university education, with 9% of people working in agriculture. In total, the number of people with primary education and the number of university graduates fell. The workers, who have worked from the start in this sector retire, and the age structure in this sector is getting older. People with university education are looking for jobs in other, more attractive sectors than agriculture.

Table 5 Educational structure of workers in agriculture in the SR (in%)

Educa-tion/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	Δ	Ø
Primary	14,3	14,3	12,4	10,2	9,9	8,7	8	8,3	5,3	-9	10,16
Apprenti-ceship	54,1	53,2	52,2	51,1	51,1	50,5	51,3	52,4	55,4	1,3	52,37

Secondary	24	24,3	27,2	28,6	30,5	31,5	31,2	30,1	32,4	8,4	28,87
University	7,6	8,2	8,2	10,1	8,5	9,3	9,5	9,2	6,9	-0,7	8,61

Source: Green report 2008 – 2016, Authors own processing

In the Czech agro-sector, from the point of view of the educational structure, the highest representation has the group of people with secondary education at an average level of 78%.

In case of people with primary education, we are seeing an overall drop by 10,3% by the end of 2016. An increasing trend can be seen in people with university education, where we register an increase by 4,7 % until 2016 compared to the first year. From the point of view of legal forms, most workers work in legal entities, either in cooperatives or companies, in both countries.

Table 6 Educational structure of workers in agriculture in the Czech Republic (in%)

Education/year	2008	2009	2010	2011	2012	2013	2014	2015	2016	Δ	Ø
Primary	18,2	16,3	16,3	15	8,8	8,8	8,4	7,8	7,9	-10,3	11,94
Secondary	74	74,5	77,2	78,7	79,2	79,1	79,3	79,6	79,6	5,6	77,91
University	7,8	9,2	6,5	6,3	12	12,1	12,3	11,6	12,5	4,7	10,03

Source: Report on the state of agriculture for 2008 - 2016, Authors own processing

From many comparative indicators, we chose to analyze and compare the share of agricultural workers on ha of agricultural land and on arable land. As can be seen from FIG. 2 the highest share of ha ha p.p. is in Poland. The area of agricultural land is the highest in Poland among the V4 countries with average about 18 823 thous. hectares. On the contrary, the lowest area of agricultural land is in Slovakia, with an average area of about 9 times lower than in Poland. For one hectare of agricultural land falls 0,1 employee in Poland, in Hungary 0,05 workers, in the Czech Republic 0,04 employee, and in Slovakia 0,03 employee.

Figure 2   The share of agricultural workers on 1 hectare of agricultural land in the V4 countries (in people)
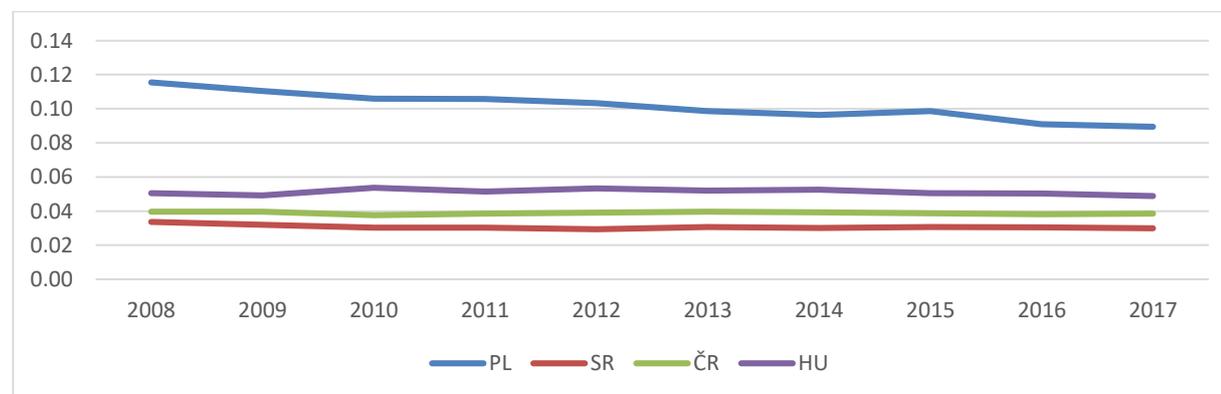
Source: Authors own calculations and processing

A similar situation is also with the number of workers on arable land. The highest representation of arable land is Poland, where the average area of arable land for the whole period under analysis is 13 818 thousand hectares, on the contrary, the lowest area of arable land is Slovakia, with an average of 1 409 thousand hectares. The share of employees on arable land is the highest in Poland, with an average of 0,14 employee, in Hungary it is 0,06 workers per ha of arable land and in the Czech Republic and Slovakia the same average level of 0,05 workers per ha of arable land.

Figure 3 The share of agricultural workers on 1 hectare of arable land in the V4 countries (in people)
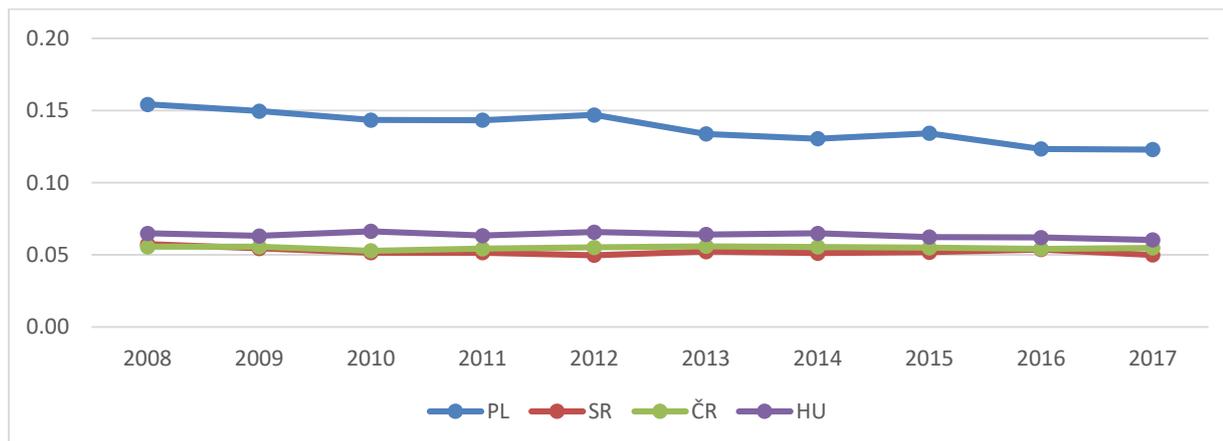
Source: Authors own calculations and processing

Poland has the highest value for agricultural production, where its average value for 2008 - 2016 was 21,771 million €, much lower is production in other V4 countries, in Hungary 7 328 mil. €, in the Czech Republic 4,543 mil. and the lowest is in Slovakia with 2,117 million €. The share of agro-production per worker is captured in Fig. 4. As can be seen, approximately the same development of production per worker is in the Czech Republic, Slovakia and Hungary at an average level of 27,624 € / worker in the Czech Republic, in the SR 28,619 € / worker and in Hungary 26,220 € / worker. The lowest is in Poland, 11 095 € / 1 worker.

Figure 4 Share of agricultural production per 1 employee in V4 countries (in €)
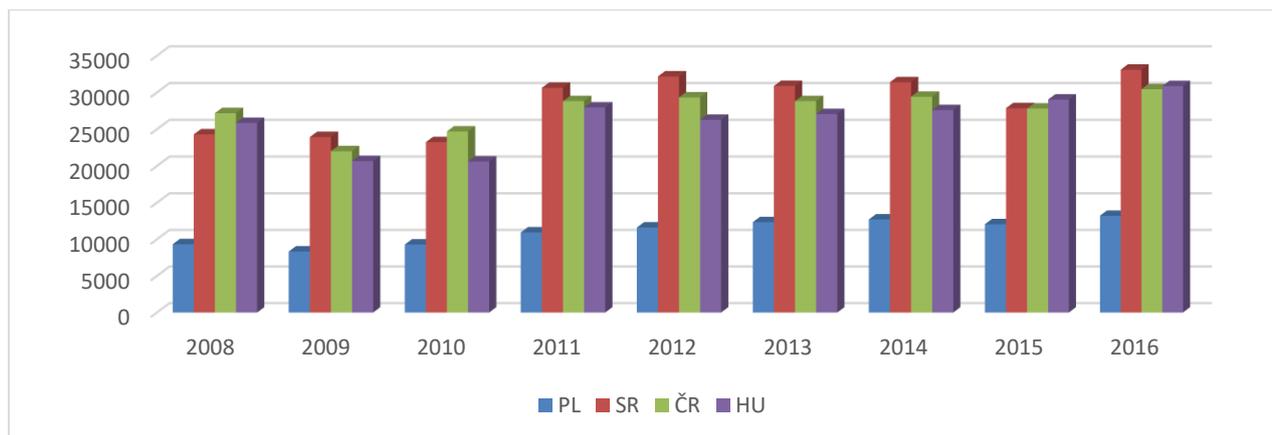
Source: Authors own calculations and processing

Gross value added in producer prices among V4 countries is the highest in Poland, with an average level of 7,781 million €. Approximately 5,000 mil. € lower is in Hungary, in the Czech Republic it is at the level of 1 260 mil. and in Slovakia it reaches the lowest value only 503 million. € within the years 2008-2016. From the point of view of the gross value added per worker in agriculture, the highest value is quantified in Hungary, where it represents 9 729 € per one worker, the lowest is in Poland, with an average 4 071 € / worker.

Figure 5 Share of gross value added per employee in V4 countries (in €)
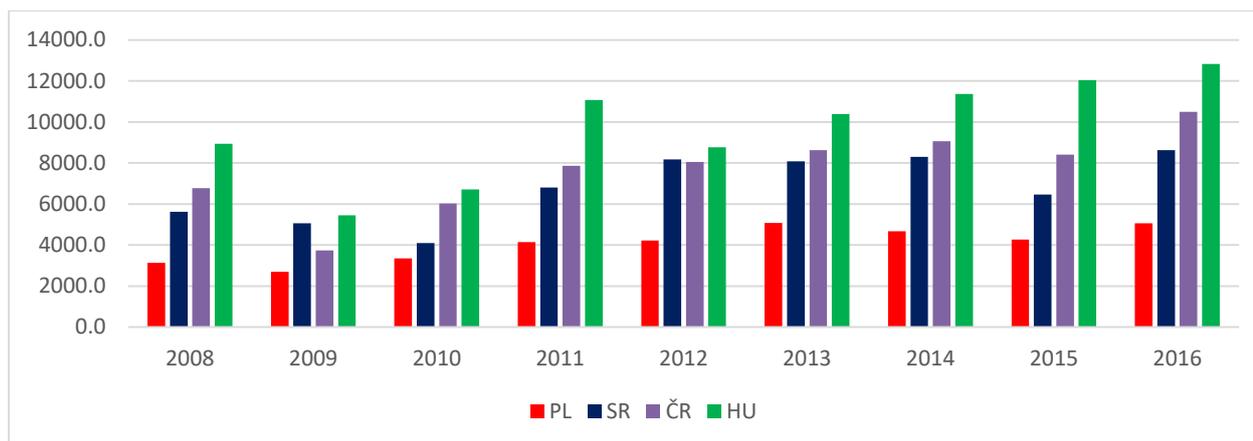
Source: Authors own calculations and processing

4 Conclusions

The agricultural sector has some special characteristics that make it more difficult, compared to other sectors, to know precisely how many people it employs. Firstly, in most Member States agriculture is still dominated by family farms, where family members provide labor input at different times of the year. Secondly, many farmers and farm workers pursue agriculture as a part-time activity and have other more or less important sources of income. Thirdly, agriculture is characterized by seasonal labor peaks, where large numbers of workers may be hired for relatively short periods.

Agriculture has many important functions, one of which is to provide nutrition to people. As one of its main priorities, the EU has set itself the task of tackling employment, increasing the efficiency of the CAP and focusing on the creation and preservation of jobs in the agricultural sector. Poland has the highest percentage of employment in agriculture on total employment in the V4 countries, with average employment in 2008-2017 at 11,2%, while the lowest employment in agriculture on the total employment is in the Czech Republic (average 2,99%). In terms of V4 countries, Poland employs the most people in agro-sector, on an average about 1,731,000 people.

The agricultural activity shows a low income, compared with the national economy, the wage in agriculture is lagging behind. The lowest wage in this sector is recorded in Hungary (608 € in 2016), on the contrary, the most valued are workers in Polish agriculture. From the point of view of the educational structure, the representation of workers with secondary education prevails, because people who have worked there since the beginning and have basic education have retired, and people with higher education are looking for a job in another sector where they are better valued.

An important role in this sector plays land. In the world, agricultural land accounts for more than one third of the total land, and approximately 10% of it, is arable land. On 1 ha of agricultural land falls the most agro-resorted workers in Poland and at least in Slovakia. The same tendency has the share of workers on arable land. Agricultural production is growing year-by-year, reflecting population growth and demand for products from the industry. From the point of view of the share of production per worker in agro-sector, it is most in the CR and at least in Poland.

References

Buchta, S. (2011). Development of agrarian employment in Slovakia after 2013. *Agricultural Economics*, Vol.57, Issue 1,2011, 21-26.

Buchta, S. (2017). Agriculture and labour market. *Ekonomika poľnohospodárstva,* Vol. XVII, 1, 2017, 77 – 85.

Dries, L., & Swinnen J.F.M. (2002) Institutional Reform and Labour Reallocation During Transition: Theory Evidence From Polish Agriculture. *World Development,* Vol.30, 3, 2002, 457-474.

Eurostat (2018), Databases. Available online: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do.

Chrastinová, Z., Belešová, S., & Jamborová, M. (2015). Economic and social aspects of agriculture. *Ekonomika poľnohospodárstva*, roč. XV, 1,2015, 4-26.

Górny, A., & Kaczmarczyk, P. (2018). A known but uncertain path: The role of foreign abour in Polish agriculture. *Journal of Rural Studies*, January 2018, https://doi.org/10.1016/j.jrurstud.2017.12.015.

Jamborová, M., & Masár, I. (2015) Development trends of employment in the agricultural sector and food production within last decade (2005-2014) in Slovakia. *Ekonomika poľnohospodárstva,* Vol. XV., 4, 2015, 109-123.

Klimek, M. (2015). III. Zamestnanosť v slovenskom poľnohospodárstve. Available online: http://www.marcelklimek.sk/potravinova-miliarda/iii-zamestnanost-v-slovenskom-polnohospodarstve.

Ogbalubi, L.N., & Wokocha, C.C. (2013). Agricultural Development and Employment Generation: The Nigeria Experience. IOSR *Journal of Agriculture and Veterinary Science,* Vol. 2, Issue 2, 2013, 60 – 69. Available online: http://www.iosrjournals.org/iosr-javs/papers/vol2-issue2/L0226069.pdf.

Other sources:

V poľnohospodárstve EÚ pracuje približne 10 miliónov ľudí. 2018. Available online: https://openiazoch.zoznam.sk/cl/182644/V-pol-nohospodarstve-EU-pracuje-priblizne-milionov-ludi.

Prognóza zaměstnanosti v odvětví zemědělství do roku 2033. 22 s. Available online: https://ipodpora.odbory.info/soubory/dms/wy-siwyg_uploads/3db983f83edc7dd5/uploads/Prognoza_zemedelstvi_BIDI_II.pdf.

Statistical Factsheet Hungary. 2018. Availableonline: https://ec.europa.eu/agriculture/sites/agriculture/files/statistics/factshe-ets/pdf/hu_en.pdf.

Structural Changes in Agrarian Trade Specialization Patterns of the Czech Republic with member states of the European Union

Ivo Zdráhal, Barbora Daňková, Kristina Somerlíková, Francois Lategan, Věra Bečvářová

Abstract: *The aim of the paper is to evaluate changes in agrarian trade specialization patterns of the Czech Republic with member states of the European Union in the last 5 years (period 2013 and 2017). Since Czech Republic became member state of European Union, its agri-food trade changed significantly. The process of restructuring is still ongoing (mainly in relation to traditional trade partners), but it seems that this structure is gradually approaching its final form. In this article the agri-food trade of the Czech Republic with other European Union member states using SITC 3-digit data is analysed. Balassa's (BI) and Lafay's (LI) indices were calculated to analyse the revealed comparative advantage score amongst the different product groups in the Czech/EU28 agrarian trade relationships. Following this analyses, the Galtonian regression was calculated and implemented as a quantitative technique to assess changes in trade specialization patterns. The results suggest that trade specialization patterns are stable with regard to product groups with revealed comparative advantage or disadvantage. Results also suggest that there is a process of (weak) divergence in the trade specialization pattern, meaning the pattern of trade specialization is considered to be strengthened because industries with initial comparative advantage became more pronounced, while those with initial comparative disadvantages became more subdued.*

Key words: Agrarian Trade · Specialization · Revealed comparative advantage · Galtonian regressions · Czech Republic

JEL Classification: Q14 · C1 · F14

1 Introduction

In the last 25 years, the Czech Republic agrarian foreign trade has been shaped by the restructuring of trade links and by the establishment of strong economic relations towards countries of European Union (EU). This is associated with the expansion of the original EU member states towards Central and Eastern Europe. Before 2004, when Czech republic joined European Union, the formation of Czech agrarian trade with EU member states was largely influenced by the asymmetric nature of the trade liberalization between the Czech Republic and EU-15, since the market of the Czech Republic was open to import from EU-15 more than markets of EU-15 were open to the export from the Czech Republic.

Since Czech Republic became member of European Union, agrarian foreign trade of the Czech Republic has undergone even more significant changes, which involved not only the territorial and commodity structure, but also its values, volumes, unit prices and in general specialization profile and competitiveness (Burianová and Belová, 2012; Smutka et al., 2012; Svatoš and Smutka, 2012; Bielik et al., 2013, Mach and Hošková, 2016, Smutka et al., 2016, Smutka et al., 2018, Zdráhal and Bečvářová, 2018). The Czech Republic was characterized by high growth rates of the value of total foreign trade and as well as agrarian component of the total foreign trade (export and import). Moreover, the growth rate of the value of agrarian trade also exceeded the average growth rate of agrarian trade of several European countries and worldwide (Smutka and Belova, 2011).

Currently, EU28 member states are the main trade partners of the Czech Republic and their share in total Czech agrarian trade is almost 90 % (Smutka et al 2017). Territorial structure of agrarian trade between the Czech Republic and EU-28 is significantly concentrated and territorially oriented primarily towards Germany, Slovakia, Poland and Italy. Specialization profile is influenced by the nature of the bilateral trade between the Czech Republic and these 4 countries.

According to Smutka et al. (2018), the product structure is also significantly concentrated. The most competitive products are cereals, live animals, oil seeds, tobacco products, dairy products, sugar, vegetable oils, milling products and beverages and alcohol. Also, the process of restructuring this product structure (especially in relation to traditional business partners) is still ongoing, but research suggests that it is gradually approaching its final form.

Ing. Ivo Zdráhal, Ph.D., Mendel University in Brno, e-mail: ivo.zdrahal@mendelu.cz

In other study Smutka et al (2017) highlights the structural problem of Czech agrarian trade. Czech agrarian exports are dominated by semi-processed and low processed products with low unit values. On the other hand, imports can be characterized by a much higher unit value and a much higher level of processing. The unit value of Czech agrarian exports has been constantly decreasing as opposed to the continuous increase of the unit value of imports. This can be seen as a symptom of the structural problems in Czech agrarian trade in terms of its value adding.

Undoubtedly, the further liberalization of agrarian trade within the EU together with the single market structure of the European Union brought new opportunities for the development of the sector. On the other hand, Czech producers have been exposed to greater competition from other EU member state producers. Agrarian foreign trade, not only between the Czech Republic and the EU Member States, but also in relation to other territories outside the European Union (EU), is becoming an important transformation and potential sectoral economic growth factor (Ferto, 2008). Together with other general factors (economic levels etc .), this increased trade contributes significantly to the development of the individual sectors in the Czech agribusiness industry (Blažková, 2010; Blažková and Chmelíková, 2014, 2015).

The objective of this paper is to analyse and evaluate changes in agrarian trade specialization patterns of the Czech Republic with European Union member states (EU 28) in the last 5 years (period 2013 and 2017). This analysis will include investigating if the agrarian trade profile of the Czech Republic is still evolving or if it is close to its final product structure.

Given the context of existing structural problems in Czech agrarian trade regarding its value adding, this study is part of an effort to provide information towards much broader questions as 1) the identification and prioritization of relevant or suitable sectors to improve comparative advantage, 2) development of policies and practices to support ongoing improvement of comparative advantage, 3) strategies and policies to sustain comparative advantage and 4) to determine suitable policy focuses with regard to the development of the comparative advantage of the agrarian and food processing sectors.

2 Methods

To capture the degree of trade specialization of a country, it is important to assess the revealed comparative advantages of the relevant sectors included in the total agrarian trade. To achieve this Balassa (1965, 1977) suggested the following index of revealed comparative advantage (RCA):

$$BI_{ij} = \frac{\frac{x_{ij}}{x_i}}{\frac{x_{wj}}{x_w}} \tag{1}$$

In this calculation X represents exports, *i* is a country, *j* is a product and *w* is a set of countries (EU28). The Balassa index varies between 0 and infinity. The values between 0 and 1 indicating that the country does not have a comparative advantage and the values between 1 and infinity signaling that the country has a comparative advantage in that sector.

Because of the shortcomings of the Balassa index, as described in following economic study of Sanidas and Shin (2010) it is also necessary to use another index. For this purpose the Lafay index (Lafay, 1992) was selected. The Lafay index, in contrast to Balassa, does not only use export values but also imports values. Another advantage of the Lafay index is its reliability when comparing its values in time series.

The Lafay index (Zaghini, 2003) is defined for a given country and for a particular product as:

$$LFI_j^i = 100 \left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^N \left(x_j^i - m_j^i \right)}{\sum_{j=1}^N \left(x_j^i + m_j^i \right)} \right) \frac{x_j^i + m_j^i}{\sum_{i=j}^N \left(x_j^i + m_j^i \right)} \tag{2}$$

Where *x* and *m* are the export and import values of individual product group of agrarian trade of the Czech Republic to/from EU28 countries. Zero represents a neutral value in terms of reporting a comparative advantage. A positive value for the Lafay index indicates the existence of a comparative advantage for a specific sector and a negative value of the Lafay index indicates the existence of a comparative disadvantage for a particular sector. This means that a higher index value suggests a higher degree of comparative advantage and specialisation.

The values of Balassa (BI) and Lafay index (LFI) were calculated for 46 different product groups constituting agrarian foreign trade of the Czech Republic with the countries of the European Union. In the next step, the Galton regression was used to assess changes in agrarian trade specialization patterns. The investigation period is between 2013 and 2017 and is based on UNCTAD data.

The analysis of the changes in agrarian foreign trade between the Czech Republic and the other member states of the European Union (EU 28) is based on the UNCTAD data. The analysed time series covers the period 2013-2017. For the

purpose of analysing the commodity structure of agrarian foreign trade, the individual sectors (product groups) are defined according to the Standard International Trade Classification (SITC) Revision 3. The analysis was carried out at the level of 3-digit code, i.e. for 46 different commodity groups of agrarian foreign trade. The sum of these is the total agrarian trade. This corresponds to the definition of agrarian trade used by the WTO (SITC 0 + 1 + 22 + 4). The values of the trade flows are in current prices in USD. The overview of the specific product groups is presented in Table 1.

Table 1 Sectors and their numeric designations (SITC rev.3, 3-digit code)

001	Live animals	057	Fruit, nuts excl. oil nuts
011	Bovine meat	058	Fruit, preserved, prepared
012	Other meat, other offal	059	Fruit, vegetable juices
016	Meat, ed. offl., dry, slt, smk	061	Sugars, molasses, honey
017	Meat, offl. Prdd, nes	062	Sugar, confectionery
022	Milk and cream	071	Coffee, coffee substitutes
023	Butter, other fat of milk	072	Cocoa
024	Cheese and curd	073	Chocolate, oth. cocoa prep.
025	Eggs, birds, yolks, albumin	074	Tea and mate
034	Fish, fresh, chilled, frozn	075	Spices
035	Fish, dried, salted, smoked	081	Animal feed stuff
036	Crustaceans, Molluscs	091	Margarine and shorten
037	Fish etc. prepd, prsvd. nes	098	Edible prod. prepetns, nes
041	Wheat, Meslin, Unmilled	111	Non-alcohol. beverage
042	Rice	112	Alcoholic Beverages
043	Barley, unmilled	121	Tobacco, unmanufactured
044	Maize unmilled	122	Tobacco, manufactured
045	Other cereals, unmilled	222	Oil seeds and oleaginous fruits (excl. flour)
046	Meal, Flour of wheat, msln	223	Oil seeds, oleaginous fruits (incl. flour, n.e.s.)
047	Other cereal meal, flours	411	Animal oils and fats
048	Cereal preparations	421	Fixed veg. fat, oils, soft
054	Vegetables	422	Fixed veg. fat, oils, other
056	Vegetables, prpd, prsvd, nes	431	Animal, veg. Fats, oils, nes.

Source: SITC rev.3

Using this methodology, the Galtonian regression was calculated and applied as a quantitative technique to assess changes in trade specialization patterns. The Galtonian method is the linear simple regression with respect to the two cross-sections of two different time periods of RCA indices scores (Sanidas and Shin, 2010). The corresponding regression equation for a given country to test the changes in trade specialization pattern is:

$$RCA_{ij}^{t2} = \alpha_i + \beta_i RCA_{ij}^{t1} + e_{ij} \tag{3}$$

where t_1 indicates the initial point in time and t_2 the latter point in time, a_i and β_i, are standard regression coefficients and eij is an error term. It is assumed that the regression is linear, and that eij follows the normal distribution and independent of RCA. The degree to which the normality assumption was met was therefore investigated.

In the equation t1 indicated 2013 and 2017 was indicated using t_2. To build a preliminary impression of the distributions of the two indices for the Czech Republic, scatter plots and histograms of each index for both time periods were developed and analysed.

The fundamental concept of the Galtonian regression is basically to assess the similarity or dissimilarity between the distributions of revealed comparative advantages for two different points in time. This provides an indication of the stability, or convergence/divergence of the trade specialization patterns.

To interpret the corresponding results the overall changes can be expressed in terms of the regression effect, indicated by ß, and the mobility effect, indicated by R, where:

- If ß > 1, there is a divergence of trade specialization

- If R < ß < 1 divergence of trade specialization

- If ß < R < 1 convergence of trade specialization

- If ß = R no convergence or divergence, thus the trade specialization pattern remained more or less stable.

Divergence means that the pattern of trade specialization has strengthened due to industries with initial revealed comparative advantage exhibiting an increase in this score, while the score for those exhibiting initial revealed comparative

disadvantage decreased. Convergence means the opposite dynamics is taking place. That means the pattern of trade specialization can be considered to have weakened.

3 Research results

3.1 Revealed Comparative advantage of the Czech Republic in Agrarian Trade

The turnover value of the Czech Republic's agrarian foreign trade grew significantly post 2004, when the Czech Republic joined the European Union. As a result of this substantial change, the territorial structure of agrarian trade also changed towards supporting trade relations with member states of the European Union. Within the single market of the European Union, economic relations and the international division of labour (both in the horizontal and vertical contexts of agribusiness value chains/networks) are currently important criteria for shaping the specialization profile in agrarian trade structure of the Czech Republic.

The manifestations of the global financial crisis in 2008 were also reflected in the value of agrarian foreign trade between the Czech Republic and EU member states. However, after a rapid recovery, the increase in turnover continued (both export and import) until 2013. Between 2013 and 2017 stagnation in the value of turnover can be observed. Table 2 presents data on the changes in agrarian trade of the Czech Republic with member states of the European Union.

Table 2 Change in values (turnover, export, import and balance) of agrarian trade of the Czech Republic with European Union member states

		2013	2014	2015	2016	2017	Sum (13-17)
Turnover	Mill. USD	15,098	15,612	14,623	14,897	15,653	75,883
Export	Mill. USD	7,318	7,754	7,325	7,375	7,566	37,338
Import	Mill. USD	7,780	7,858	7,298	7,523	8,087	38,546
Balance	Mill. USD	-462	-105	27	-148	-521	-1 208
TC index	index	94.1	98.7	100.4	98.0	93.6	96.9[1]
No. of sectors with CA	BI	19	18	17	18	18	18[1]
	LFI	18	18	16	16	17	17[1]
No. of sectors with CdisA	BI	27	28	29	28	28	28[1]
	LFI	28	28	30	30	29	29[1]

Source: UNCTAD, own calculations

Note: CA – comparative advantage, CdisA – comparative disadvantage; [1] average

It is important to note that the Czech Republic fails to achieve a positive balance of agrarian trade with the member states of the European Union (exception in 2015). The average Trade coverage index suggests that between 2013 and 2017 the value of export covered 96.7 % of the value of imported agricultural commodities and food products.

The revealed comparative advantage of 46 sectors of agrarian trade of the Czech Republic was evaluated using the mentioned Balassas and Lafay indexes.

Results from the Balassa index analyses suggest that, on average, 18 sectors show revealed comparative advantage and 28 sectors show revealed comparative disadvantage. Between 2013 and 2017 the sectors that consistently exhibited a comparative advantage are sectors 001, 017, 022, 041, 043, 045, 048, 061, 062, 071, 073, 081, 098, 111, 122, 222, 223 and 421.

Results from the Lafay's index analyses suggest that, on average, 17 sectors show revealed comparative advantage and 29 sectors show revealed comparative disadvantage. Between 2013 and 2017 the sectors that consistently exhibited a revealed comparative advantage are sectors 001, 017, 022, 034, 041, 043, 045, 048, 062, 098, 111, 122, 223 and 421. Although there are minor differences, both indices have, in principal, identified the same sectors.

In the period under review, the revealed comparative advantage of some sectors improved, while some sectors decreased in terms of their revealed comparative advantage score. Table 3 presents the BI and LFI values and variations (Δ) between 2013 and 2017.

Table 3 Variation of BI and LFI values between 2013 and 2017, Czech Republic

S	BI			LFI			S	BI			LFI		
	2013	2017	Δ	2013	2017	Δ		2013	2017	Δ	2013	2017	Δ
001	1.77	1.61	*-0.16*	1.73	1.71	-0.02	**057**	0.45	0.35	*-0.11*	-1.29	-1.71	*-0.43*
011	0.19	0.24	*+0.05*	-0.46	-0.69	-0.23	**058**	0.57	0.58	*+0.01*	-0.24	-0.33	*-0.08*
012	0.48	0.37	*-0.11*	-4.36	-4.75	-0.39	**059**	0.22	0.13	*-0.09*	-0.13	-0.29	*-0.15*

016	0.53	0.10	*-0.43*	0.07	-0.13	-0.21	**061**	1.70	1.21	*-0.49*	0.21	0.04	*-0.18*
017	1.13	1.03	*-0.10*	0.36	0.23	-0.13	**062**	2.29	2.21	*-0.08*	0.60	0.47	*-0.13*
022	1.78	1.79	*+0.02*	2.68	2.50	-0.18	**071**	1.48	1.57	*+0.09*	-0.30	-0.20	*0.10*
023	0.20	0.17	*-0.03*	-0.52	-0.61	-0.08	**072**	0.05	0.02	*+0.03*	-0.27	-0.31	*-0.04*
024	0.55	0.53	*-0.02*	-1.14	-1.08	0.07	**073**	1.22	1.04	*-0.18*	-0.48	-0.46	*0.01*
025	0.58	0.45	*-0.13*	-0.22	-0.25	-0.03	**074**	0.71	0.81	*+0.10*	-0.06	-0.03	*0.03*
034	0.53	0.65	*+0.12*	0.41	0.54	0.13	**075**	0.46	0.91	*+0.45*	-0.06	-0.01	*0.05*
035	0.07	0.09	*+0.02*	-0.07	-0.06	0.01	**081**	1.09	1.40	*+0.32*	-0.63	0.15	*0.78*
036	0.02	0.05	*+0.03*	-0.04	-0.01	0.03	**091**	0.14	0.13	*-0.01*	-0.58	-0.48	*0.10*
037	0.34	0.28	*-0.05*	-0.17	-0.18	-0.02	**098**	1.30	1.21	*-0.09*	0.01	0.23	*0.22*
041	3.17	4.10	*+0.93*	2.87	3.06	0.19	**111**	1.27	1.43	*+0.17*	0.18	0.36	*0.18*
042	0.62	0.66	*+0.04*	-0.17	-0.08	0.09	**112**	0.73	0.71	*-0.01*	-0.07	-0.21	*-0.14*
043	1.67	2.90	*+1.23*	0.39	0.54	0.15	**121**	0.33	0.00	*-0.32*	-0.27	-0.09	*0.18*
044	1.06	0.84	*-0.22*	0.29	0.06	-0.24	**122**	2.25	4.18	*+1.93*	1.64	3.46	*1.82*
045	2.06	1.89	*-0.16*	0.18	0.10	-0.08	**222**	2.26	1.22	*-1.03*	1.15	-0.21	*-1.36*
046	0.71	0.74	*+0.03*	-0.08	-0.06	0.02	**223**	4.22	3.13	*-1.10*	0.26	0.17	*-0.10*
047	0.12	0.17	*+0.04*	-0.02	-0.04	-0.02	**411**	0.41	0.29	*-0.12*	-0.23	-0.19	*0.05*
048	1.43	1.44	*+0.01*	0.46	0.81	0.35	**421**	2.16	2.05	*-0.11*	1.61	1.33	*-0.28*
054	0.34	0.32	*-0.01*	-2.54	-2.37	0.16	**422**	0.08	0.13	*+0.05*	-0.17	-0.15	*0.02*
056	0.33	0.32	*-0.01*	-0.51	-0.60	-0.09	**431**	0.51	0.41	*-0.11*	-0.03	-0.16	*-0.13*
BI	Positive sum				19	5.637	**LFI**	Positive sum				22	4.730
	Negative sum				27	-5.318		Negative sum				24	-4.730
	Sum					0.319		Sum					0.0

Source: own calculation

Results from the Balassa index analysis suggest that 19 sectors increased their revealed comparative advantage scores while the scores for 27 sectors decreased. Summation of the variations scores provides an indication of the resultant movement in the revealed comparative advantage scores.

This means that, in the case of the BI the resultant positive variation is 5.637 and resultant negative variation is -5.318. This suggests that total resultant tendency for the included sectors is a positive 0.319.

Results from the Lafay's index analysis suggest that 22 sectors increased their revealed comparative advantage scores while the scores for 24 sectors decreased.

The resultant positive and negative variation when using the LFI is 4.730 and -4.730. The resultant value of zero is expected, due to the theoretical structure of the index. The two indices do not always agree on the changes in revealed comparative advantage that took place in the sectors during the period between 2013 and 2017 (there is disagreement in 13 of the 46 sectors).

3.2 Trade Specialization Patterns: Over-time Analysis

The Galtonian regression was calculated and applied as a quantitative technique to assess changes in trade specialization patterns. The Galtonian method is the linear simple regression with respect to the two cross-sections of two different time periods of RCA indices scores. The question was whether there is divergence or convergence in trade specialization patterns. To have a preliminary idea of distributions of the two indices, we examine the histograms of each index of both time periods 2013 and 2017 (in Appendix; figures 1,2,3,4).

The table 4 presents descriptive statistics of average values of both RCA indices of 46 sectors in 2013 and 2017.

Table 4 Descriptive Statistics of RCA Indices (averaged over period 2013-2017, Czech Republic)

	BI		LFI	
comparative advantage neutral point	1		0	
upper bound.	+ ∞		+ ∞	
lower bound	0.00		- ∞	
	2013	2017	2013	2017
n	46	46	46	46
mean	0.990204	0.997142	0.00	0.00
median	0.600981	0.688478	-0.064785	-0.069699
min	0.022411	0.001410	-4.35816	-4.74565

max	4.224351	4.175349	2.866764	3.455330
variance	0.816461	1.026507	1.264161	1.522899
s.d.	0.903582	1.013167	1.124349	1.234058
skewness	1.467560	1.631283	-0.737221	-0.416909
kurtosis	2.535904	2.608575	5.547249	5.892369

Source: own calculations

The average LFI index is 0, which corresponds to the theoretical characteristics of the index. The BI index value is greater than median, which implies right-skewness. The empirical distribution of index values reflects their properties in terms of symmetry. LFI (lower bound and upper bound) values are more symmetrically spread around the comparative advantage neutral point (value 0). BI values are not symmetrically distributed. Calculated values of descriptive statistics for both indices appear to have no normal distribution. It is particularly evident from the values of skewness and kurtosis.

In the next step, data normality was tested because of the legitimate use of OLS regression. Kolmogor's Smirnov test was used for testing. The test results are presented in the table (Table 5).

Table 5 Normality Tests for OLS Residuals

	year	K-S
BI	2013	0.20089*
	2017	0.16286
LFI	2013	0.20055*
	2017	0.20875*

Note: * (significant at 5 % level)

Source: own calculations

In the case of the BI index, the data in 2013 showed an abnormal distribution, which is why the data was transformed using a Box-Cox transformation, as is evident from Figure 1 and 2 (in Appendix). In the case of the LFI index, both years appeared to be abnormal and did not even after the transformation of normality (Figure 3 and 4 in Appendix).

Divergence means that the pattern of trade specialization has strengthened due to industries with initial revealed comparative advantage exhibiting an increase in this score, while the score for those exhibiting initial revealed comparative disadvantage decreased. Convergence means the opposite dynamics is taking place. That means the pattern of trade specialization can be considered to have weakened. To interpret the corresponding results the overall changes can be expressed in terms of the regression effect, indicated by ß, and the mobility effect, indicated by R. Both the values of ß, R and α as well as assessment of changes in trade specialization patterns are presented in the table (Table 6).

Table 6 Results of OLS Galtonian Regression

	BI				LFI			
	original scores		transformed scores		original scores		transformed scores	
ß	0,998977	R < ß < 1	1.0096	ß > 1	1.0418	ß > 1	0.778047	ß < R < 1
R	0,890927	diver-gence	0.910714	diver-gence	0.949186	diver-gence	0.937682	conver-gence
α	0,007950		-0.0503		-0.209021		0.244551	

Source: own calculations

The evaluation was made in the case of original data and also in the case of transformed data for both indices. In case of the BI Index, both results (using original and transformed scores) indicate same dynamic - divergence. Different results are available for the LFI index. In the case of original data, the results indicate divergence. In the case of transformed data, the results indicate convergence. It can therefore be concluded that rather there is a divergence in the pattern of trade specialization. It is also necessary to take into reasoning that there was not met the condition of normality in case of LFI index scores in the both years. Also, in the case of BI transformed scores and LFI original scores, ß is higher than 1, but not significantly. Based on the assessment of these results, these results suggest that there was divergence in the pattern of trade specialization of the Czech Republic between 2013 and 2017, but this divergence was rather weak.

4 Conclusions

The aim of the paper was to evaluate changes in agrarian trade specialization patterns of the Czech Republic with member states of the European Union in the last 5 years (period 2013 and 2017).

In the last 25 years, the Czech Republic agrarian foreign trade has been shaped by the restructuring of trade links and by the establishment of strong economic relations towards countries of European Union (EU). This is associated with the expansion of the original EU member states towards Central and Eastern Europe.

The turnover value of the Czech Republic's agrarian foreign trade grew significantly post 2004, when the Czech Republic joined the European Union. As a result of this substantial change, the territorial structure of agrarian trade also changed towards supporting trade relations with member states of the European Union. Within the single market of the European Union, economic relations and the international division of labour (both in the horizontal and vertical contexts of agribusiness value chains/networks) are currently important criteria for shaping the specialization profile in agrarian trade structure of the Czech Republic.

Results from the Balassa index analyses suggest that, on average, 18 sectors show revealed comparative advantage (17 sectors using LFI index). Between 2013 and 2017 the sectors that consistently exhibited a comparative advantage are sectors 001, 017, 022, 041, 043, 045, 048, 061, 062, 071, 073, 081, 098, 111, 122, 222, 223 and 421.

This is in line with conclusions of Smutka et al (2017, 2018) indicating that Czech agrarian exports are dominated by semi-processed and low processed products with low unit values. On the other hand, imports can be characterized by a much higher unit value and a much higher level of processing.

In the period under review, the revealed comparative advantage of some sectors improved, while some sectors decreased in terms of their revealed comparative advantage score. Results from the Balassa index analysis suggest that 19 sectors (analysis of LFI index indicated 22 sectors) increased their revealed comparative advantage scores while the scores for 27 sectors decreased.

Following this analyses, the Galtonian regression was calculated and implemented as a quantitative technique to assess changes in trade specialization patterns. The results suggest that trade specialization patterns are stable with regard to product groups with revealed comparative advantage or disadvantage. Results also suggest that there is a process of (weak) divergence in the trade specialization pattern, meaning the pattern of trade specialization is considered to be strengthened because industries with initial comparative advantage became more pronounced, while those with initial comparative disadvantages became more subdued.

This can be seen interpreted in the way that the structural problems in Czech agrarian trade in terms of its value adding would continue.

Following methodology suggested by Sanidas and Shin (2010), further research can be undertaken on expanding the idea of Galtonian regression (robust regression and the quantile regression) or using other research strategy (kernel density estimation, Markov stationary methods). Further research regarding these topics will be done by authors.

References

Balassa, B. (1965). *Trade liberalisation and revealed comparative advantage*. The Manchester school of economic and social studies, 33, 99-123. Doi: 10.1111/j.1467-9957.1965.tb00050.x

Balassa, B. (1977). *Revealed' comparative advantage revisited: an analysis of relative export shares of the industrial countries*. 1953-1971. The Manchester school of economic and social studies, 45, 327-344, 1977. Doi: 10.1111/j.1467-9957.1977.tb00701.x

Bielik, P., Smutka, L., Svatoš,M., & Hupková. D. (2013). *Czech and Slovak agricultural foreign trade – two decades after the dissolution*. Agricultural Economics Volume: 59, Issue: 10, Pages: 441-453.

Blažková, I. (2010). *Economic Performance Differentiation of the Processing Stage within the Commodity Chain*. Agricultural Economics (Czech), 56(1), 25-31.

Blažková, I., & Chmelíková, G. (2015). *The Impact of Import Competition on the Development of Market Concentration in the Czech Food and Beverages Industry*. In Proceedings from X. International Conference on Applied Business Research ICABR. 1. vyd. Brno: Mendel University in Brno, pp. 129-135. ISBN 978-80-7509-379-0.

Blažková, I. & Chmelíková, G. (2014). *Market Concentration as a Precondition for Higher Competitiveness of the Czech Food Industry*. In Proceedings of the 8th International Scientific Conference INPROFORUM. Investment Decision-Making in the Period

of Economic Recovery,November 6 – 7, 2014. 1. vyd. České Budějovice: Jihočeská universita v Českých Budějovicích Ekonomická fakulta, 2014, ISBN 978-80-7394-484-1.

Burianová J., & Belová A. (2012). *The Competitiveness of Agricultural Foreign Trade Commodities of the CR Assessed by Way of the Lafay Index*. Agris On-line Papers in Economics and Informatics, 4 (4): 27-36.

Ferto, I. (2008). *The evolution of agri-food trade patterns in Central European countries*. Post-Communist Economies, 20(1): 1–10. doi.org/10.1080/14631370701865680

Lafay, G. (1992). *The measurement of revealed comparative advantages*. In: DAGENAIS, M. G. & MUET, P.-A. (eds.) International Trade Modelling. London: Chapman & Hall.

Mach, J., & Hoskova, P. (2016). *Trends in the EU Trade of Dairy Products*. Agrarian Perspectives XXV. Global and European Challenges for Food Production, Agribusiness and the Rural Economy, Proceedings of the 25th International Scientific Conference, 14-16 September 2016, Prague, Czech Republic 2016 pp.175-184 ref.11

Sanidas, E., & Shin, Y., (2010). *Comparison of Revealed Comparative Advantage Indices with Application to Trade Tendencies of East Asian Countries*. Department of Economics, Seoul National University.: http://www.akes.or.kr/eng/papers(2010)/24.full.pdf

Smutka, L., Burianová J., & Belová A. (2012). *The Comparative advantage of Czech Agricultural Trade in relation to the most important trade partners countries in the perion of 2008-2011*. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 60(7): 273-288.

Smutka L., & Burianová J. (2013). *The competitiveness of Czech agrarian trade within the context of the global crisis*. Agriculture Economics – Czech, 59: 183-193.

Smutka L., Rovny, P., Pulkrabek J., & Horska, E. (2016). *Foreign Trade in Sugar (HS1701) and Sugar Containing Products (HS17) - Comparison of the Czech and Slovak Republic during the last two Decades*. Listy Cukrovarnicke a Reparske. Volume: 132 Issue: 7-8 Pages: 234-240.

Smutka L., Maitah M., & Svatoš M. (2018). *Changes in the Czech agrarian foreign trade competitiveness – different groups of partners' specifics*. Agric. Econ. – Czech, 64.

Smutka L., Svatoš M., & Maitah M. (2017). *Changes in Czech agrarian foreign trade competitiveness –different groups of partners' specifics.* Agricultural Economics, 2017. ISSN: 1805-9295. doi.org/10.17221/399/2016-AGRICECON

Svatoš M., & Smutka L. (2012). *Development of agricultural trade and competitiveness if the commodity structures of individual countries of the Visegrad Group*. Agriculture Economics – Czech, 58: 222-238.

UNCTAD: United Nations Conference on Trade and Development [online]. 2018. [01.08.2018], http://unctadstat.unctad.org/EN/

Zaghini, A. (2003). *Trade advantages and specialization dynamics in acceding countries*. Working paper № 249. Frankfurt am Main, Germany: European central bank, pp. 4–15.

Zdráhal, I., & Bečvářová, V. (2018). *Entry into the common market of the European Union in terms of Czech Republic's foreign trade with dairy products*. Acta Universitatis agriculturae et silviculturae Mendelianae Brunensis. 2018. sv. 66, č. 2, s. 605-616. ISSN 1211-8516.

Appendix

Figure 1 Histograms and probability plots for Balassa Indexes in 2013 (original and transformed values)
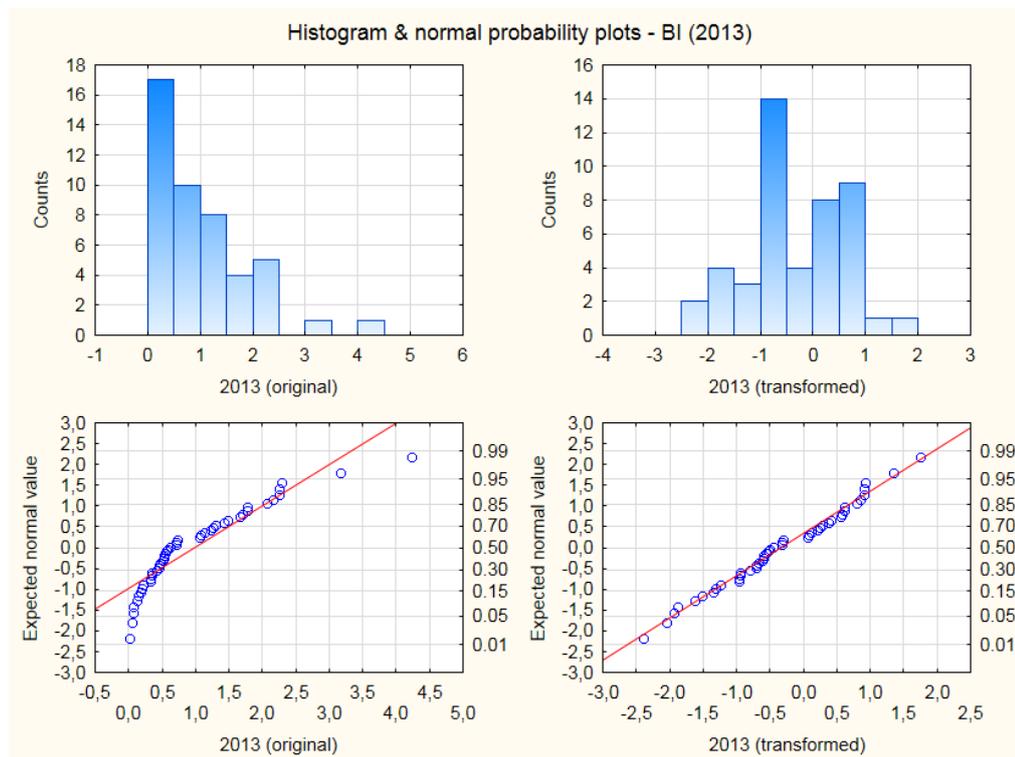
Source: Own processing

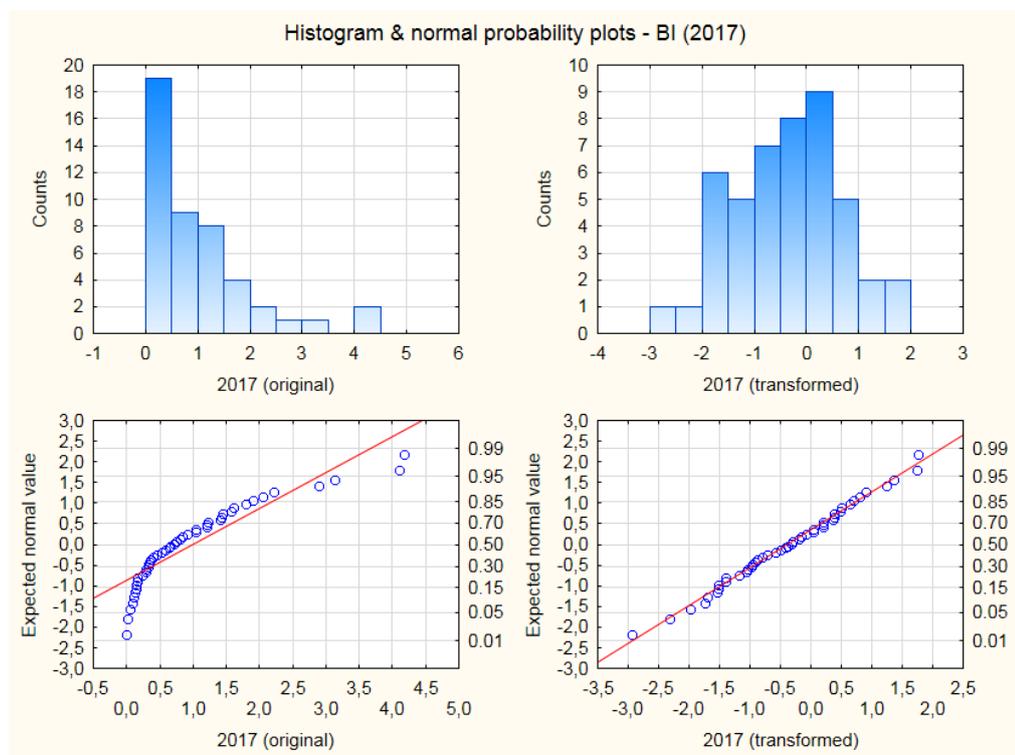**Figure 2** Histograms and probability plots for Balassa Indexes in 2017 (original and transformed values)

Source: Own processing

Figure 3 Histograms and probability plots for Lafay Indexes in 2013 (original and transformed values)
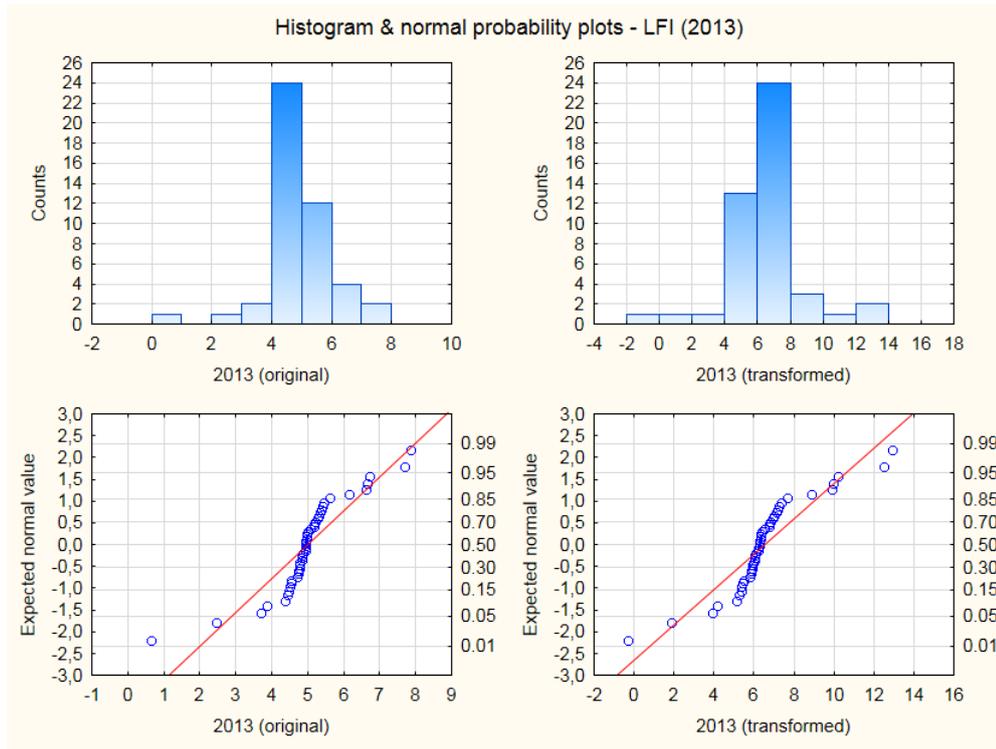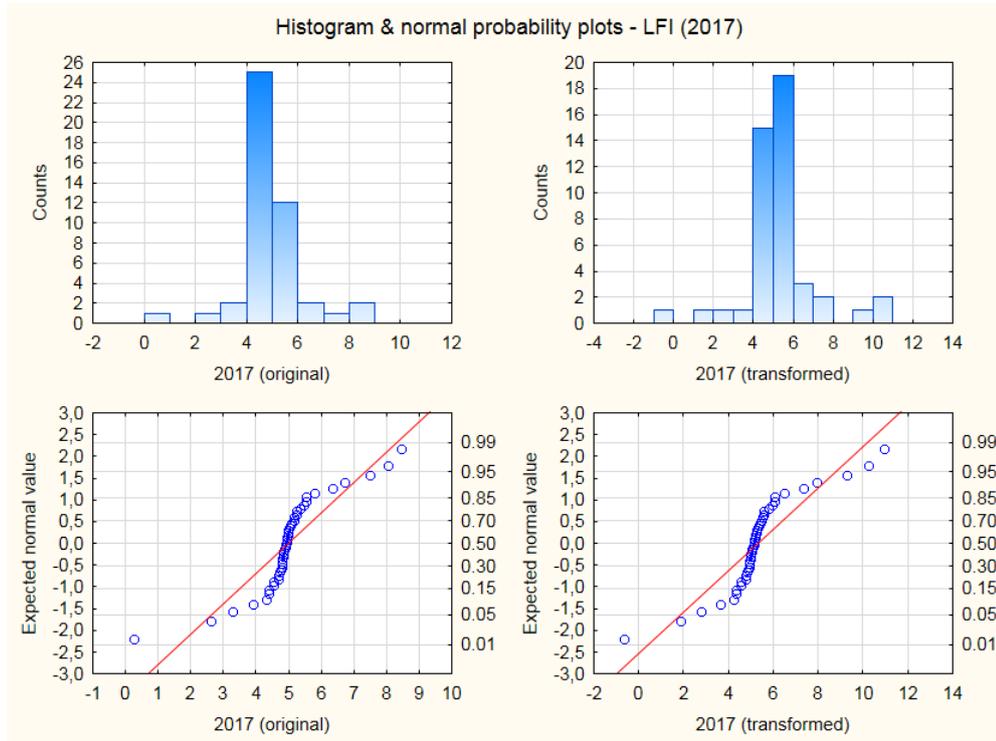

Source: Own processing

Figure 4 Histograms and probability plots for Lafay Indexes in 2017 (original and transformed values)

Source: Own processing

Modelling Relationship Between Sale and Consumer Prices of Curd Cheese in Slovakia

Daniela Hupková, Veronika Mihálová, Ľudmila Dobošová, Zuzana Bajusová, Jana Ladvenicová

Abstract: *Paper examines the relationship between sale and consumer prices in supply chain of the dairy product - curd cheese in the Slovak Republic. Estimation is based on the monthly price data of curd cheese for the period 2000-2017 obtained from the Statistical Office of the Slovak Republic and the Agricultural Paying Agency. We applied the correlation analysis, which confirms that there is a statistically significant dependence between the sale and consumer prices. The regression analysis quantifies scale of changes in consumer prices due to the sale prices change. The paper also shows the development of prices during analysed period, which showed increasing trend, with exception of significant decline in 2009 after the food crisis and also with declines in years 2015 and 2016. In the paper we calculate the average monthly growth of the curd cheese prices confirming increasing price scissors in the food supply chain and the power of subjects on the supply level of the curd cheese supply chain, thereby refuting the curd cheese market perfection in the Slovak Republic.*

Key words: Food supply chain · Prices · Curd cheese · Regression and correlation analysis

JEL Classification: Q02 · Q21

1 Introduction

The milk food supply chain is connecting levels in an irredeemable order, which are involved in distributing dairy products to the consumer. Supply chain is the way of distribution over which come products from the beginning of gaining them in a natural form from a plant or animal source through the milk processors and sellers to the final consumer.

Milk prices monitoring along the supply chain has undoubted reason, which is confirmed by Jansik (2014). Milk is elementary raw material in the dairy process and accounts for 30-60% of the milk process expenses. Therefore, any changes in the producers' raw milk prices have also impact on wholesale and retail prices of different dairy products.

Dudová, Bečvářová (2015) revealed with analysis of dairy products supply chain in the Czech Republic presence of asymmetric price transmissions, with a more obvious transmission of positive price changes rather than negative. They also found that this is a case of the demand-driven behaviour of the commodity chain.

Surprising evidence was provided by Kharin (2018). The initial analysis of the relationship between farmer and retail prices of milk in Russia has denied that there may be long-term cointegration between these prices, which means that prices do not move together. This is a different finding compared to studies submitted by other authors as evidence in western European countries. The causality between farmers and retailers' prices was examined by the Granger test and showed that prices of primary producers replied more strongly and with a longer duration to retail prices changes than retail sales react to changes in farm level prices. This suggests greater retailer power in the supply chain. The asymmetry of transmission confirms market power and the decline in prices at the farmers' level, which is not fully transferred to the next levels of the vertical. This is also due to the higher profit margins of oligopolistic market subjects. The reason of

doc. Ing. Daniela Hupková, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: daniela.hupkova@uniag.sk

Ing. Veronika Mihálová, Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr.A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: xmihalovav@uniag.sk

Ing. Ľudmila Dobošová PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: xdobosoval@uniag.sk

Ing. Zuzana Bajusová, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: zuzana.bajusova@uniag.sk

Ing. Jana Ladvenicová, PhD., Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Department of Economics, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic, e-mail: jana.ladvenicova@uniag.sk

incomplete price transmissions are transaction costs (including communication and transport infrastructure) and trade and other policies.

The buying and selling prices in the raw cow's milk sector in Poland are affected by considerable variability, as indicated by world prices for milk, according to Szajner (2017). This is because dairy industry surpluses are realized on foreign markets depending on the situation on the markets in the world. The supply chain of dairy products is so strongly marked by a considerable degree of asymmetry, despite Poland's attempt to adapt to EU membership. Adjusting the state of the supply chain are seeking to strengthen the position of farmers themselves in relation to retailers and processors.

A study by Rezistis (2018) examined the verticals of dairy products in Finland. Based on it was discovered the asymmetric transmission of skimmed and low-fat milk for a long period, for blue cheese and Emental cheese also. For only a short period this was an asymmetric price transfer of Edam cheese and for short and long period asymmetrically transferring prices were for curd cheese and yoghurt observed. More dairy products have a typical long-term positive asymmetry. As a cause are considered retail market power and other factors such as milk quotas set by the Finnish government or strategic stock management.

2 Methods

The main aim of the paper is to examine relationship between sale and consumer prices in supply chain of the dairy product - curd cheese in the Slovak Republic and to explore the extent and dynamics of price changes for analysed commodity. Price data are obtained from the Statistical Office of the Slovak Republic and the Agricultural Paying Agency and are recorded with a monthly periodicity in the period 2000-2017.

The paper applies correlation analysis to examine the relationship and the power of dependence between the sales and consumer prices of curd cheese. The regression analysis quantifies magnitude of price changes at the consumer level at one percentage change in sales prices. It proceeds from a power model characterized by the equation:

$$CP = a * SP^b$$

where: CP – consumer price of curd cheese
         SP – sale price of curd cheese
         a – locating constant
         b – regression coefficient

The equation after logarithmization is:

$$lnCP = lna + b * lnSP$$

The correlation analysis determined the power of dependence. A correlation coefficient closer to 1 indicates a strong dependence between the sales and consumer curd cheese prices. The determination coefficient expresses how many percent of the consumer curd cheese prices variation the chosen model has allowed to explain by the variability of the sales prices. The higher the values, the more favorable model is, and results can be considered more credible. However, the adjusted coefficient of determination is the preferred criterion because it takes into account the number of observations.

The F-test examines the validity of zero hypothesis about impropriety of selecting the regression model for particular dependence. Test statistic F is calculated for a given model and compared to its table value. If the F value calculated for the model is higher than the table F, a zero hypothesis is rejected and an alternative hypothesis is accepted which claim that the selected regression model is suitable for describing the particular dependence.

The T-test of regression analysis validates hypotheses about regression coefficients. The zero hypothesis on the statistical insignificance of regression coefficients is rejected if calculated T statistic of the model is greater than the table value of T statistics. An alternative hypothesis on the statistical significance of the regression coefficients of the model is then obtained. Interpretation of the point-based regression coefficients of the power model is the expression of the percentage change in the consumer price caused by a one-percent change in the curd cheese sales price.

3 Research results

Curd cheese is one of the final product made from milk and belongs to a group of fresh unripened cheeses. Although it is rich in nutritional value it is consumed in Slovak households at low level. Paper is focusing on sales and consumer prices of the curd cheese supply chain.

Figure 1 Sale and consumer prices of curd cheese in EUR/100 kg in 2000-2017
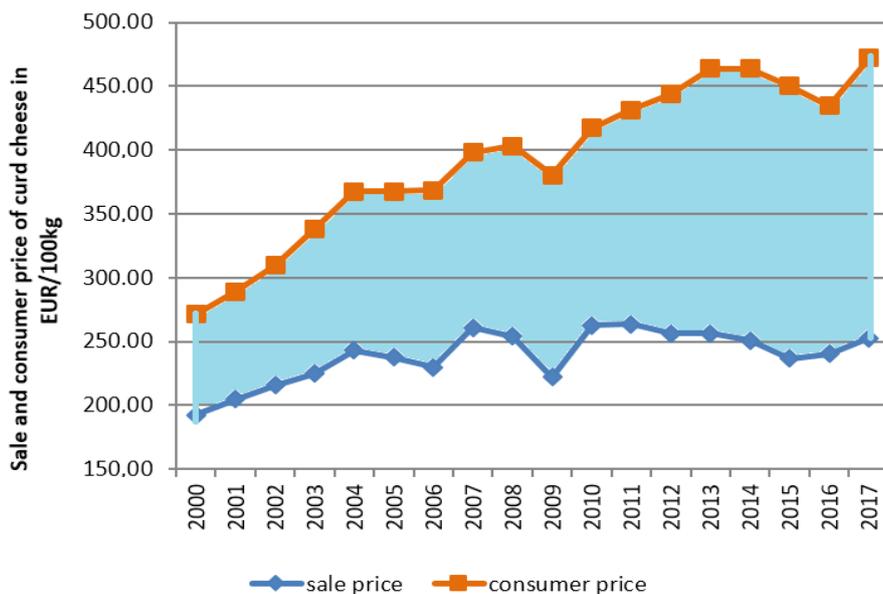
Source: Agricultural Paying Agency, own processing

The figure 1 shows the trend of curd cheese prices on two supply chain levels, specifically at the level of the processor and the consumer. Due to inadequate presentation of the monthly price in the 2000-2017 time horizon, the prices of December are recorded in the chart for each observed year. From the chart is obvious that curd cheese prices have been on the rise since 2000. Significant decline was noticeable only in 2009 and in 2015, 2016. Also the price growth rate is at different levels of the supply chain different.

The following table helps to quantify this occurrence and states that it is a phenomenon of price scissors opening, when the difference between sales and consumer prices increases from one year to the next, which makes the scissors more unfolding. The retail price of curd cheese increase on average for 17-years period by 0.29 EUR per 100kg per month, while the average monthly increase in curd prices on consumer market is 3 times higher, that is by 1.01 EUR per 100kg. Even larger opening price scissors may indicate where the curd cheese supply chain has a price-setting power. It is obvious that in this case consumer is in a weakened position and has no bargaining power.

Table 1 Average monthly price growth in EUR per 100kg

Average monthly growth of sales prices of curd cheese in EUR/100 kg	0.29
Average monthly growth of consumer prices of curd cheese in EUR/100 kg	1.01

Source: Own processing

The retail and consumer price of curd cheese should show a similar pattern over a longer time period, as it is generally assumed that the price at the higher levels of the supply chain is transmitted to lower levels. Of course, there is always a certain gap between the prices of different stages in the chain that should characterize the constant margins. However, the price trend observed over time should be a reflection of price changes at higher vertical levels, so consumer prices should reflect the development of curd cheese prices over the long term. Only a perfectly competitive market would be able to ensure that price changes will be immediately provided and of equal extent. However, reality does not provide us with a perfectly competitive environment for analyses, so asymmetric price transmissions may be anomalies.

The following figure shows whether occurs statistically significant dependency between sales and consumer prices and shows a trend line for the power model with the equation.

Figure 2 Dependency between consumer and sales prices of curd cheese
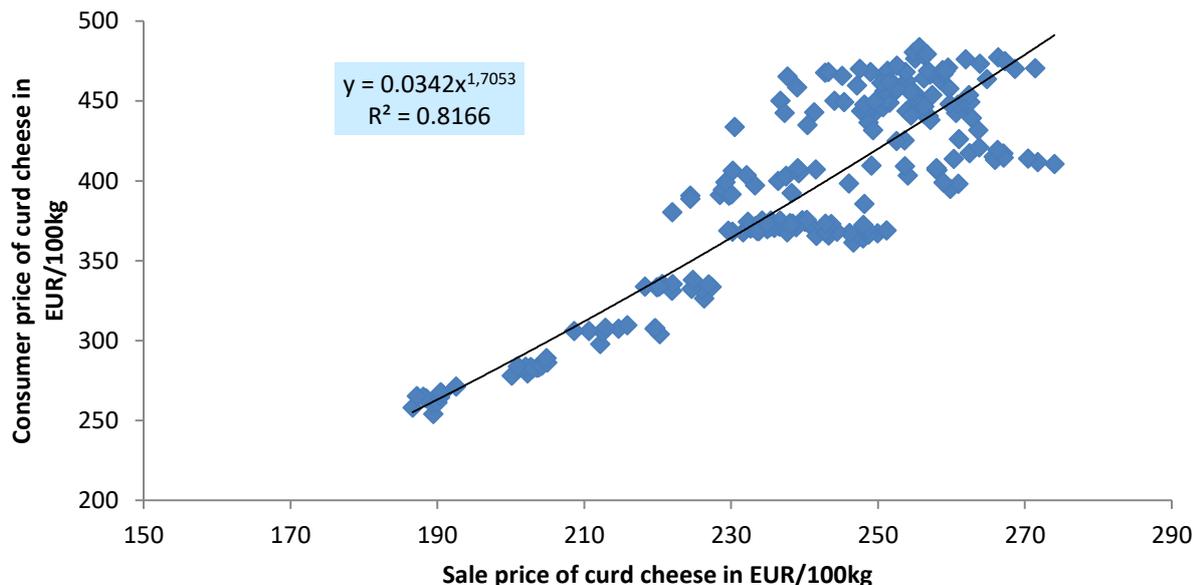
Source: Own processing

Regression and correlation analysis application for applied power model describing the dependence between sales and consumer prices provided us following data:

Table 2 Correlation analysis

Multiple R	0.9036
R Square	0.8166
Adjusted R Square	0.8157

Source: Own processing

The correlation coefficient with its value close to zero indicates a strong dependence between sales and consumer curd cheese prices during analysed period. The adjusted coefficient of determination states that chosen model and independent variable - selling price, explain 81.57% of changes in curd cheese consumer prices. The model therefore has a high ability to express itself.

Table 3 Results of F-test and T-test

F calculated	>	F critical
952.6655		6.7548
T calculated for regression coefficient b	>	T critical for regression coefficient b
30.8653		2.5989

Source: Own processing

The F-test rejects a zero hypothesis and accepts alternative hypotheses that chosen regression model was suitable to describe the dependence between monthly curd cheese sales and consumer prices. The model explains changes in consumer prices of curd cheese with 99% reliability. The T-test also confirmed an alternative hypothesis on the regression coefficient significance. The consumer prices of curd cheese will change with changes in the sale prices on the Slovak market with a statistical significance of 100%.

Estimation of the power model parameters for curd cheese prices:

$$CP = 0.0342 * SP^{1.7053}$$

Based on the estimated regression coefficient we can state that with a 1% increase in the sale price of curd, consumer prices may react with increase by 1.71%. Consequently, as prices rise along the food supply chain of curd cheese, the consumer price increases at a faster rate as the retailers' price increases.

4 Conclusions

The curd cheese as a product of raw cows' milk processing is purchased by consumers on Slovak markets to a lesser extent. This fact is also influenced by the trend of curd cheese prices, which can be monitored since year 2000. Sales and consumer prices are on the rise, with a few more significant declines and at the same time the price scissors occur at the curd cheese market. Average monthly growth of sales prices is 0.29 EUR per 100kg, while consumer prices monthly increase three times, exactly by 1.01 EUR per 100kg. This fact only confirms opening of price scissors and indicates power of the supply chain of curd cheese, which is localized on the retailers' side. Consumer does not have sufficient bargaining power to influence prices. The Slovak market with curd cheese is a definitely imperfect market. The price transmissions are not fully realized as the increase in the consumer price is higher than the increase in the sales price. The applied regression model determines that the one-percent increase in the sales price may cause increase in the consumer price by 1.71%. Also calculated correlation coefficient at 0.90 confirms the strong dependence between the sales and consumer prices on the curd cheese market. The model also submits that with statistical significance is changing consumer price of curd cheese as a result of sales price changes.

References

Dudová, B., & Bečvářová, V. (2015). The Character of Price Transmission Within Milk Commodity Chain in the Czech Republic. In *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* [online], vol. 63, no. 3, pp. 887-892. **ISSN** 1211-8516 (Print); 2464-8310 (online). DOI 10.11118/actaun201563030887, [Accessed: 02 October 2018].

Jansik C., Irz X., & Kuosmanen N. (2014). Competitiveness of Northern European dairy chains. In *MTT Agrifood Research, Economic Research* [online], Publication 116, ISBN 978-951-687-177-9. [Accessed: 10 October 2018].

Kharin, S. (2018). Price Transmission Analysis: the Case of Milk Products in Russia. In *AGRIS On-line Papers in Economics and Informatics* [online], vol. 10, no. 1, pp. 15-23. DOI:10.7160/aol.2018.100102, [Accessed: 04 October 2018].

Rezitis, A.N. (2018). Investigating price transmission in the Finnish dairy sector: an asymmetric NARDL approach, In *Empirical Economics,* [online], pp. 1-40, ISSN 1435-8921 (online). DOI https://doi.org/10.1007/s00181-018-1482-z, [Accessed: 04 October 2018].

Szajner, P. (2017). Price Transmission on Milk Market in Poland between 2004 and 2017. In *Problems of Agricultural Economics* [online], vol. 353, no. 4, pp. 3-23. Available: https://doi.org/10.30858/zer/84966, [Accessed: 02 October 2018].

Agricultural Paying Agency, Agrarian Trade Information of Slovakia, [online] http://www.apa.sk/mlieko-a-mliecne-vyrobky-1.

The impact of subsidies on the agricultural primary production structure in the Czech Republic

Marie Prášilová, Radka Procházková, Anna Žovincová

Abstract: *Agriculture is a multifunctional sector and is of great importance for the whole of society and has cross-overs to other sectors. Thanks to its primary function – production of foodstuffs - it occupies a strategic position among other sectors of national economy. More than a half of the Czech Republic area serves the agricultural purposes. The area really employed in growing agricultural crops (without permanent crops) has in the CR been significantly reduced. The species diversity of crops is changing. This results from a decrease in the total area and changes in the structure of crop areas. Czech agriculture is supported from the EU funds and by domestic support granted from national sources. The EU has not established equal conditions for all the member states. According to some experts hence in an extreme case even a paradox can arise that, structure of subsidies by the type of agriculture will lead to such a situation when the production of products currently restrained will be stimulated. The article is analyzing impacts of subsidies on the agricultural primary production in the Czech Republic. The solution is based on available data sources of the CR Ministry of Agriculture, State Agricultural Intervention Fund, Czech Statistical Office and Czech Office for Surveying and Cadastre. Based on time series correlation of selected agricultural primary production indicators, the impacts of the EU Common Agricultural Policy over the 2005-2017 period upon the specific dimensions of sensitive sectors of Czech agriculture have been specified .*

Key words: Agriculture · Subsidies · Common Agricultural Policy · Correlation

JEL Classification: C22 · E27 · Q14 · Q18 · Q24

1 Introduction

The EU Common Agricultural Policy (CAP) keeps trying to set up a European agriculture model with an emphasis on multifunctional agriculture development. Subsidies are the instrument for agricultural policy promotion in the EU member countries´ specific natural and economic   conditions. On the one side subsidies are aimed at the agricultural production, but at securing maintenance and creation of the landscape, and at further environmental services and non-agricultural activities, too. A deeper interconnection of agriculture with the recovery and development of the countryside is becoming increasingly important. Czech agriculture is supported from the EU funds and by the domestic support paid from national resources. Through the CAP reform payments have been relocated to the multi-component model in which the basic element is the so-called fundamental payment. While so far Czech farmers have known the SAPS (Single Area Payment Scheme) only, in the new setting for the 2014-2020 period the direct payments have been expanded by other components, some of these obligatory, some optional by the country´s decision. At that, the possibility of SAPS preservation was one of the main requirements by most of the new EU member states during the discussion on the reform and based on this it has been embedded in the legislation. The CR Ministry of Agriculture chose the way of going on in the SAPS payments as it has been used so far, up to 2020. Direct payments account for the largest share of money earmarked for agricultural subsidies (SZIF, 2017). Apart from the SAPS and the payments for greening also the payment to young farmers belongs to direct payments, as well as the voluntary support tied to production (until 2014 the special supports according to Article 68 of the EU Council Regulation No. 73/2009) aimed at sensitive sectors (protein crops, sugar beet, potatoes for consumption and starch potatoes, hops, meat-type calves and ewes, eventually goats grazed on grassland, cows bred in a system with market milk production, fruit and vegetables with high and very high labour intensity). At

doc. Ing. Marie Prášilová, CULS Prague, Faculty of Economics and Management, Department of Statistics, Kamycka 129, 165 21 Prague 6 – Suchdol, Czech Republic, prasilova@pef.czu.cz

Ing. Radka Procházková, CULS Prague, Faculty of Economics and Management, Department of Statistics, Kamycka 129, 165 21 Prague 6 – Suchdol, Czech Republic, prochazkova@pef.czu.cz

Ing. Anna Žovincová, CULS Prague, Faculty of Economics and Management, Department of Statistics, Kamycka 129, 165 21 Prague 6 – Suchdol, Czech Republic, zovincova @pef.czu.cz

the same time farmers in the Czech Republic can ask for temporary domestic support from national resources. Within it the applicants so far could obtain subsidies for farmland, hops, starch potatoes, ruminants, sheep and goat breeding, breeding cows for meat. The largest group of support subsidies was represented by subsidy programmes based on the Principles of Conditions for granting subsidies for each given year. Another group of supports has been represented by other national supports by institutions of the Department of Agriculture and other Departments. In particular these are the supports paid from the infection fund, credit assistance and also expenses for the so-called general service (i.e ‚research, service activities, Ministry of the Environment programmes, land adjustments and other). A significant group of supports was set up by the supports granted through the PGRLF (Farmer and Forester Support and Safeguard Fund, Podpůrný a garanční rolnický a lesnický fond, in Czech), in the subsidies for credit interest, first of all from its investment programmes. The PGRLF also grants a considerable support from the „Insurance Support" programme. Since 2013 also land purchase support has been granted (Ministry of Agriculture, 2017).

Střeleček et al. (2009) are commenting that, the Common Agricultural Policy has been introduced aimed at securing an adequate quality of life to the farmers and preserving the European heritage. The cost of its implementation made it 40 % of the EU budget. The EU has not set equal conditions for all the member states. Hence a paradox can be caused by the fact that, the structure of subsidies by the type of agriculture will lead to stimulation of production of such products that are currently restrained. The difference in subsidies in comparison with the biggest producers having a similar farm production structure, is significant for the Czech Republic and it can be compared with a SAPS increase by 75 %. Employing the Stochastic Frontier Analysis *Quiroga et al. (2017)* have examined the impact of the current subsidy programme categories on the efficiency and environmental sustainability in agricultural primary production. Decision by farm management concerning use of the fertilizers purchased from the EU agroenvironmental programme support affects, according to *Laukkanen, M. and Nauges, C. (2014)*, the loading of land and correct fertilizer use. Connections between the farm size, European subsidy and farm performance in the conditions of Slovenia have been studied by *Bojnec, Š. and Latruffe, L. (2013)*. From the study by *Helming, J. and Taubeau, A. (2018)* some recommendations are obtained as to the agricultural policies effects assessment. The authors have employed the Computable general equilibrium model and the Partial equilibrium model to this end. The results are showing that, policy makers should consider very carefully the benefits and disadvantages of both the direct and indirect effects of the subsidy upon farm economics, land use, environment and regional development. *Prášilová, M., Procházková, R., and Hloušková, Z. (2016)* have studied the position of agricultural sector and changes in the production environment in detail. *Pletichová, D. and Gebeltová, Z. (2015)* have assessed the connections between changes of the land quality and selected subsidies, aimed primarily at efficient land use and lasting production potential sustainability. Correlation analysis and comparison method have been employed in the research. A relationship between the amount of subsidies paid (SAPS and TOP-UP, AEO, LFA) and change of production potential of land has not been confirmed. A statistically significant relationship has been found between the land quality change and the NATURA 2000 subsidies.

2 Methods

2.1 Data source

Statistical analysis has been based on available data sources of the CR Ministry of Agriculture, State Agricultural Intervention Fund, Czech Statistical Office and Czech Office for Surveying and Cadastre (statistical yearbooks on the land fund). For the analysis proper, time series of selected agricultural crops sowing areas have been used, of livestock numbers, of land areas by species and subsidies paid, over the 2005-2017 period. Computations have been performed in the STATISTICA software, version 13.

2.2 Time series correlation

When studying relationships between time series of the indicators assessed, an assumption is in power that, these can be described by an additive model, i.e., each time series can be expressed as the sum of regular and irregular components. In the assessment of a causal relationship between the variables, the method of relationship tightness measurement can be used, between the random components series, i.e.,the series cleaned of the trend, or from the seasonal component eventually. Through establishment of residual deviations – deviations of the empirical values from the trend-smoothed values of both the time series studied (of the X indicator and the Y indicator)

$$e_x = x_t - x_t' \quad \text{a} \quad e_y = y_t - y_t' \;, \tag{1}$$

where $x_t' = f(t)$,

     $y_t' = f(t)$, $t = 1, 2, ..., n$

it can be verified whether the e_x and e_y deviations are arranged in time on random basis, or the autocorrelation exists between them. If by applying a test an insignificant autocorrelation is found, i.e.,the time series residuals are not correlated, it can be concluded that the $y'_t = f(t)$ function chosen is describing the time series trend properly. The correlation tightness of two indicators´ time series can be measured by the correlation coefficient, using residual deviations $e_x = x_t - x'_t$ a $e_y = y_t - y'_t$ ($t = 1, 2, ..., n$). As *Hindls et al.(2000)* have stated, the correlation coefficient is established using the formula:

$$r_{e_x e_y} = \frac{\sum_{t=1}^{n} e_x \cdot e_y}{\sqrt{\sum_{t=1}^{n} e_x^2 \cdot \sum_{t=1}^{n} e_y^2}} \tag{2}$$

3 Research results

The separate member countries have an amount of the so-called national envelope allocated by a European regulation. The CR Ministry of Agriculture has stated that, for the Czech Republic the envelope of direct payments has been allocated for the current period on average at almost 24 billion CZK (875 mill. EUR). From this amount the funds have to be subtracted, transferred over the 2015-2019 years into the Countryside Development Program budget, and also 15 % of the money destined for support of sensitive commodities, the so-called voluntary support tied to production, detached (see Figure 1).

Figure 1 Direct payments in CR agricultural primary production by sources (%) in 2005-2017
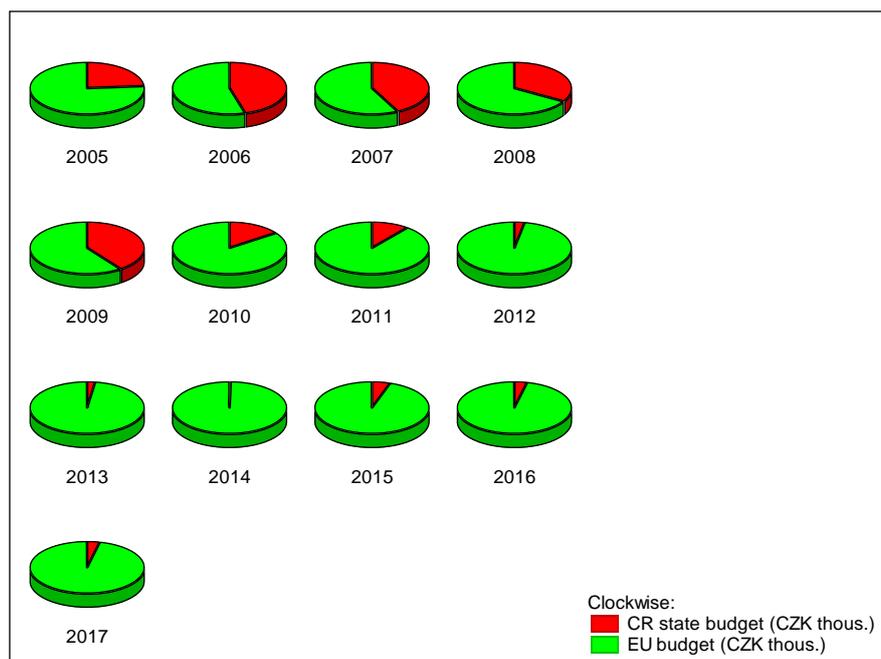
Source: SZIF, own processing

Next the funds aimed at support of young farmers have to be subtracted from the direct payments basic envelope, what makes it 0.2 % of the envelope by an estimate, and a new significant component of direct payments in particular, aimed at greening, making it 30 % of the envelope, too. The resulting part represents the basis for SAPS payments. According to preliminary estimates, over the 2015-2020 years there will be an envelope at about 12.7 bill. CZK (463 mill. EUR) available annually for the SAPS payments, what corresponds to an amount of about 130 EUR/hect. The specific SAPS rate in CZK per hectare over the separate years will depend first of all on the numbers of applications for payments, eventually numbers of hectares eligible and on the development of exchange rate of CZK/EUR. To the 130 EUR/ha rate given above, other direct payment components will be added in case of certain conditions fulfilled, e.g., obligatory greening satisfied (see Figure 2).

Figure 2 Development trends of direct payments in CR in 2005-2017 (CZK thous.)
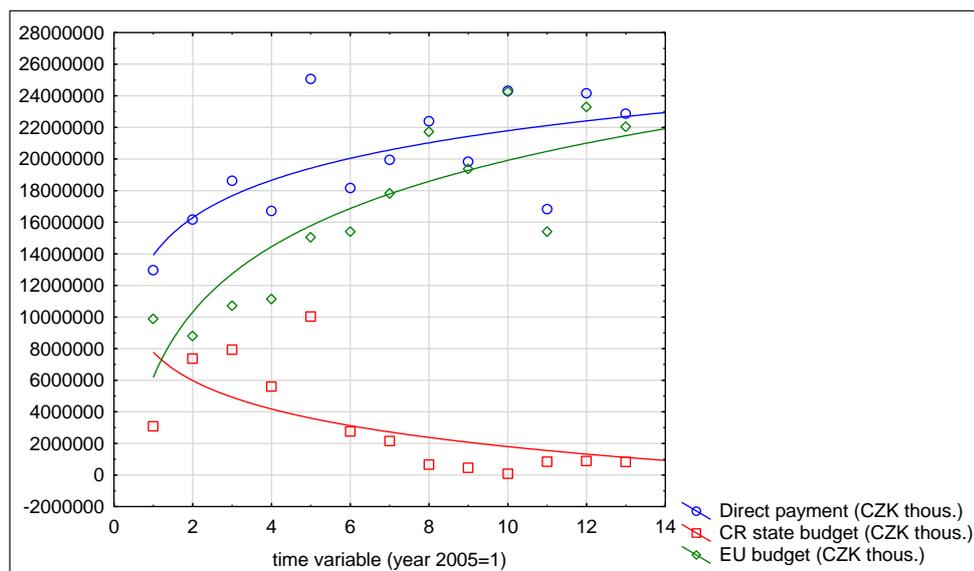
Source: SZIF, own processing

3.1 Direct payments paid and their structure

Direct payments are the most important resource of funds markedly supporting the primary producers in agriculture. Among the direct payments it is the Single area payment scheme (SAPS), Separate sugar payment (SSP), Energy payment (EP, till 2012 only), Separate tomato payment (STP, till 2015) and the National supplement payment to direct support (Top-Up), Temporary domestic support (PVP, since 2014), Greening (since 2015), Young farmer (since 2015), Voluntary support tied to production (VCS, since 2015) and Special support (since 2016) The Temporary domestic support (PVP), formerly Top-Up, enables the new member states to support the sensitive sectors of agriculture. It is exclusively provided from national budget and practically it represents a continuation of the National supplement payments to direct support (see Figure 3). The support is aimed at the sector of ruminants, cows bred in the system without market milk production, sheep and goats bred, hops, starch potatoes and farmland. In order to obtain a subsidy the applicant has to be an active farmer operating on farmland that is registered in the LPIS register in the sense of user relations.

Figure 3 Direct payments structured by the most significant chapters (in %) over 2005-2017
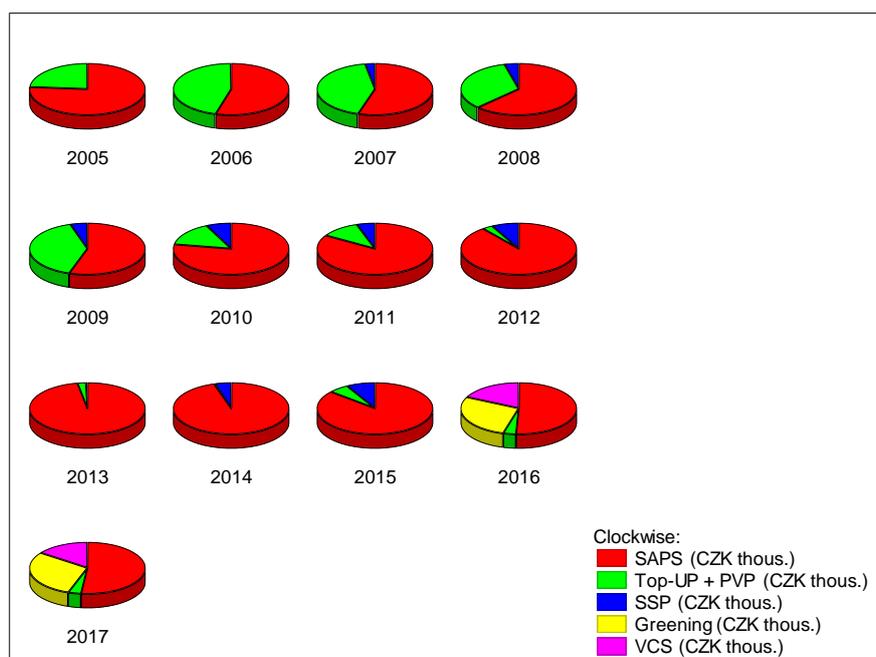
Source: SZIF, own processing

During CR membership in the EU the binding rules for subsidies were being changed after complicated negotiations between the member countries under the Common Agricultural Policy. The Figure 4 reflects this policy from the point of

Czech agriculture realms. The connection of sowing areas and the SAPS subsidies clearly shows the separate periods and the efficiency, at the same time, of impact of the subsidy instruments upon the intensifying factors of agricultural primary production.

Figure 4 Clusters of years (2005-2017) by SAPS funds level and sowing areas in the CR
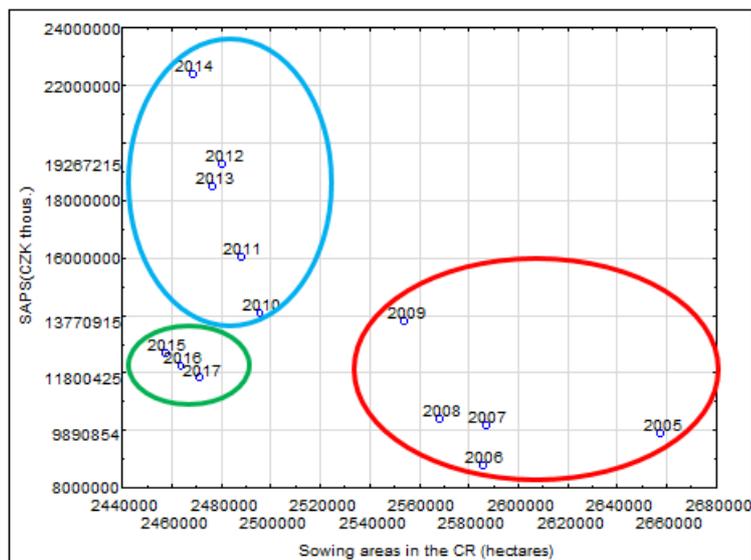
Source: SZIF, ČSÚ, own processing

3.2 Correlation in time series

The Common Agricultural Policy of EU countries aims at being always more competitive and market oriented. At that it is aiming at efficient agricultural production persistence when supporting the sectors or regions that are important from the economic, social or environmental viewpoints and are facing certain problems. Among the sensitive and monitored farming sectors there is growing of potatoes, sugar beet, rapeseed and cattle breeding. While the potato area and cattle breeding recorded a sharp decline since the Nineties, rapeseed as a strategic energy crop shows expanding areas and sugarbeet is a quotaless crop during the new 2014-2020 period only. The correlation coefficient matrix (Tab. 1) shows the impact of the CAP upon specific dimensions of the sensitive sectors of Czech agriculture over the 2005-2017 period.

Tab. 1: Correlation in time series

	Direct payment	SAPS	Top-up	SSP	Potatoes	Sugar beet	Rapeseed	Cattle	Farmland	Arable land
Direct payment	1									
SAPS	0,5017	1								
Top-up	-0,1903	**-0,5809**	1							
SSP	0,0869	0,4614	-0,295	1						
Potatoes	-0,4053	-0,5732	**0,8941**	-0,0542	1					
Sugar beet	0,3316	0,3925	**-0,6871**	-0,3508	**-0,6876**	1				
Rapeseed	0,5340	**0,6859**	**-0,7712**	0,1079	**-0,7983**	0,4349	1			
Cattle	0,0123	-0,5311	-0,0616	-0,4827	-0,1092	0,0708	-0,0532	1		
Farmland	-0,5066	-0,4432	**0,8404**	0,0519	**0,9385**	**-0,6373**	**-0,7961**	-0,3331	1	
Arable land	-0,5016	-0,4158	**0,8330**	0,0800	**0,9325**	**-0,6540**	**-0,7780**	-0,3551	0,9990	1

Source: SZIF, own processing

Note: Statistically significant correlation coefficients are marked in colour ($\alpha=0.05$)

The Table 1 shows strong positive bindings of potato growing dimension with the National supplement payments to direct support (Top-up). The Separate sugar payment did not have a significant impact upon sugar beet area, anyway. The intention to regulate sugar production by means of quotas has been materialized in case of the Czech Republic. Rapeseed and sugar beet are competitive crops against potatoes from the viewpoint of areas. Cattle breeding does not react on domestic payments.

4 Conclusions

More than a half of the Czech Republic area serves to farming purposes these days. The area really employed in farm crops growing (without permanent crops) has been diminishing significantly in the Czech Republic. It results from the decrease of the crops total area. This is no trend of the recent years, but a phenomenon having lasted for decades already. Also the share of agriculture on total GDP shows a falling trend, similar as the development of employment in the sector of agriculture. As *Bečvářová et al. (2010)* give it, the problem lies not in the decrease of the indicators mentioned but in the efficiency of production factors use and permanent diminishing of the sector dimension. As a significant structural change the overbalance of crop production can be taken and expansion of the extensive ways of farming. Over the recent years the arable land area decrease in favour of the permanent grassland has been recorded both at the domestic and European levels. Species diversity of the crops grown decreased in the Czech Republic, farmers retreated from the cultivation of cereals (first of all rye and barley) and technical crops areas are growing, on the other hand. Plant production has been oriented to a greater extent on cultivation of the cost-effective crops, especially rape.

Czech agriculture has been supported from the European Union funds and from the domestic support granted from national resources. After the Common Agricultural Policy reform the payments moved to the multi-component model. The support is currently being aimed at the agricultural production on the one hand, but on securing the services of landscape upkeep and creation and other environmental services as well as on non-agricultural activities,too. Increasingly important appears a deeper connection of agriculture with rural renewal and development. The most important resource of the agricultural primary producers´ funds are the direct payments. Structure of these has been changing over the 2005-2017 years and the decisive share has been kept by the Single area payment scheme (SAPS) throughout. The sensitive sectors mentioned have been supported by the National supplement payment (Top-up) and the temporary supports (PVP, SSP,EP). The amounts of these subsidy titles have been correlated with crop areas and livestock numbers. The solution has shown that, the CAP instruments are dynamic, and they give an impulse for the solution of the primary producer-processor-consumer vertical in the EU space. The National supplement payments from the CR state budget positively affect area increase of potatoes while, on the other hand, the areas of rape and sugar beet are affected by these payments strongly negatively. Both of these crops are competitors by their areas to the sector of potatoes. Cattle breeding does not react upon the domestic payments as seen from the numbers of animals. As *Bašek and Divila (2008)* have given it, the increasing EU support has a positive impact on the economic situation of Czech farmers on the one hand, but on the other hand it can start negative changes in the structure of production and in the relationship of agriculture to natural resources. The behaviour of farming subjects is often orientated more on gaining support than on the market conditions regardless the current production structure.Further reduction of the production capacities is undesirable. Structural imbalance with expressions of negative effects in the landscape form a threat to long-term competitiveness. A functioning, competitive and structurally balanced agrifood sector has an irreplaceable importance for the modern Czech society.

References

Bašek, V., & Divila, E. (2008). Farm structure in the Czech Republic – Today and Tomorrow. In Farms in Central and Eastern Europe – Today and Tomorrow. Varšava. 2008. ISBN 978-83-60798.

Bečvářová, V., Vinohradský, K., & Zdráhal, I. (2010) Development of Czech agriculture in the European context. *DSM Business Review*. 2, No 1, 86-112. ISSN 0975-1998.

Bojnec, Š., & Latruffe, L. (2013). Farm size, agricultural subsidies and farm performance in Slovenia. *Land Use Policy*, vol. 32, 207-217. ISSN 0264-8377.

Budňáková, M.: *Situační a výhledová zpráva půda*. Praha: Ministerstvo zemědělství ČR. ISBN 978-80-7434-252-3.

Helming, J., & Tabeau, A. (2018). The economic, environmetal and agricultural land use effects in the European Union of agricultural labour subsidies under the Common Agricultural Policy. *Regional Environmetal Change*.18 (3), 763-773. ISSN 1436-3798.

Hindls, R., Hronová, S., & Novák, I. (2000). *Metody statistické analýzy pro ekonomy*. Praha: Management Press. ISBN 80-726-1013-9.

Laukkanen, M., & Nauges, C. (2014). Evaluating Greening Farm Policy: A Structural Model for Assessung Agrienvironmental Subsidies. *Land Economics*, 90 (3), 458-481. ISSN 00237639.

Pletichová, D., & Gebeltová, Z. (2015). Evaluation of the Effect of Subsidies on the Production Capability of Land in Selected Regions of the Czech Republic. *AGRIS on-line Papers in Economics and Informatics* , 7 (4), 111-122. ISSN 1804-1930.

Prášilová, M., & Procházková, R. (2015). Long-term changes in production and structure of Czech agriculture and the devices for modelling of future development of these. *Agrarian Perspectives XXIV*, Prague, 347-353. ISBN 978-80-213-2581-4.

Quiroga, S., Suárez, C., Fernández-Haddad, Z., & Philippidis, G. (2017). Levelling the playing field for European Union agriculture: Does the Common Agricultural Policy impact homogeneously on farm productivity and efficiency? *Land Use Policy*, vol. 68, 179-188. ISSN 0264-8377.

Střeleček, F., Zdenek, R., & Lososova, J. (2009). Comparison of agricultural subsidies in the Czech Republic and in the selected states of the European Union. *Agricultural Economics*, 55(11), 519-533. ISSN 0139-570X.

SZIF (2004-2017). *Národní dotace*. (Online). http://www.szif.cz.

Agricultural performance of the Visegrad countries in relation to the Common Agricultural Policy

Katarína Baráthová, Artan Qineti

Abstract: *Accession of the Visegrad countries to the EU in 2004 has brought many possibilities but also challenges for all economic sectors, including the agricultural sector, which has been strongly impacted by adoption of the Common Agricultural Policy. Besides their location, Visegrad countries share similar history and traditions, but on the other hand they also show important differences in initial conditions and the paths they chose to follow. This makes them a natural subject for comparative research. The objective of the paper is to assess the status of the agriculture in these countries after their accession to EU and adoption of the CAP. Using the latest available data, the paper analyses the importance of agriculture in economies of these countries, structure of agricultural holdings and the role of direct payments after the accession in 2004.*

Key words: Agriculture · EU accession · Visegrad countries · CAP · Direct payments

JEL Classification: Q10 · Q13 · Q18

1 Introduction

The accession of Visegrad countries (Czech Republic, Hungary, Poland and Slovakia) to the EU in 2004 brought several changes to the field of agriculture. The biggest one was adoption of the Common agricultural policy (CAP). Before the accession a lot of studies were trying to estimate its impact on agriculture of these states as well as the impact of this enlargement on the EU itself. As Fernández (2002) states one of the greatest challenges for the EU was the extension of the CAP towards Central and Eastern European Countries (CEECs) which include Visegrad countries. In most of these states, agriculture had greater relative importance in terms of GDP and employment than in the other states which had already been members of the EU. Therefore the enlargement was perceived as a big burden for the budget of the CAP. Most studies predicted that the integration of these states into the CAP will encourage their agricultural growth. Liapis and Tsigas (1998) predicted that as a response to potentially higher producer prices under the CAP the average production levels in Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia should increase by 24% in the cereal sector, by 41% in the livestock sector and by 119% in the dairy sector. Frandsen and Jensen (2000) envisaged the general improvement in farm income levels for most CEECs and improvement of their financial position.

After the accession many studies were dealing with the analysis of its impact. Lovec and Erjavec (2012) found that with successful integration, living and working conditions of most farmers in CEECs were not worsened, especially in sectors such as livestock products, grains, fruits and vegetables. Food prices and agricultural production prices increased, but the prices of the raw agricultural products remained relatively low even after the enlargement. Thus, opportunity costs for farmers in CEECs to abandon the agricultural business were considerably increased, which sometimes improved the position of those remaining in business. Bojnec and Ferto (2008) analysed agri-food trade competitiveness of CEECs with the EU-15 and concluded that trade has increased as a result of enlargement, though there have been 'catching-up' difficulties for some countries in terms of price and quality competition. Gorton et al. (2009) identified several reasons why the CAP does not fully fit the region of CEECs. The accession of ten new states to EU in 2004 have significantly increased the proportion of the EU's rural population and CEECs accessions have been qualitatively different due to the number of candidate countries, their socio-economic characteristics, and the historical legacy of socialism. While the share of total employment in the rural areas of the CEECs was over twice that of the EU-15, GDP per capita in these areas was only 40% of the EU-15 level. In most CEECs the big challenge in rural development was the alleviation of poverty. For this purpose the instruments improving education, vocational training, the provision of microfinance and developing

Ing. Katarína Baráthová, Slovak University of Agriculture, Faculty of Economics and Management, Department of Economic Policy, Tr. A. Hlinku 2, 949 76 Nitra, e-mail: xbarathovak@uniag.sk

doc. Ing. Artan Qineti, PhD., Slovak University of Agriculture, Faculty of Economics and Management, Department of Economic Policy, Tr. A. Hlinku 2, 949 76 Nitra, e-mail: artan.qineti@uniag.sk

the non-farm rural economy were needed. But while such instruments could obtain some funding from second pillar, in practice expenditure on them was minor compared with farm-centric measures.

2 Methods

In relation to current debate about the future of the CAP and reform of its instruments, the aim of this paper is to evaluate the status of the agricultural sector in Visegrad countries in the light of the latest available data. The main source of data were Eurostat and The Farm Accountancy Data Network (FADN). Since FADN represents the only source of harmonized farm microeconomic data in EU it enables us to examine the importance of direct payments to farmers' income in each member state. As indicator of income we chose Farm Net Value Added (FNVA). FNVA represents gross farm income decreased by costs of depreciation. It is used to remunerate the fixed factors of production (labour, land and capital), whether they are external or family factors. DG AGRI argues that this income indicator is suitable for comparison between member states, because the share of own and external production factors often differs significantly between member states. Direct payments in our calculations include decoupled payments and total subsidies for operations linked to the production of crops and livestock.

3 Research results

The role of agriculture in a national economy is best characterized by its share in GDP. Generally, all over the world the role of agricultural sector in the national economies is declining and this tendency can be observed also in the V4 countries. Compared to old member states EU-15, agriculture in V4 countries plays a much more important role. Before the accession to the EU, the country with the highest share of agriculture in GDP among V4 was Hungary - almost 5 percent, followed by Slovakia with slightly less than 4 percent. Czech Republic and Poland had same share 3.1 percent of GDP. However after the accession to the EU and adoption of the CAP, there has been declining trend. The worst decline can be observed in Hungary, where agricultural sector today comprises only 3.3 percent of GDP and in Poland where the share of agriculture fell belong 2 percent of GDP, the lowest among V4 countries. It is important to note that decreasing role of the agriculture in economies is not caused only by the CAP but it is general trend.

Table 1 Percentage share of agriculture in GDP in the Visegrad Countries and EU-15

	2000	2004	2008	2012	2017
Czech Republic	3.1	2.3	1.9	2.3	2.2
Hungary	4.9	4.3	3.4	3.8	3.3
Poland	3.1	3.3	2.5	2.7	1.7
Slovakia	3.9	3.6	3.7	3.2	3.3
EU-15	2.2	1.9	1.4	1.5	1.5

Source: World Bank (2018)

Another important indicator of the agricultural performance evaluation is the development of agricultural production. As Figure 1 shows there are significant differences in the development of agricultural output among the Visegrad countries. Poland is country with biggest increase in the value of agricultural output after the accession to EU and also belongs to countries with the highest agricultural output within the whole EU. The development of agricultural output in all Visegrad countries is quite stable, although in 2009 and 2010 all experienced the serious decline caused by the crisis.

Figure 1 Development of output of agricultural industry in billion EUR (at basic prices)
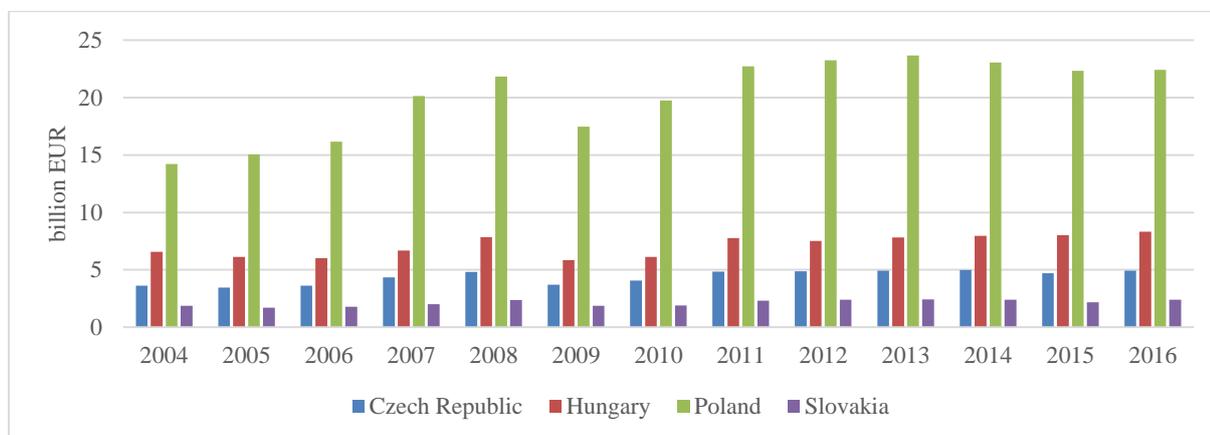
Source: Eurostat (2018)

Looking at the development in relative terms, Visegrad countries were best performing countries of the EU in 2016. The highest increase in agricultural output was recorded in Slovakia (+10.7%), followed by Poland (+4.6%), Hungary (+4.1%) and the Czech Republic (+3.5%). Contrary, the largest fall was registered in Estonia (-19.8%), followed by Latvia (-8.3%), France (-6.5%), Denmark (-5.4%) and Slovenia (-5.2%).

While analysing the development of agriculture in Visegrad countries, in order to reveal the reasons behind different performances it is important to take into account also the underlying factors in the agriculture of these countries. One of these factors is different structure of farms, which however stems from pre-transition economic development of these countries. Unlike in the other Visegrad countries, communists in Poland did not enforce the far-reaching collectivization and thus by the end of 1980s, private farms operated on 77% of arable land and produced 80% of agricultural output (Lipton and Sachs, 1990). However as Fidrmuc et al. (2002) add that due to many restrictions on private farmers, including restrictions on land sales, the Polish agriculture was dominated by small and very inefficient farms (five hectares on average). This structure has not changed very much after 1990 and today the agriculture of Poland is still dominated by small farms. On the other hand agriculture in Hungary and in Czechoslovakia during socialist period was characterized by process of collectivization, when the individual farmers had been forced to join collective farms (Gorton – Davidova, 2001). But in Hungary due to economic reform, agricultural policy gradually included more market oriented factors and rules. After the collapse of communist regimes Hungary and Czechoslovakia embarked to privatization of agricultural production assets and the restructuring of state and collective farms, the process known as de-collectivization. As Mathijs and Swinnen (1998) claim the transformation of state and collective farms has resulted in the establishment of cooperatives, limited liability and joint stock companies, limited and unlimited partnerships, and sole proprietorships. In Slovakia and Czech Republic successor organizations to the former state and collective farms retain large-scale structure. Therefore today in these two states far less land is operated by small farms. Even the EU accession had just a limited impact on farming structures of the Visegrad countries.

Table 2 Number of farms in V4 countries after EU accession

	2005	2007	2010	2013	2016	Change 2005/2016
Czech Republic	42 250	39 400	22 860	26 250	26 530	-37 %
Hungary	714 790	626 320	576 810	491 330	430 000	-40 %
Poland	2 476 470	2 390 960	1 506 620	1 429 010	1 410 700	-43 %
Slovakia	68 490	68 990	24 460	23 570	25 660	-63 %

Source: Eurostat (2018)

Generally for several decades now the whole EU faces downward trend in the number of farms. Since accession to the EU, the rapid decline in number of farms can be observed in Visegrad countries as well, especially in Slovakia, where in 2016, the number of farms was by 63 percent smaller than in 2005. However this radical reductions may be caused by threshold changes for the 2010 Farm Structure Survey. Therefore, it is also important to look at the change in utilized agricultural area (UAA). As Figure 2 suggests the UAA in all Visegrad countries has been relatively stable over the years. Thus, a decline in farm numbers combined with stable UAA means that farms are actually getting bigger. According to data from FADN, farms in Slovakia are the largest in the whole EU with average size 525 ha, followed by farms in Czech Republic, where the average is 205 ha. In comparison with the rest of the EU, these farm sizes are extremely big. On the other hand, farms in Hungary (48 ha) and Poland (less than 19 ha) are much smaller.

Figure 3 Utilized Agricultural Area of Visegrad countries (in ha)
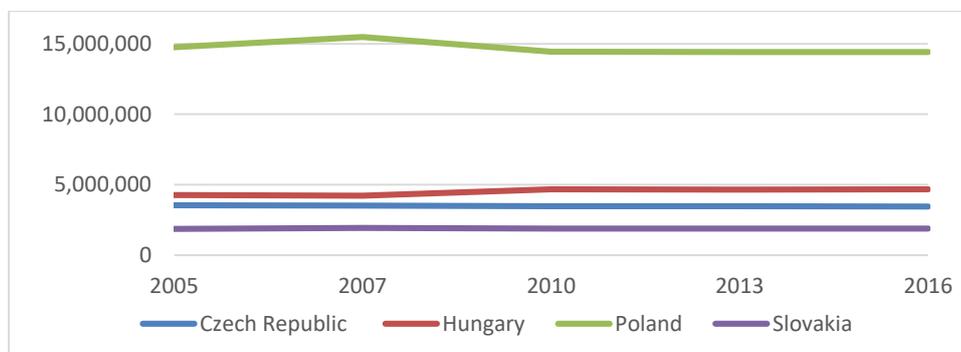
Source: Eurostat (2018)

The adoption of the CAP has led to a substantial increase in support of farmers in most new member states through the system of direct payments. This was a significant change since the level of support in CEECs was very low after the collapse of communism regimes. As stated by Michael (2004) in the run-up to EU accession, the CEECs had progressively

harmonized their agricultural policies with the CAP, but despite that overall support level were much lower than in EU-15. For this reason, CEECs saw direct payments as means indispensable for increasing farm incomes, agricultural competitiveness and production potential. However, while in EU-15 direct payments were provided as Single Farm Payment based on the historical levels of production, for most countries that joined EU in 2004 (except for Slovenia and Malta) direct payments have been phased in through a transitional system named the Single Area Payment Scheme (SAPS), which corresponds to a flat rate area-based payment. Moreover, it was decided that payments would start at 25 percent and would reach 100 percent of the level of payments applied in EU-15 only after ten years phasing-in period (Kosior, 2014). Over the years these differences led to tensions among states because of the major disparities.

Examining the share of direct payments in farmers' income shows their importance for viability of farms. We calculate the share of direct payments to Farm Net Value Added (FNVA) for the whole EU in order to see the relative position of Visegrad countries (Figure 3). In 2016, direct payments on average accounted for 30 % of FNVA in the EU-28, this number was same also in previous two years. The highest proportion of direct payments to FNVA in 2016 was observed in Finland and Estonia (both 75%), followed by Lithuania (64 %). Out of four Visegrad countries, Poland has the highest proportion (47 %), followed by Slovakia (45 %). In Czech Republic this share represents 40 % and in Hungary 36 %.

Figure 3 Share of direct payments to Farm net value added in EU member states, 2016
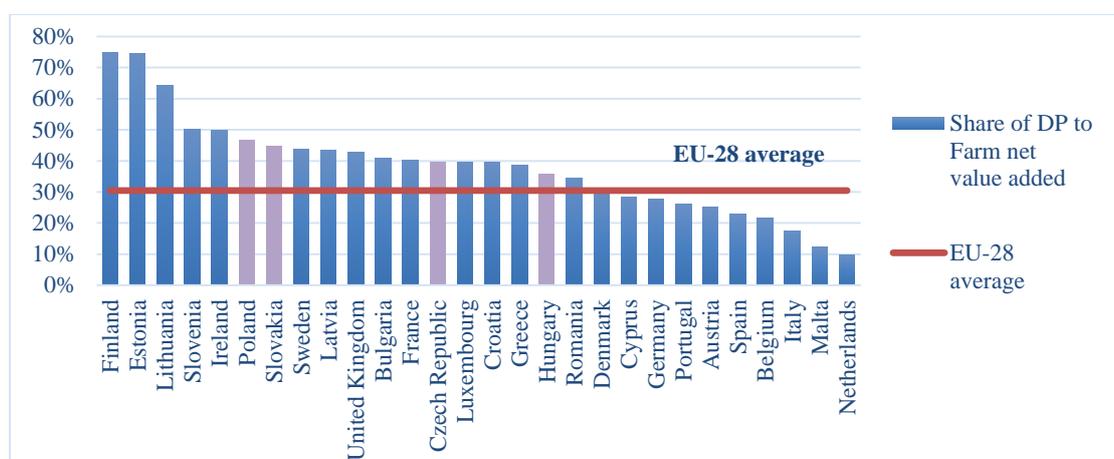
Source: FADN (2018)

In 2016, Slovakia reached the highest FNVA in EU, but 45 % of it were direct payments, which means that without support from EU, the farms in Slovakia would not be so successful. Especially livestock production is very dependent on payments from CAP. Higher proportion of direct payments in V4 countries can be also attributed to the extensive farming practices with relative large areas of land. The country with the second highest FNVA in 2016 was the Netherlands, but direct payment accounted for only 10 % of FNVA. The low share of support from direct payments suggests that the agriculture of the Netherlands was more focused on its highly profitable and less subsidized sectors, such as poultry and pig production and horticulture.

The proportion of direct payments to FNVA also depends on the type of farming, reflecting mainly differences in average farm size. The Figure 5 shows proportion of DP to FNVA in Visegrad countries in 2016.

Figure 4 Share of DP to FNVA in Visegrad countries by type of farming (2016)
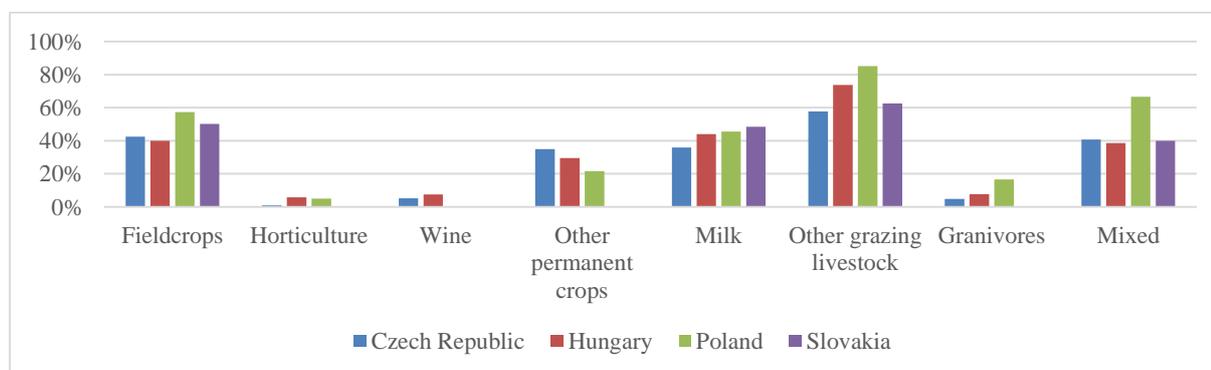
Source: FADN (2018)

In particular, direct payments represent a substantial part of FNVA for grazing livestock in all four countries, the highest in Poland. It is followed by dairy sector, and by mixed and field crop farms mainly because of the average farm

size in these countries. On the other hand, direct payments play only a limited role in sustaining income in the horticulture, wine and granivores sectors in all four countries.

Direct payments have always faced a lot of criticism mainly because of their distribution among farmers. OECD (2011) points out that most support goes to large farms in high yielding areas with incomes above national averages. Hence, direct payments are poorly targeted to low income farms. Swinnen (2009) explains that small farmers are disadvantaged in many ways. Though they are eligible for direct payments, due to the small size and administrative procedures, most of them receive marginal amounts or do not even participate in the system. Criticism of direct payments distribution is especially issue in Visegrad countries. Based on the latest available data from 2016 we can look at the distribution of the direct payments in these states. Analysis of the distribution of direct payments by number of beneficiaries and by amount received is presented in Table 2. Beneficiaries of direct payments are divided into nine classes according to total amount of payments they receive.

Table 3 Distribution of direct payments among agricultural holdings of Visegrad countries in 2016

Beneficiaries and payments received in the financial year 2016		Czech Republic	Hungary	Poland	Slovakia
Total numbers of beneficiaries		28 940	95925	1 349 857	18 269
Total amount paid to beneficiaries (in thousands €)		834 010	179 801	3 339 826	425 430
Beneficiaries receiving	<500 EUR	10.27%	43.59%	28.67%	22.79%
	500-1250 EUR	17.18%	31.22%	27.83%	25.52%
	1250-2000 EUR	10.82%	8.85%	13.36%	11.27%
	2000-5000 EUR	20.69%	9.53%	18.66%	15.78%
	5000-10000 EUR	12.43%	4.19%	7.76%	6.67%
	10000-20000 EUR	9.87%	1.84%	2.78%	4.59%
	20000-50000 EUR	8.50%	0.60%	0.71%	4.89%
	50000-100000 EUR	3.48%	0.09%	0.15%	2.71%
	>100000 EUR	6.77%	0.08%	0.07%	5.80%
Direct aid distributed among beneficiaries receiving	<500 EUR	0.12%	6.64%	3.74%	0.31%
	500-1250 EUR	0.50%	13.05%	9.19%	0.89%
	1250-2000 EUR	0.60%	7.38%	8.57%	0.77%
	2000-5000 EUR	2.32%	15.88%	23.64%	2.13%
	5000-10000 EUR	3.07%	15.64%	21.80%	2.02%
	10000-20000 EUR	4.89%	13.40%	14.87%	2.82%
	20000-50000 EUR	9.07%	9.11%	8.37%	6.72%
	50000-100000 EUR	8.52%	3.51%	4.23%	8.42%
	>100000 EUR	70.90%	15.39%	5.58%	51.43%

Source: calculations based on Indicative Figures of European Commission on the distribution of direct aid (2016)

Very often it is stated that on average in EU, 80 % of the beneficiaries receive around 20 % of the payments (with important differences among Member States). Referring to year 2016, direct payments in Visegrad countries are not equally distributed. In Slovakia, 48 % of farmers received less than 1250 EUR. This suggests that almost half of the farmers receive very low support. In Czech Republic only 28% of farmers receive less than 1250 EUR. However in Hungary and Poland these numbers are more extreme, 75 % and 57 % respectively. But this is mainly caused by the fact that agriculture in Hungary and Poland is dominated by small farms. These numbers does not seem to be so bad. But looking more closely we can see that in Slovakia these 48 % of farmers receive only 1.20 % of the total financial envelope the country has for direct payments. In Czech Republic 28 % of farmers receive only 0.62 % of the total financial envelope. In Hungary 75 % of farmers who receive less than 1250 EUR share together only 19.7 % of total budget of Hungary for direct payments. In Poland, 57 % of farmers receiving less than 1250 EUR, share 13 % of the whole envelope for direct payments. Looking at these numbers from the other side, we can see that in Czech Republic, 6.77 % of farmers receiving payments greater than 100 000 EUR actually consume 71 % of the budget for direct payments for Czech Republic. In Slovakia, this number is also very high, 5.8 % of farmers receiving payments greater than 100 000 EUR actually consume 51 % of the national envelope for direct payments. In Hungary and Poland, the distribution of direct payments is not so extreme.

4 Conclusions

The main objective of the paper was to examine the situation of agricultural sector in Visegrad countries. Same region, common history and entrance to EU at the same time are main reasons why these countries are subject of comparative research. The share of agriculture in GDP is biggest in Slovakia and Hungary (3.3 %), the smallest in Poland – only 1.7 %. Although this share is nowadays lower than in the past, it is still bigger than in old member states of EU. The development of agricultural output over years has been stable, although the crisis brought decline in 2009 and 2010. Data from 2016 show that Visegrad countries are currently best performing states in terms of agricultural output. While these states have experienced significant rise in agricultural output, the rest of EU either stagnates or falls. In order to reveal the reasons behind differences and similarities in performance of Visegrad states we analysed also the background and underlying factors. The structure of agricultural industry reveals the differences between the states. While Poland and Hungary are more dominated by small farms, the situation in Slovakia and Czech Republic is reverse. This is caused by different development during communism and also during transition. Even though it may look like the membership in EU has changed this structure, because of significantly lower numbers of farms after 2010, it is mainly caused by the different thresholds of European Commission for classification of farms. Actually the decline in number of farms in combination with stable UAA suggest that farms are getting bigger. Data from FADN even show that farms in Slovakia and Czech Republic are on average biggest in the EU. In order to see the importance of direct payments in income of farmers we calculated the share of direct payments to Farm net value added. Compared to average of EU-28, this share is higher in all Visegrad countries. Especially in Poland and Slovakia almost half of farmers' income depends on direct payments. Sectors most dependent on direct payments are grazing livestock, followed by dairy sector and by mixed and field crop farms. Long discussed topic in relation to direct payments is their uneven distribution. Our analysis shows that among Visegrad countries the most uneven distribution can be observed in case of Slovakia and Czech Republic. Because the direct payments are received by farmers based on the number of eligible hectares, this distribution is caused mainly by large-scale nature of farming in Slovakia and Czech Republic and by missing medium-scale farming. We can conclude that although in Visegrad countries agricultural sectors still play more important role in economies than in EU-15 states, they are more dependent on support from EU, but due to different farm structure the aid is not fairly distributed.

References

Bojnec, Š., & Fertő, I. (2008). European enlargement and agro-food trade. *Canadian Journal of Agricultural Economics,* 56 (4): 563-579.

Fernández, J. (2002). The Common Agricultural Policy and EU Enlargement: Implications for Agricultural Production in the Central and East European Countries. *Eastern European Economics,* 40 (3): 28-50.

Fidrmuc, J., Fidrmuc, J., & Horvath, J. (2002). Visegrad Economies: Growth Experience and Prospects. Report prepared for the GDN Global Research Project: Determinants of Economic Growth. Centre for European Integration Studies, Bonn.

Frandsen, S. and H. Jensen. (2000). Economic Impact of the Enlargement of the European Union. Analysing the Importance of Direct Payments. SJFI Working Paper no. 15/2000. Copenhagen.

Gorton, M., & Davidova, S. (2001): The international competitiveness of CEEC agriculture; World Economy Vol. 24. No. 2. pp. 185-200.

Gorton et al. (2009). The Folly of European Union Policy Transfer: Why the Common Agricultural Policy (CAP) Does Not Fit Central and Eastern Europe. Regional Studies, 43 (10): 1305-1317. doi: 10.1080/00343400802508802

Kosior, K. (2014). The Impact of Central and Eastern Europe on the Common Agricultural Policy. Romanian Journal of Political Science, 14 (1).

Liapis, P., & Tsigas, M. E. (1998). CEEC Accession to the EU: A General Equilibrium Analysis. Burfisher, M. and E. Jones (eds.), Regional Trade Agreements and US Agriculture. Agricultural Economics Report No. 771. ERS. Washington D.C.

Lipton, D., & Sachs, J. (1990). Creating a Market Economy in Eastern Europe: The Case of Poland. Brooking Papers on Economic Activity 1:1990, pp. 75-147.

Lovec, M., & Erjavec, E. (2012). "Big bang" Enlargement and Common agricultural policy reform. Društvena istraživanja, 1(115): 219–238. doi: 10.5559/di.21.1.12.

Mathijs, E., & Swinnen, J. (1998). The Economics of Agricultural Decollectivization in East Central Europe and the Former Soviet Union. E*conomic Development and Cultural Change,* 47 (1): 1-26.

Michael, J. (2004). Agriculture and EU Enlargement: Seventeenth Report of 2003-2004.

OECD (2011). "The Europeans Union's Common Agricultural Policy (CAP) post-2013." Better Policies for Better Lives. Paris: OECD.

Swinnen, J. (2009). On the Future of Direct Payments. Paper presented at the BEPA Workshop. February 26, 2009, European Commission, Brussels.

Economic productivity of the small and medium-sized food industry enterprises in the South Moravia and the South Bohemia Regions

Eliška Svobodová, Iva Živělová

Abstract: *The small and medium-sized enterprises have an important place in the regional development. They contribute to the competitive environment; to the gross domestic product creation; they have a share on the creation of added value and increase the employment rate. The aim of this thesis is to compare the efficiency of the small and medium-sized food industry enterprises in the South Moravia and South Bohemia Regions, to evaluate economic efficiency of these enterprises and theirs benefits to the economic productivity of the mentioned regions.*

1 Introduction

The small and medium-sized enterprises (SMEs) have and important function role in the economic production of the region. They are taken as the economic development power. They create the competition area, contribute to the creation of the Gross Domestic Product (GDP), increase the employment rate, have a share on the creation of the added value, they can more flexibly react on the demand changes than bigger companies, they also influence the balance of payments in the Republic, because the SMEs have a share on the export and realize also other important roles. The SMEs can realize their activities in different spheres of the national economy. In this case there is necessary to take in account, that the character of the region influences the activity or the location of the enterprises.

The aim of the theses is to compare the economic productivity of the small and medium-sized food industry enterprises in the South Moravian and South Bohemian Regions and to evaluate the benefits of these enterprises on the economic efficiency of the mentioned regions in the years 2013 – 2016.

2 Methods

For the evaluation of the economic productivity in the South Moravian and South Bohemian Regions the data from the Albertina database Czech statistical office and Ministry of industry and trade of the Czech Republic were used. The evaluation was made in the Part C of the CZ-NACE (classification of Economic Activities) – Manufacturing industry, category 10 – Production of the food products, without production of the industry fertilizers. The evaluation period is 2013-2016.

For the evaluation of the economic production of the SME of the mentioned regions there are used the indicators of the financial analyses, namely the indicators of the debt ratio, liquidity, activity and profitability. The linear trend has been used for the prediction of the trends in the time period.

3 Research results

3.1 Small and Medium-sized enterprises in the South Moravia and South Bohemia Regions

South Moravian Region belongs to the regions with significant economic potential. The main position in the region has the industry, namely manufacturing industry. The traditional position in this region has also agriculture. As the increasing part of industry there can be mentioned the building industry and the trade industry including services. The benefit of the

Ing. Eliška Svobodová, Ph.D., MENDELU in Brno, FRRMS, Department of regional and business economics. Zemědělská 1, 613 00 Brno, e-mail: eliska.svobodova@mendelu.cz

prof. Ing. Iva Živělová, CSc., MENDELU in Brno, FRRMS, Department of regional and business economics. Zemědělská 1, 613 00 Brno, e-mail: iva.zivelova@mendelu.cz

South Moravian Region is good transport availability (Živělová 2010). The area of the region is 718 782 ha (31.12.2017), the density of population 164,7 inhabitants/km². The region has seven districts and 673 municipalities. (Czech Statistical Office, Regional time series, ROK).

The South Bohemian region is traditionally known as an agricultural region. Nowadays, the main position in this region has the manufacturing industry. In this region there is the possibility of cross-border cooperation by the business activities with the neighboring EU states. (AKČR, http://www.asociacekraju.cz/kraje-cr/jihocesky-kraj/charakteristika-kraje-2/, ROK). The area of region is 1 005 798 ha (31.12.2017), population 640 196 inhabitants, density of population 63,7 inhabitants/km². The region has seven districts and 624 municipalities. (Czech Statistical Office, Regional time series, ROK).

The main indicator of the economic production of the region is the Gross Domestic Product (GDP). The GDP is the monetary value of the sum of added values of the individual institutional sectors or individual industries in the activities which are according to the European accounts system evaluated as production sectors and are calculated in purchase price (czso.cz). The economic productivity in the South Moravian and also in the South Bohemian Regions in the last 10 years is increasing. You can see the real data in the figures 1 and 2.

Figure 1 Progress of the total GDP (in mld. CZK) and per 1 inhabitant (in thousand CZK) in the South Moravia Region
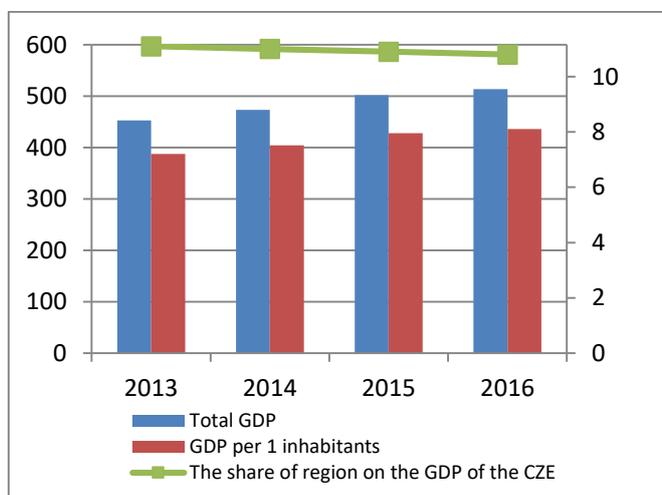
Figure 2 Progress of the total GDP (in mld. CZK) and per 1 inhabitant (in thousand CZK) in the South Bohemian Region
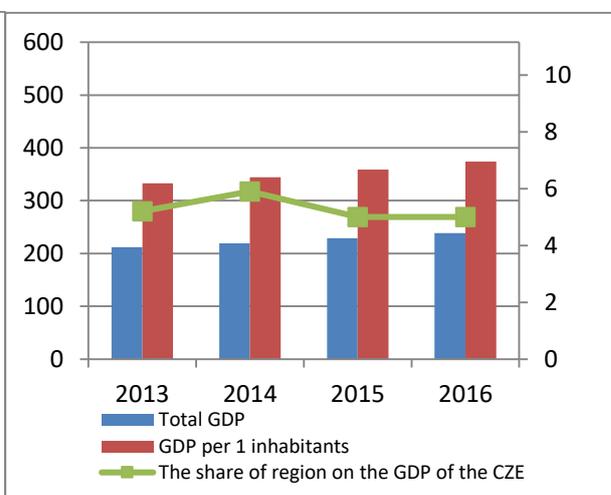
Source: Czech Statistical Office, Public database, Own processing

The Gross Domestic Product in the South Moravian Region, generated by its total amount of CZK 513 666 million in 2016, ranks the region to third position within all the regions of the Czech Republic. The share of the region on the GDP of the Czech Republic was around 11% in the years 2013-2016, but with a slight downward trend. The GDP per inhabitants in the South Moravian region was 436.4 thousand CZK in the year 2016, which is the second highest amount within the Czech Republic. With the population of more than 1,183 thousand is the South Moravian Region on the fourth place in the Czech Republic. Both monitored indicators showed a favorable growth in in the South Moravian Region. .

The South Bohemian Region with a total GDP of 238 620 million CZK ranks to the seventh position of the Czech Republic regions in 2016, GDP per inhabitants reach the value of 1 373.8 thousand CZK per inhabitant, what is the 8th place within the regions of Czech Republic. The South Bohemian Region is on the sixth 6th position in the Czech Republic regions when the numbers of inhabitants are taken to account. The South Bohemian Region had a favorable course throughout the monitored time series, but also compared to the South Moravian Region, it has the same growth rate in the year 2016.

The enterprises which are running their business in the region have the decisive influence on the development of the economic productivity of the region. The Gross domestic product is generated by the companies of different product focus and different size. In spite of the contribution of large enterprises, which are the major contributors of the GDP, the role of small and medium-sized enterprises is indisputable, because of their driving force on economic development and their influence on the main prerequisite for the functioning of the market mechanism, namely the competitive area. The share of small and medium-sized enterprises in the total number of active business entities in the Czech Republic was 99.2% in

the year 2016. The share of value added of the SMEs was 56.2% and the share of SME employees in the total number of employees of the business sphere in the Czech Republic was 59.1%.[2]

The share of the South Moravian Region SME is 12% of the total number of small and medium-sized enterprises in the Czech Republic in the year 2016. The share has been increasing very slowly in the years before 2013, but in the years 2013-2016, the share already shows a steady state.

The South Bohemian Region, in terms of its area, population and total number of business entities, participated in the total number of small and medium-sized enterprises in the Czech Republic in the monitored years by only 5.3%. The share of the small enterprises in this region by the total number of SMEs is around 96%, of which the largest percentage is made by the enterprises with less than 5 employees.

3.2 Economic productivity of the small and medium-sized enterprises in the South Moravia and South Bohemia Regions

The manufacturing industry has a longtime tradition in the Czech Republic and makes a significant segment of the state's economy. Based on the data of the Ministry of Industry and Trade, the dynamic development of the manufacturing industry confirms its share on the creation of gross added value and employment, which reached approximately 27% in the year 2017. The Czech Republic is one of the countries with the largest share of the manufacturing industry in the economy, within the EU-28 countries; it is right behind the Ireland (Panorama of the Manufacturing Industry of the Czech Republic 2017). The manufacturing industry includes various sectors, traditionally, especially in some regions, which have a significant position in the food industry. To this regions belongs also the South Moravian Region and the South Bohemian Region, that the reason why they were selected for the comparison.

In the South Moravian region there were analyzed the data from 176 food industry enterprises. Among these enterprises have an important share the companies focused on the production of bakery and confectionery products; in the processing and preserving of meat, or the enterprises which produce other food products. Other groups of the food industry enterprises have only a small share in the group of analyzed business companies. None of the businesses are involved in processing and preserving fish

In South Bohemia Region there were analyzed the data from 83 food industry enterprises. The higher share of companies focused on the production of bakery and confectionery products; the processing and preserving of meat, or the enterprises which produce other food products. In the South Bohemian Region there was also found one fish processing and preserving enterprise.

For the analysis of the economic productivity of the food industry companies there were used a group of indicators, as was mentioned in the methodology part. These indicators are possible to divide in the groups of indicators for the debt, solvency, efficiency of short-term enterprise assets and profitability.

For the analysis of the indebtedness of SMEs in the South Moravian and South Bohemia Regions were used the indicators of the total debt, debt to equity ratio, interest coverage and debt repayment in years. The average values for selected enterprise sets are shown in tab. 1.

Table 1 Progress of the debt indicators by the selected group of enterprises in the years 2013 - 2016

Indicators	2013	2014	2015	2016
South Moravia Region				
Total debt in %	45,47	42,82	44,43	44,49
Debt to equity ratio	0,86	0,76	0,81	0,81
Interest coverage	10,46	11,32	11,77	17,01
Debt repayment in years	4,40	3,76	3,69	3,44
South Bohemia Region				
Total debt in %	64,74	61,73	60,72	44,34
Debt to equity ratio	2,20	1,56	1,59	0,79
Interest coverage	2,18	13,98	9,74	8,09
Debt repayment in years	11,56	4,99	5,58	3,90

Source: Own processing by using data from the database Albertina

---

[2] Report of the SME development and their support 2016, Ministry of Industry and Trade of the Czech Republic

Debt ratios measure the extent in which the firm is financed by foreign financial resources. The indebtedness affects the profitability of the enterprise, because the use of foreign resources increases the cost of the business (Živělová 2014).

In the South Moravian Region, total indebtedness is below 50% during the reporting period. The value of indebtedness is influenced by the liabilities where tax benefits cannot be used, as by the interest on bank loans. This is reflected in the high values of interest coverage indicators. The debt repayment period in the years is low in the South Moravian region, which indicates a relatively good productivity of the monitored enterprises.

The situation of corporate indebtedness is less favorable in the South Bohemian Region. The share of foreign resources on total assets is higher than 60% in the first three years. The value of indebtedness is, as in the previous case, mainly influenced by the liabilities, which cannot increase business productivity. In 2016, the debt was reduced to 44%, which was caused by the decrease of foreign sources by almost 6 million CZK compared to the previous period, and the value of assets has decreased by less than 500 thousand CZK.

Solvency ratios are an expression of the ability of an enterprise to repay its required liabilities in the required form and at the required venue. The solvency capability is measured by using liquidity indicators, which express the degree of difficulty and speed of conversion of assets to cash. (Režňáková et al., 2010). Indicator values are stated in the tab. 2.

Table 2 Progress of the solvency indicators by the selected group of enterprises in the years 2013 - 2016

Indicators	2013	2014	2015	2016
South Moravia Region				
Current ratio	2,96	2,37	2,08	1,40
Quick ratio	2,43	1,93	1,60	1,11
Cash ratio	0,91	1,38	1,27	0,57
Gross cash flow ratio	17,81	17,92	18,68	18,27
South Bohemia Region				
Current ratio	3,10	2,44	2,16	1,42
Quick ratio	2,43	1,99	1,67	1,12
Cash ratio	0,96	1,44	1,34	0,53
Gross cash flow ratio	17,37	17,62	18,46	17,43

Source: Own processing by using data from the database Albertina

In both monitored regions, the solvency ratios of a selected set of companies are in general-agreed values, indicating a sufficient ability to pay for companies. While the trend of indicator values is declining, it still does not indicate excessive downgrade in solvency. The difference between the indicators of total and quick liquidity does not indicate that companies would have unnecessary inventories which would reduce their productivity. Also the indicators of cash liquidity confirm adequate liquidity. Also the indicator of gross cash flow liquidity shows a sufficient amount of money to cover short-term liabilities.

Indicators of activity are one of the key factors of efficiency, influencing the return on investment capital. It reflects the amount of assets that the company needed to secure its sales (Kislinger 2010). Indicator values are shown in tab. 3.

Table 3 Progress of the efficiency of short-term enterprise assets indicators by the selected group of enterprises in the years 2013 - 2016

Indicators	2013	2014	2015	2016
South Moravia Region				
Inventories turnover period in days	21,21	23,16	25,00	24,37
Turnover time of receivables in days	31,93	31,20	37,18	35,97
Turnover time of short-term receivables from business activities in days	20,30	18,81	19,86	20,83
Turnover time of short-term liabilities from business activities in days	20,89	18,68	20,00	18,73
South Bohemia Region				
Turnover time of inventories in days	31,38	33,81	30,02	33,73
Turnover time of receivables in days	37,84	32,68	35,72	36,95
Turnover time of short-term receivables from business activities in days	48,40	32,18	47,88	44,09
Turnover time of short-term liabilities from business activities in days	44,09	32,54	35,51	19,10

Source: Own processing by using data from the database Albertina

In both monitored regions, the selected indicators of the activity have reached acceptable values, which indicate the effectiveness of using the most important components of short-term assets, which are inventories and receivables. It can be concluded that companies do not hold a high but reasonable amount of inventory. So the companies are able to respond flexibly on the changes in the demanded amounts for the products. The relation between the receivables turnover period and the liabilities turnover period is acceptable. For the enterprise it is better if the indicators reach the same values, or when the turnover time of the liabilities is higher than the turnover time of the receivables.

Table 4 Progress of the profitability indicators by the selected group of enterprises in the years 2013 - 2016

Indicators	2013	2014	2015	2016
South Moravia Region				
Return on equity in %	7,87	7,87	9,25	10,25
Return on assets in %	5,17	6,20	7,05	7,52
Added value per output in %	18,94	18,80	22,65	24,80
South Bohemia Region				
Return on equity in %	0,98	13,67	13,46	8,17
Return on assets in %	1,97	7,65	7,20	6,67
Added value per output in %	24,88	21,43	32,16	31,24

Source: Own processing by using data from the database Albertina

Profitability indicators measure the overall effectiveness of enterprise management. They are based on the different forms of profit, which is generally accepted as the top indicator of the business efficiency. Profitability indicators include the impact of liquidity, asset management and debt management on the company's profitability. (Živělová 2013). In both regions, the values of profitability indicators are in positive values, which indicate that the production of enterprises is profitable (see Table 4).

Figure 3 shows trends in selected indicators of profitability.

Figure 3 Progress of the profitability indicators in the South Moravia Region
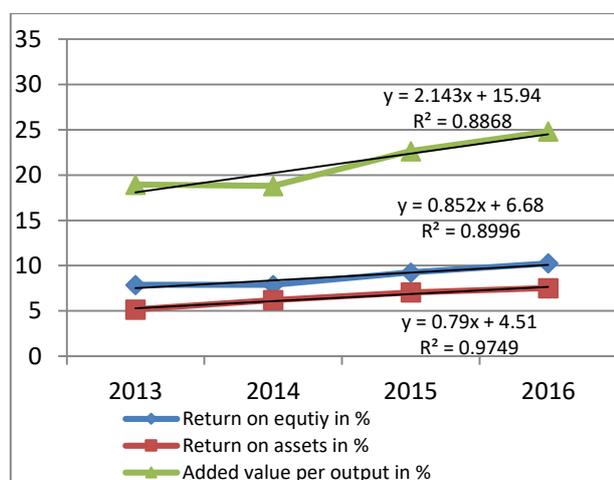
Figure 4 Progress of the profitability indicators in the South Bohemia Region
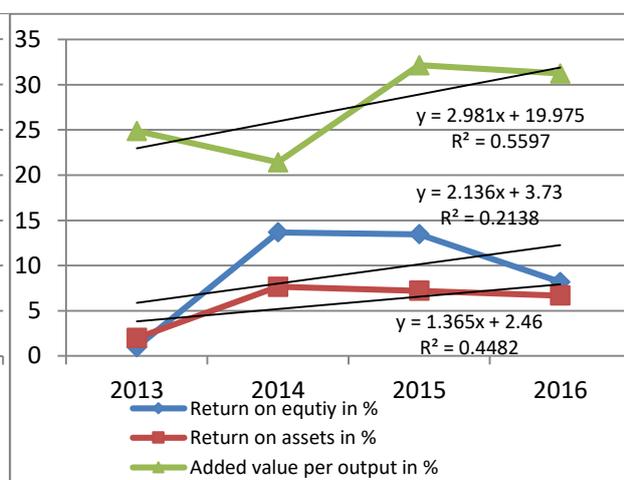
Source: Own processing by using data from the database Albertina

Although the indicators of profitability are positive in the two compared regions, however, the development of values in the time series shows different trends. In the Region of South Moravia the values of all selected indicators of profitability are in the desired direction, because the calculated values increase. These results are corresponding with the average annual growth rates. While maintaining current development trends in the future, development can be viewed positively. In the South Bohemian Region, the trend tends to indicate a decline in return on equity and also in return on assets. In this region, it is necessary to identify the causes of the decline so that measures for further development can be recommended.

4 Conclusions

All the indicators of the South Moravian companies show positive trends. There can be seen the increasing return on the invested capital. Despite the positive development, the return on own and total capital is below the average value of the manufacturing industry. The results of the return on equity in the manufacturing industry are between 12.5% and 15.0%

in the years 2013-2016, return on total capital between 8% and 10%. (Panorama of the Manufacturing Industry of the Czech Republic 2017).

On the other hand, the added value, expressing the relation between the revenues of the outputs and the costs of acquiring individual inputs from external suppliers, gradually reached the values of the manufacturing industry in the South Moravian Region. In 2016 is the added value higher by the evaluated group of enterprises than in the whole manufacturing industry, where the share of value added on outputs reach the value 22%.

In the South Bohemian region, the situation is more favorable in all of the evaluated indicators. Negative can be seen the downward trend in indicators value. The negative development is given by the increasing volume of assets, especially long-term assets, with a decline in the economic results associated with rising costs. The South Moravia Region performs better results than the South Moravian Region in the area of added value measured to output, where the value of the indicator exceeds 31% in the last two monitored years.

The CZ-NACE 10 "The production of food products" includes a number of groups which produce food products, but the result of their activities are different types of products. The economic productivity of the enterprise is influenced by these specific activities of a business. In the selected set of enterprises in the two monitored regions has the highest share the group of enterprises 10.1, processing and preserving meat and meat products, and group 10.7 engaged in the production of bakery, confectionery and other flour products.

The positive impact on the results of the whole group of enterprises CZ-NACE 10in the South Moravian Region has the group 10.1 processing and preserving meat and producing meat products. The pro can be seen in the growth of return on equity, which was 17.74% in 2016, while the return on equity of the whole group of enterprises was only 10.25%. In the case of a group 10.7 the companies involved in the production of bakery, confectionery and other flour products, the impact cannot be treated like positive.

In the South Bohemian Region it is not possible to evaluate the impact of the group (10.1.) the group of enterprises engaged in processing and preserving meat and producing meat products on the results of the whole group of enterprises CZ-NACE 10 like positive. Despite of the relative high return on equity in 2014, reported the group 10.1, in 2016 there was a loss. In the case of a group of enterprises who produce of bakery, confectionery and other flour products (group 10.7.), the average values of the profitability indicators achieved by these enterprises are similar to the results of the whole group 10.

The economic productivity of the enterprises is affected by number of other factors in addition to the field of activity. The analysis of these other factors will be the subject of further research.

Acknowledgement

References

Kislingerová, E. *Manažerské finance*. Praha: C.H. Beck, 2010. 864 s. ISBN 978-80-7400-194-9.

Kislingerová, E., & Synek, M. *Podniková ekonomika*. 6., přepracované a doplněné vydání. Praha: C.H. Beck, 2015. 526 s. ISBN 978-80-7400-274-8.

Mankiw, N G., & Taylor, M P. *Macroeconomics*. 3. vyd. Andover: Cengage Learning, 2014. 451 s. ISBN 978-1-4080-8197-6.

Režňáková, M. *Řízení platební schopnosti podniku*. Praha: Grada Publishing, a.s., 2010. 192 s. ISBN 978-80-247-3441-5.

Sedláček, J. *Finanční analýza podniku*. 2. vyd. Brno: Computer Press, 2011. 152 s. ISBN 978-80-251-3386-6.

Živělová, I. *Vývoj ekonomické výkonnosti Jihomoravského kraje.* [CD-ROM]. In Region v rozvoji společnosti 2010. s. 308--312. ISBN 978-80-7375-435-8.

Živělová, I. *Business Finance*. Brno: Mendelova univerzita v Brně, 2013. 168 s. ISBN 978-80-7375-849-3.

Panorama zpracovatelského průmyslu ČR 2017. Praha: Ministerstvo průmyslu a obchodu, 2018. 218 s. ISBN 978-80-906942-4-8.

https://www.czso.cz/csu/xb/casove_rady.

https://vdb.czso.cz/vdbvo2/faces/cs/index.jsf?page=statistiky.

https://www.czso.cz/csu/czso/statisticka-rocenka-ceske-republiky.

The Structure of Organic Farms´ Financial Sources - Is It Sustainable?

Radka Redlichová , Gabriela Chmelíková, Karel Vinohradský

Abstract: *The paper presents a part of results of the organic farming economic performance research, focused on the development of financial sources between years 2001 – 2016. In this paper the special attention is paid to the regions with less favorable areas (LFA). The method of the research is based on the comparison with conventional farms using the FADN CZ database.*

The total financial revenues for 1 hectare of organic (OF), as well as conventional farms (CoF) have been increasing in the period from 2001 to 2016. The revenues of OF were half compared to CoF in the last year. The financial sources structure development of OF and CoF differed more substantially. The revenues from production contribute to the total revenues of CoF by 80 % and less than 50 % of OF in the second half of the period. In the LFA, where the most OF are located, the contribution of production revenues to the total revenues was only 45 – 50 %.

The paper aims to contribute to the knowledge about the development of financial sources structure of OF, taking into account the higher contribution of OF to the environment (declared by OF), the development of productivity of OF, organic products market and share of state subsidies´ ingerency.

Key words: Organic Farming · Financial Sources · Less Favourable Areas · Regional Differences · State Ingerency

JEL Classification: O13 · Q11 · Q12 · Q13

1 Introduction

Organic agriculture is an alternative way of agriculture production using environmental attitudes of agricultural and food products production. The organic farming technology is focused on permanent care about the soil fertility, proper crop rotation, elimination of chemical fertilizers, plant and animal protection agrochemicals as well as care about the animal welfare. Final products are declared to be health contributed, resp. more contributed compared to the conventional products. The rules for the organic agriculture and organic products production are set by national as well as European legislation, namely The Code No 242/2000 coll. About the organic agriculture, the regulation of European Council No 834/2007 and by its implementing regulation of the European Committee No 889/2008 and No 1235/2008.

Based on the above mentioned European and following national regulations the organic agriculture should fulfill two roles:

- the ensuring of the supply for specific market satisfying the demand for organic products

- the production of public goods contributing to the environmental protection

Lower yield per hectare and higher unit costs that are resulting from the principles of organic agriculture system lead to the lower share of financial sources from the production. The compensation for the organic farmers should be ensured by:

- higher price of organic products on the market

- the state subsidy ingerency corresponding to the higher non-production benefits

The research that is presented in this paper, is following the long-term tendencies of financial sources development. The special attention is paid to the ratio of financial sources from production and state subsidies.

Ing. Radka Redlichová, Ph.D., Mendel University in Brno, Faculty of Regional Development and International Studies, Department of Reginal and Business Economy, Zemědělská 1, 613 00 Brno, e-mail: radka.redlichova@mendelu.cz

doc. Ing. Gabriela Chmelíková, Ph.D., Mendel University in Brno, Faculty of Regional Development and International Studies, Department of Reginal and Business Economy, Zemědělská 1, 613 00 Brno, e-mail: gabriela.chmelikova@mendelu.cz

prof. Ing. Karel Vinohradský, CSc, Mendel University in Brno, Faculty of Regional Development and International Studies, Department of Reginal and Business Economy, Zemědělská 1, 613 00 Brno, e-mail: vinohrad@mendelu.cz

2 Aim and Methods

The aim of the paper is to contribute to the knowledge of organic farms economic development by the evaluation of the financial sources structure in the period between 2001 – 2016. The special attention is paid to the organic farms in the LFA regions and to the difference between organic and conventional farms. Based on these findings the conclusions for agrarian policy will be derived.

The method of the research is based on *comparative analysis* of the OF and CoF datasets, taking into consideration the natural conditions farms are operating in. These conditions are set by the share of the land in the mountain LFA or other LFA. This method is consistent with FADN CZ (Farm Accountancy Data Network of the Czech Republic) administered by the Institute of the Agricultural Economy and Information in Prague.

Data for the research are used from the FADN CZ database that is the part of FADN EU network, using the same methods of data collection and calculation. Data of years 2001 – 2016 were used. In the 2001 the total number of CoF in the dataset was 1166 with the total area of 805333 hectares and 38 OF with the total area of 17638 hectares. In 2016 the number of CoF was 1148 on the total area of 772420 hectares and there was an increase in the OF number and total area to 246, resp. 58667 hectares.

To be able to fulfill the aim of the paper, three indicators dealing with the financial sources were used: *total revenues, production revenues and total costs*. Total revenues consist of the production revenues and the balance of subsidies and taxes. Total costs are based on FADN CZ method and are the sum of production consumption, depreciation, external factors costs (wages, rents, interests) and furthermore are increased by the valuation of the unpaid labor using the average wages for AWU (Awerage Working Unit) in the given year.

The development trends of the above mentioned indicators were analyzed using the trend values. These were calculated based on the regression of the empirical values by second order polynomial function. Therefore, the general formula for this regression could be expressed as: $y = ax2 + bx + c$, where:

y = theoretical value based on the regression function

ax^2, bx, c = quadratic, linear and absolute members with a, b and c coefficients. The polynomials parameters for the indicators used in the charts and tables are available in the research documentation.

The trend values are signed with bold curves in the charts. Thin dashed lines stand for the empirical values.

3 Research results

The total financial revenues for 1 hectare of organic (OF), as well as conventional farms (CoF) have been increasing in the period from 2001 to 2016. Total revenues increase was faster in CoF (see table 1). Average annual increase for CoF was 1816 CZK/ha, for OF 1284 CZK/ha. At the end of the period the total revenues for 1 hectare of OF were half, compared to CoF.

Table 1 Revenues, costs and profit (CZK/ha)

			number of compa- nies	revenues			total costs
				production	others	total	
OF		2001	38	7 967	3 355	11 322	10 321
		2016	246	15 215	15 325	30 540	27 543
CoF		2001	1166	34 546	1 574	36 119	35 615
		2016	1148	51 556	11 808	63 364	58 428
OF/CoF 2016			x	0,30	1,30	0,48	0,47
LFA	OF	2001	36	7 322	3 339	10 661	9 678
		2016	204	15 029	15 348	30 377	27 469
	CoF	2001	661	32 260	1 788	34 048	33 658
		2016	464	45 639	12 162	57 801	54 606
	OF/CoF 2016		x	0,33	1,26	0,53	0,50

note:
production revenues = revenues from agricultural and other economic activity
other revenues = the balance of subsidies and taxes
total costs = costs adjusted by the valuation of the unpaid labor
Source: FADN CZ, 2018; own calculation

Nowadays, more than 80 % of OF are operating in LFA and they are focused on the cattle breeding using the permanent grasslands. The differences between financial revenues of OF and CoF in the LFA is very similar (see table 1, charts 1 and 2).

Substantially differences between OF and CoF are in the total revenues structure, regarding production and other revenues. Production revenues have contributed to the total revenues of CoF by 80 % and of OF by less than 50 % in the second half of the period, while in the LFA the contribution of production revenues to the total was around 45 – 50 %. Other revenues therefore contribute to the total revenues by more than 50 % in OF, in CoF by 20 %.

The research results, that can be seen in the table 1 and charts, show, that neither in OF nor in CoF *are the production revenues not sufficient to cover all the costs.* At the end of the period were the costs covered by production revenues by 88 % in CoF and by 55 % in OF. The additional sources in the form of subsidies had covered the rest of the costs and allow farms to reach the profitability of revenues of 7,8 % for CoF and 9,8 % for OF.

Figure 1: The development of the financial sources structure – total overview
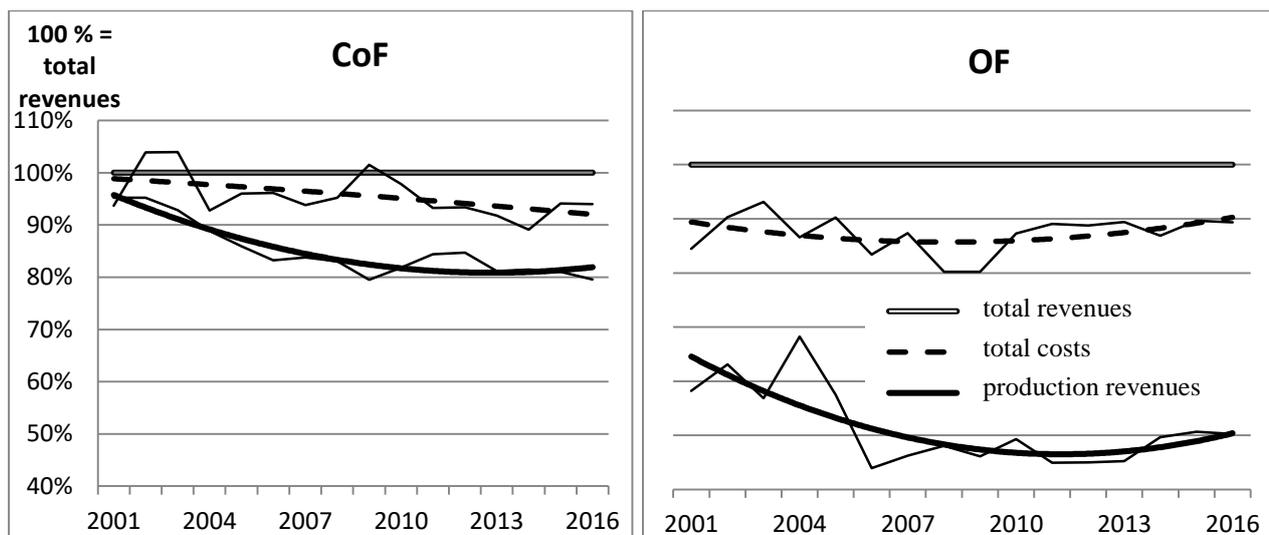
Source: FADN CZ, 2018; Own processing

Figure 2: The development of the financial sources structure in LFA
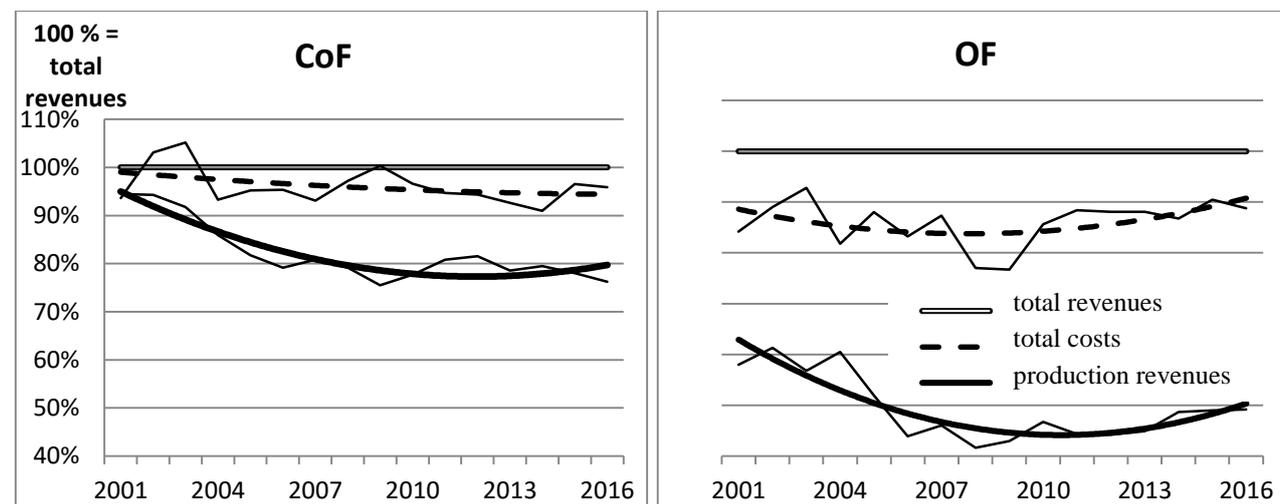
Source: FADN CZ, 2018; Own processing

The above mentioned analysis of the development leads to the question on the causalities. The financial development of both groups of farms was involved by the entry of the Czech Republic to the EU common market and to the conditions of common agriculture policy. Especially the agribusiness formation, competitive environment development and price transmission in the food verticals have changed the conditions of the financial management of the Czech agriculture. This result is supported by the outcomes of Bečvářová, Zdráhal (2013); Goodwil, Hasper (2010); Carraro, Stefani (2011); Svobodová, Bečvářová, Vinohradský (2011); Blažková, Chmelíková (2010); Redlichová (2007). The impact of these changes on the financial situation in the agriculture result in the need of subsidies from the public resources of Eu and

Czech republic in *the share of around 20 % of farmers financial income*, what is the share reached by CoF in the second half of the period under observation.

The reasons for about 30 % higher share of subsidies on the total revenues in the organic agriculture still remain to be explained. Based on the knowledge about the economy of the organic agriculture in the Czech Republic (Redlichová, Bečvářová, Vinohradský (2014); Živělová, Jánský (2007)), in the other EU countries (Nigglet et al. (2008), Sanders (2001); Gassner, Freyer, Laitner (2008)), as well as the knowledge about the Czech organic market development (Hrabalová, Wollmuthová, Hlavsa, Čítková (2014); Hrabalová, Darmovzalová, Wollmuthová (2013); Šejnohová, Hlaváčová, Babáčková (2018)), it is possible to conclude, that *the high share of subsidies on the total financial sources of organic agriculture is mainly the "income compensation" of the disbalance of the organic products market*:

1. The supply of organic products is in the long run higher than the demand. The substantial part of production of organic agriculture (70 – 77 %) is sold on conventional production market.

2. The market prices therefor contribute to the costs coverage with only 55 %.

3. Higher costs of the production unit of the organic agriculture conclude to the lower productivity of this agricultural system. This is given by the level of biotical side of the used technology. In the Czech Republic the level of productivity of organic farming compared to the conventional one is 60 % in case of labor and material costs and 30 – 40 % in the case of land use.

Part of subsidies could be explained like the contribution to the declared *higher benefit of the public goods contributing to the environmental creation*. This benefit should be evaluated keeping in mind that the majority of organic farms are located in LFA focusing on cattle breeding. Similar production orientation has also the majority of conventional farms located in LFA. The programs focused on the grassing were quite environmentally successful in both the groups as well as programs supporting the grassland treatment in the areas threatened by erosion. To the environment protection is in the case of conventional farm contributes also the Cross Compliance systems. These facts support the above mentioned conclusion on focusing the major part of the organic farming subsidies to compensation of the low incomes from organic products sales.

The above mentioned results give also some *stimulus for agrarian policy*. As a main goal of contemporary organic farming could be regarded *the recovery, resp. the establishment of the balance on the organic product market*. One of the steps leading to reaching this goal is, on the supply side, the increasing of the productivity of organic farming through ecofunctional intensification (see Niggli et al. (2008)) and the reduction of the of the extensive increase of the land under organic agriculture. On the demand side the steps leading to the check of organic products quality could be recommended, as well as the action minimizing the market deformations of the price transmission in the food verticals of agribusiness, e.g. also organic products verticals.

4 Conclusions

The financial revenues of OF were around 30 thousand / hectare at the end of the period 2001 – 2016 and were half compared to the CoF revenues. There was quite a difference in the structure of these revenues. In the OF the share of subsidies and taxes balance on the total revenue was more than 50 %, in the CoF 20 %. Similar situation was in the LFA, where the major part of OF is located.

The production revenues have covered the costs by 55 % in OF and 88 % by CoF at the end of the period under observation. The additional sources in the form of subsidies had covered the rest of the costs and allow farms to reach the profitability of revenues.

The higher share of subsidies on the financial sources of OF is mainly the "income compensation" that is caused by the disbalance of the market, mainly by the low demand for organic products and the high level of costs due to low productivity of organic agriculture system. The declared higher non-production benefit of the organic agriculture for the environmental creation is the reason for only lower share of the subsidies.

The question in the title of this paper could be answered: The contemporary structure of the financial sources of Czech OF is sustainable, if the decision makers of the agrarian policy keep the nowadays system of the subsidy practice, probably for the reasons that are out of the economic criterions. From the points of view of economic sustainability of organic farming development, principles of market economy and rational managing of the public finance, the rectification of the policy is necessary, aiming to the creation of balance on the organic market production and the stimulation of increase of the productivity of organic agriculture.

References

Bečvářová, V., & Zdráhal, I. (2013). *Agriculture and Rural Development in the European Model of Agricultural Policy - Shaping Strategy in the Context of Environmental Changes*. Brno:Mendelu, 2013. ISBN 978-80-7375-858-5

Blažková, I., & Chmelíková, G. (2010). Analýza cenových relací v komoditní vertikále. [CD-ROM]. Brno: In *Sborník příspěvků z mezinárodní vědecké konferen*ce Region v rozvoji společnosti 2010. (pp. 13-17). ISBN 978-80-7375-435-8.

Carraro A., & Stefani G. 2011. *Price Transmission in Three Italian Food Chains. A Structural Break Approach*. 2011. Working paper. EAAE 2011 Congress [online]. 2011 [cit.2018-10-25].http://ageconsearch.umn.edu/bitstream/114317/2/Carraro_Alessandro_386.pdf

Gassner, B.; Freyer, B., &Leitner, H. (2008) Labour Quality Model for Organic Farming Food Chains. Poster at: Cultivating the Future Based on Science: 2nd Conference of the International Society of Organic Agriculture Research ISOFAR, Modena, Italy, June 18-20, 2008.

Goodwin, B. K., &Harper, D.C. 2000. Price Transmission, Threshold Behavior, and Asymmetric Adjustment in the U.S. Pork Sector. In *Journal of Agriculture and Applied Economics*. 2000, Vol. 32, č. 3. ISSN 1074-0708.

Hrabalová, A., Darmovzalová, I., & Wollmuthová, P. (2013) *Statistická šetření ekologického zemědělství – Základní statistické údaje 2012*, TÚ 4212/2013. Výstup č. 2 ÚZEI, 2013. online [cit. 2018-11-19]. http://eagri.cz/public/web/file/284641/Zprava_EZ_2012_final.pdf.

Hrabalová, A., Wollmuthová, P., Hlavsa, T., Čítková, Z. (2014) *Analýza vývoje nabídky biopotravin v maloobchodních řetězcích a jejich cen v letech 2009 - 2013*. TÚ 4212/2014 Samostatná příloha ke zprávě „Statistická šetření ekologického zemědělství–Zpráva o trhu s biopotravinami v ČR. ÚZEI. Brno, 2014. online [cit. 2018-11-19]. http://eagri.cz/public/web/file/306464/Analyza_nabidky_biopotravin_2009_2013_priloha_Zpravy_o_trhu_s_biopotravinami.pdf.

Niggli, U., Slabe, A., Schmid, O., Halberg, U., & Schlüter, M. (2008). *Strategic Research Agenda for Organic Food and Farming. Vision for an Organic Food and Faming Research Agenda to 2025*. IFOAM – EU a FiBL. 2008, 46 s. online [cit. 2014 -10 - 12]. Available at: http://www.tporganics.eu/upload/ TPOrganics _VisionResearchAgenda.pdf

Redlichová, R. 2007. *Zhodnocení a komparace ekonomické úrovně ekologicky hospodařících zemědělských podniků.* Brno, 2007. Disertační práce (PhD). MZLU v Brně, Provozně-ekonomická fakulta, Ústav podnikové ekonomiky. 2007-11-1.

Redlichová, R., Bečvářová, V., & Vinohradský, K. (2014).*Vývoj ekologického zemědělství ČR v ekonomických souvislostech*. 1. vyd. Brno: Mendelova univerzita v Brně, 2014. ISBN 978-80-7509-173-4.

Sanders, J. (2007). *Economic Impact of Agricultural Liberalisation Policies of Organic Farming in Switzerland*. Frick: Research Institute of Organic Agriculture (FiBL).

Svobodová, E., Bečvářová, V., & Vinohradský, K. (2011). *Intenzivní a extenzivní využívání přírodních zdrojů zemědělství ČR.* Brno: Mendelova univerzita v Brně, 2011. ISBN 978-80-7375-579-9.

Šejnohová, H., Hlaváčová, J., & Babáčková, J. (2018) *Statistická šetření ekologického zemědělství – Zpráva o trhu s biopotravinami v ČR v roce 2016* , TÚ 4212/2018. Výstup č. 1 ÚZEI, 2018. online [cit. 2018-11-19]. dostupné z: http://eagri.cz/public/web/file/580754/Zprava_o_trhu_s_biopotravinami_2016.pdf.

Živělová, I., & Jánský, J. (2007). Subsidies for the organic agriculture. *Agricultural Economics*, 53(9), 393-402.

SESSION

MATHEMATICAL-STATISTICAL MODELLING AND OPTIMIZATION IN PRACTICE

European Insurance Market Analysis: A Multivariate Clustering approach

Stavros Athanasiadis, Tomáš Mrkvička

Abstract: *Clustering has been proved to extract valuable information resided in complex and massive data sets. Motivated by this evidence, this paper is aimed to provide a multivariate clustering of European insurance market in terms of the insurance penetration curves of European countries. Yet, at the same time, this clustering is provided through two different cases, where the first case considers only the magnitude (size) of these curves, and the second considers only their shape. In this paper, two partitional clustering methods are utilized, k-means and Gaussian mixture model, with two distance measures, the Euclidean and Mahalanobis distance, respectively. Both clustering methods form clusters within a sample of 34 European countries observed between 2004 and 2016; that is before, during and post-financial and sovereign debt crises. The clustering solutions also reveal the extent to which the employed clustering methods and distance measures are being able to capture the distinctive properties of the original curves as depicted during the period under examination.*

Key words: Insurance · Insurance penetration · Partitional clustering methods · Distance measures

JEL Classification: C38 · G22 · O16

1 Introduction

The recent financial and sovereign debt crises have been a challenge for insurance undertakings and subsequently for insurance markets. In particular, European insurance market had to face the decreasing level of insurance consumption of both insurance activities (life and non-life). In addition, it seems that insurance consumption may vary not only according to external factors like macro and socio-economic conditions, but also according to factors specific to the insurance industry sector (Millo and Carmeci, 2015). It is interesting to examine whether variations in insurance consumption in European countries could be summarized during the period from 2004 to 2016 – a period covering also the financial and sovereign debt crises between 2007 and 2011.

According to Millo and Carmeci (2010), insurance consumption is a term that refers to an equilibrium point that is reached in an insurance market between the supply and demand of insurance products. In practice, what we observe in markets is the so-called premium volume, which is defined as the direct written premium paid by policyholders to insurer for being secured against a specific uncertainty or risk. The premium volume is first written on the balance sheets of insurers under the heading gross written premiums (GWP) and, then, aggregated to the accounts of a country.

It is easily inferred that the premium volume explicitly represents insurance consumption. For instance, Ward and Zurbruegg (2000) used annual real insurance premiums to measure insurance consumption. However, measuring insurance consumption across countries of different income level and population size has revealed the need for alternative measures. Traditionally, the most commonly used measures of insurance consumption is insurance penetration (IP) and insurance density (ID). IP is defined as the ratio of premium volume to gross domestic product (GDP), while ID is the ratio of premium volume to population. In line with Olayungbo and Akinlo (2016), we utilize IP as a measure of insurance consumption since it considers the insurance activities relative to the size of the economy.

Observing insurance markets outlook on an annual basis allows to collecting IP rates across different countries over yearly periods. We propose representing the time evolution of a country's IP rate as a curve (time-series), which is called IP curve and carries the historical information about the behavior of insurance market development in this country. Many studies provide some descriptive statistics, such as trends (averages) and dispersions (standard deviations) of the IP curves over the period employed in each study. All these summary statistics serve the purpose of analyzing the insurance consumption that is one of the main variables of interest in the study of causal effects of the economic growth on insurance

Ing. Stavros Athanasiadis, University of South Bohemia in České Budějovice, Faculty of Economics, Department of Applied Mathematics and Informatics, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: athans00@ef.jcu.cz

doc. RNDr. Tomáš Mrkvička, PhD., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Applied Mathematics and Informatics, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: mrkvicka.toma@gmail.com

(Dragos, 2014) or causal effects of insurance on economic growth (Arena, 2008). However, it is found that such studies use no technique to avoid large variations (heterogeneity) of insurance consumption among the sample countries. Consequently, it is necessary to find homogeneous groups of countries based on their IP curves to improve the quality of the causal effect analysis.

This paper is motivated by the idea that the clustering of European countries in terms of the IP curves can lead to the construction of homogeneous groups of countries and to a better understanding of European insurance market development before, during and post-financial and sovereign debt crises period. This idea becomes more coherent when we realize that under a suitable clustering of European countries, it will be possible first to recognize the dependencies and relations to other effects within a given homogeneous cluster of countries and then draw conclusions within this cluster.

The aim of this study, therefore, is to identify meaningful and homogeneous clusters of European countries according to two main properties of the IP curves, namely, the magnitude (size) and the shape. For each property, we apply two partitional clustering methods, k-means and Gaussian mixture model, with two different dissimilarity (distance) measures, the Euclidean and Mahalanobis distance respectively. Later, this cluster identification could be used for assessing whether the produced representative (centroid) curves of each cluster retain the properties of the cluster member IP curves. To isolate the two properties of the IP curves from each other, we generate, through logit transform and log difference transform, two input data sets to pass to the clustering methods.

Previous studies on the IP data clustering problem is solved by conducting either multivariate clustering analysis (Armean and Muresan, 2017a) or spatial statistics analysis (Armean and Muresan, 2017b). However, the data used in both studies were static in the sense that the development or the change of IP rates over the past years was not considered. Instead, authors chose two different year-end IP rates across European countries: before and after the financial crisis.

2 Methods

Our data come from observations of the IP rates across 34 European countries during the period from 2004 to 2016. These rate observations are sourced from Swiss Re Sigma database (2016) and presented on a per country per year basis. Consequently, the clustering methods accept a matrix of size 34×13 as input data. However, our approach, treat these data as multivariate data vectors to account for possible correlations of IP rates between years. This means that each year's IP rates across European countries or each column of the matrix is an individual variable, which we will refer to as "year-end IP variable".

Two different data transformations are proposed prior to the application of clustering methods that generate two input data. The first transformation is using the logit function (Gelman and Hill, 2007) to make the variables fit a normal distribution and more stable. We choose this type of transformation, since the data are actually percentage (proportional) data and have a bounded domain like [0,1]. The second transformation is taking the log differences of the IP rates over time (Ord, Fildes and Kourentzes, 2017) to get rid of the magnitude effects in our data. However, the clustering solutions are converted back to the proportion scale for graphical presentation and analytical interpretation of data. This back-conversion requires that we use the inverse functions of the two transformations, which are also supported by the same references stated above. From this point onwards, the two input data are referred to as "logit-transformed data" and "log-differenced data" respectively.

Clustering is a method that addresses the problem of identifying a set of groups (clusters) within a data set, and as such uncovers the hidden or the unknown structure of this data set. Clustering methods can be either model-based methods or heuristic methods, the latter of which is further subdivided into hierarchical (Milligan and Cooper, 1987) and partitional methods (Ayramo and Karkkainen, 2006). In this paper, we are concerned with partitional methods and, in particular, with the k-means and the Gaussian mixture model.

A partitional clustering method provides a single partition of the data, not a sequence of partitions, allowing only for disjoint partitions or clusters. It always begins with the initialization phase that involves pre-specifying the number of clusters and the initial centers (centroids) of these clusters. While, it ends with generating clusters so that a certain optimization criterion is met.

The most widely known partitional clustering method is the k-means (MacQueen, 1967), which is named as such because it calculates the mean (centroid) of each cluster. If we provide k-means with a data set, a no particular distribution of clusters and a fixed number of clusters, then it generates optimal clusters by minimizing the sum of squared error (SSE) or else the within-cluster square error (Jancey, 1966).

The k-means enjoys some advantages such as the computationally efficient way of achieving the optimal clustering solution and the simplicity of its methodology. However, it suffers from some disadvantages like the high sensitivity to initialization phase, data noise and presence of outliers in the data.

Two major dissimilarity (distance) measures found in (Arathi and Govardhan, 2014) are used to determine the degree of association between data vectors, the Euclidean distance (ED) and the Mahalanobis distance (MD). Let two data vectors measured on p variables be expressed as $x_i = (x_{i1}, \cdots, x_{ip})^T$ and $x_j = (x_{j1}, \cdots, x_{jp})^T$, where the T superscript denotes transpose. Then, ED between data vectors x_i and x_j is given by the formula:

$$d(x_i, x_j) = \left((x_i - x_j)^T (x_i - x_j) \right)^{\frac{1}{2}} \tag{1}$$

which assumes that variables are independent of each other. However, when variables appear to be correlated somehow then the MD comes to force. This is because, by definition, MD accounts for correlation among variables via the inclusion of an inverse covariance matrix Σ^{-1} (as it is defined in Krzanowski, 2000) between data vectors x_i and x_j in its formula:

$$d(x_i, x_j) = \left((x_i - x_j)^T \Sigma^{-1} (x_i - x_j) \right)^{\frac{1}{2}} \tag{2}$$

Another point associated with the distance measures is that k-means usually involves calculating the cluster centroids by using the ED. This has as result that clusters are of a hyperspherical form, which in practice is very restrictive – data may contain clusters of different form. We can overcome this restriction by introducing the MD that tends to form ellipsoidal clusters.

In regards to heuristic clustering methods, the most known methods for estimating the optimal number of clusters H are the Elbow method, the Silhouette method, the Calinski-Harabasz method and the Gap method to name a few (for a review of these and several other methods, see Milligan and Cooper, 1985). In this paper, we are making a particular note for the silhouette statistic and its dependent silhouette index (SI) that were proposed by Rousseeuw (1987). Briefly, SI takes a value in the range $[-1, 1]$, where values closer to 1 implies high within-cluster homogeneity and large between-cluster separation. Producing the average SI of data vectors for a range of values of h, the optimal number of clusters H is the one that maximizes this average.

Model-based clustering methods operate under the assumption that multivariate data vectors belonging to a component (cluster) follow its distinct multivariate distribution. In what follows, we will consider this assumption and model a mixture of components as a (finite) Gaussian mixture model (GMM) (Symons, 1981), with one multivariate normal (MVN) density accounting for each component. Then, by definition of the MVN density (Fraley and Raftery, 2002) the distribution parameters of the hth component, where $h = 1, \cdots, H$, are the mean μ_h and the covariance matrix Σ_h.

The optimization criteria related to model-based clustering are more general than the SSE criterion of k-means, which assumes no cluster distribution. Banfield and Raftery (1993) proposed criteria that are based on expressing the above covariance matrix Σ_h for the hth component (cluster) in the form of the following product of matrices (decomposition):

$$\Sigma_h = \lambda_h D_h A_h D_h^T \tag{3}$$

where:

D_h^T transpose matrix of eigenvectors of Σ_h

A_h diagonal matrix whose elements are proportional to the eigenvalues of Σ_h

λ_h is a scalar containing the largest eigenvalues of Σ_h

Each parameter in (3) describes a particular geometric feature of the hth component's structure. For example, the orientation is determined by the matrix D_h, the size by λ_h and finally the shape by A_h. Thus, such decomposition of Σ_h allows geometric features of the hth component to vary in terms of its orientation, size and shape. Imposing restrictions on parameters D_h, λ_h and A_h is equivalent to making specific assumptions about the component structure that result to the construction of the so-called "models". Common models and the corresponding geometric interpretation are found in Bensmail and Meulman (2003).

In probabilistic terms, model-based clustering assumes that optimally there are H clusters within a data sample $X = \{x_i\}_{i=1}^n$ of size n and the probability density function (PDF) $f(x_i|\vartheta_h)$ with cluster-specific parameter ϑ_h could be used for describing data in cluster h, where $h = 1, \cdots, H$. In a (finite) mixture model M_H of H clusters, there are also parameters

specific to the mixture weights π_h assigned to each cluster, which are non-negative and summing to one. The parameter set of the mixture model's PDF is, therefore, enlarged and denoted as $\theta_H = (\vartheta_1, \cdots, \vartheta_H; \pi_1, \cdots, \pi_H)$.

Let $p(X|\theta_H, M_H)$ denote the likelihood function of the M_H and let d_H be the number of free parameters in this model. The estimation of the parameter set θ_H is based on the Expectation-Maximization (EM) algorithm (McLachlan and Krishnan, 1997), since there is no closed form solution to finding an optimal set $\widehat{\theta_H}$ that maximizes the $p(X|\theta_H, M_H)$ under M_H. Consequently, the EM algorithm returns a maximum likelihood estimate $\widehat{\theta_H}$ of the parameter set θ_H for which the approximate likelihood $p(X|\widehat{\theta_H}, M_H)$ is locally maximal.

In line with Kass and Raftery (1995), we determine the optimal number of clusters H by using the Bayesian model selection that is based on the posterior distribution $p(H|X) \propto p(X|H) \, p(H)$ and more precisely on the computation of the marginal likelihood $p(X|H)$ for various values of H or its equivalent $p(X|M_H)$ for various models M_H. This computation, however, is not easily carried out, except through asymptotic approximations such as the Schwarz criterion (Schwarz, 1978). It is proved that:

$$-2\log p(X|M_H) + 2c \approx -2\log p(X|\widehat{\theta_H}, M_H) + d_H \log n \qquad (4)$$

The right-hand side of (4) is called Bayesian information criterion (BIC) and the optimum value of H is chosen such that BIC is minimized. The first term is the lack of the model harmonization, and the second term is a measure of complexity.

3 Research results

With respect to the input data, clustering methods and dissimilarity (distance) measures, we experimented with four case studies and computed their sets of results by using the R v. 3.5.2 software. The four case studies are: (I) logit-transformed data and k-means with ED; (II) logit-transformed data and GMM with MD; (III) log-differenced data and k-means with ED; and (IV) log-differenced data and GMM with MD. Since the financial and sovereign debt crises in Europe began in the middle of 2007 and ended at the end of 2011, we depicted in our figures this period by vertical lines that intersect the axis of years to 2007 and 2011. In this way, we implicitly constructed three periods of different economic conditions within the period 2004-2016. These periods are called phase-period A, B and C and correspond to the period before, during and post-financial and sovereign debt crises.

By analyzing the plots in Figures 1 and 3, which present the silhouette method under case studies (I) and (III) respectively, yields that the optimal number of clusters is two clusters. In addition, the majority of other methods that estimate the optimal number of clusters returns also two clusters. The BIC under case studies (II) and (IV) shown in Figure 2 and 4 respectively, appears to give the same results – two components (clusters). Using these methods, we determine that the optimal clustering for all case studies is obtained with two clusters.

Figure 1 Silhouette method (I)   **Figure 2** BIC (II)   **Figure 3** Silhouette method (III)   **Figure 4** BIC (IV)
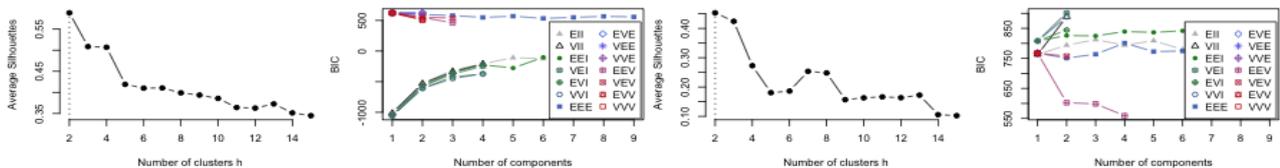
Source: Own processing

Figure 5 visualizes the clustering of European countries in terms of their IP curves within the three phase-periods and under case study (I). We observe that the centroid IP curve of cluster 1 (solid line) is distinguishable from that of cluster 2 (dashed line), which means that the clustering has captured successfully the magnitude signal in both cluster member IP curves.

Looking, therefore, on the centroid IP curves allows us to see the top trends in IP rates. For example, it is found that almost invariably, within all phase-periods, IP rates for countries in cluster 1 followed in cycles of two years' increasing trend, two years' decreasing trend. In comparison with cluster 1, the IP rates for countries in cluster 2 have displayed a two-year increasing trend before they plunged in the downturn, after accounting for financial and sovereign debt crises.

We are not only interested in clustering the European countries in terms of the IP curves, but also in extracting (where possible) common characteristics of each cluster under the same macro-economic environment. Since countries in cluster 1 have higher IP rates than those of the countries in cluster 2, for all phase-periods, we are able to say that cluster 1 presents the unstable well-developed insurance markets. Whereas cluster 2 presents the less-developed insurance markets that are facing shrink challenges especially during financial and sovereign debt crises period. It is interesting to see that

cluster 1 unites countries such as Austria, Belgium, Cyprus, UK, Denmark, Estonia, Finland, Norway, Spain, Sweden, Germany, France, Italy, Holland, while countries such as Greece, Romania, Serbia, Turkey, Bulgaria, Island, Czech Republic, Poland belong to cluster 2.

Figure 5 Centroid IP curves   **Figure 6** Cluster 1 member IP curves   **Figure 7** Cluster 2 member IP curves
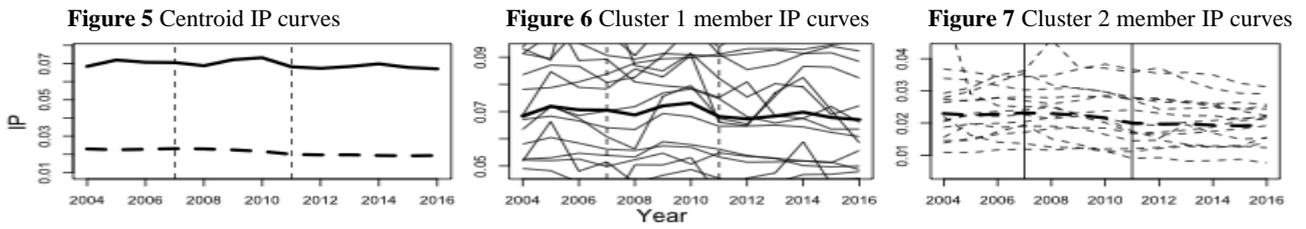
Source: Own processing

The centroid IP curve (thick line) and the member IP curves (thin lines) of each cluster (one IP curve for each country included in each cluster) are visualized in Figures 6 and 7. It is clear from these figures that the clustering has slightly represented the shape variations of the member IP curves.

For case study (II), examination of Figures 8, 9 and 10 revealed that we could draw similar conclusions to that of the case study (I). It is as if we produced a clustering solution of normally distributed processed data with independent year-end IP variables. However, the assumption of case study (II) is that these variables are highly correlated. Therefore, this might be an evidence for high correlation of nonlinear form between year-end IP variables that MD is not able to capture.

Figure 8 Centroid IP curves   **Figure 9** Cluster 1 member IP curves   **Figure 10** Cluster 2 member IP curves
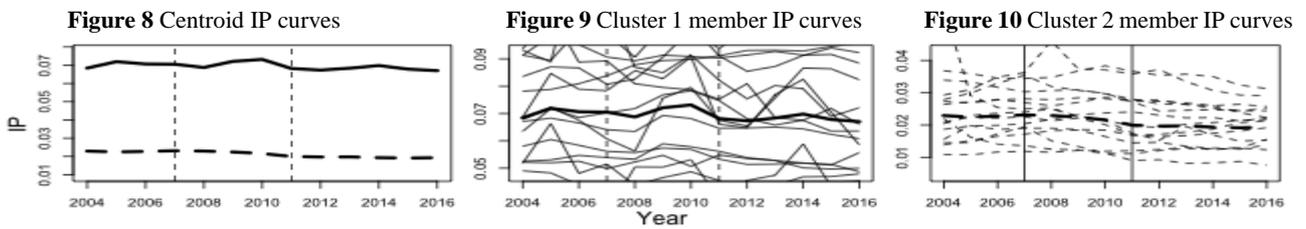
Source: Own processing

Considering Figure 11 together with Figures 12 and 13, we see that even though the clusters that obtained under the case study (III) are distinct, they have not recovered the magnitude of their member IP curves, while they have slightly recovered the shape of these curves. The size of cluster 1 (solid line) is so large that contains all except two of the European countries, which leads to no meaningful results and characterization of clusters. This is because, we are forcing ED to operate with high dimensional data (IP curves), in which (case study (III) assumption) the magnitude effect is eliminated.

Figure 11 Centroid IP curves   **Figure 12** Cluster 1 member IP curves   **Figure 13** Cluster 2 member IP curves
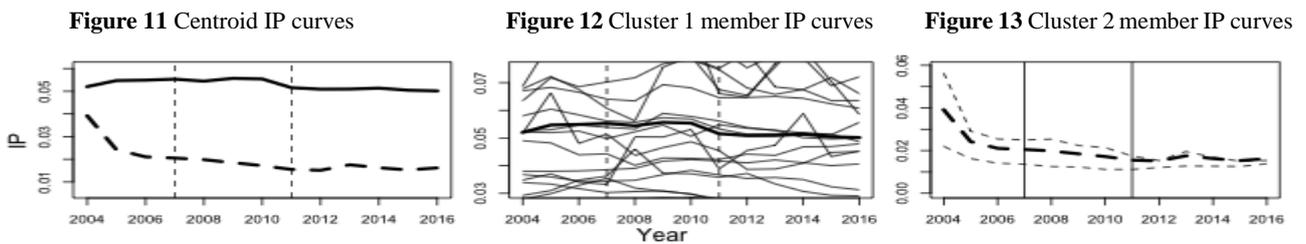
Source: Own processing

Figure 14 depicts the centroid IP curves obtained under the case study (IV). Here, the centroid IP curves are not distinguishable from each other, since they intersect at two points (year 2010 and 2011). In other words, the clustering has not adequately summarized the information carried in the member IP curves with respect to their magnitude. However, the centroid IP curves in Figures 15 and 16 indicate that they have slightly extracted the shape features of the member IP curves of each cluster. Again, no meaningful results and characterization of clusters are possible.

Figure 14 Centroid IP curves   **Figure 15** Cluster 1 member IP curves   **Figure 16** Cluster 2 member IP curves
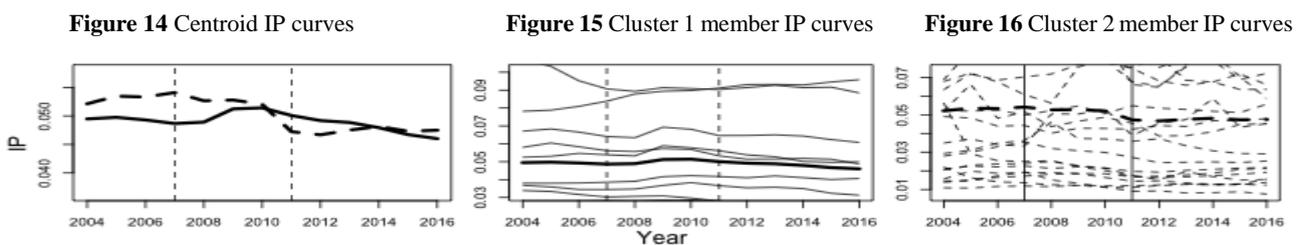
Source: Own processing

4 Conclusions

In this paper, we constructed four case studies in an effort to assess whether the k-means and the GMM are producing cluster centroid IP curves that retain, at the same time, the magnitude and the shape properties of the cluster member IP curves. To this end, we have characterized the processed data in two ways. First is the normally distributed processed data that account for the magnitude effect of the IP curves and provide more stable data – data without heavy tails and outliers – compared to the raw data. Second is the magnitude-free or non-stationary processed data that account only for the shape effect of the IP curves. Under these two characteristics, we assumed either that year-end IP variables are independent of each other and applied ED with k-means or that they are correlated and applied MD with GMM.

Within each case study, we have assessed and interpreted (where possible) the clustering solution. As a result, we are now able to state that well-developed insurance markets faced major challenges due to their instable behavior within past decade. On the other side, the potential deterioration of less-developed insurance markets was obvious after the start of financial and sovereign debt crises.

The clustering solutions obtained by using the logit-transformed data with both Euclidean and Mahalanobis distance drew quite good distinction between clusters of countries that accounts only for the magnitude of the IP curves. However, the Mahalanobis distance did not provide any insight in how to account for their shape. The opposite can be said of the clustering solutions that obtained by using the log-differenced data and the same distance measures as above. The magnitude of the IP curves is not captured at all by the centroid curves, whereas their shape is captured slightly.

Consequently, we demonstrated that multivariate clustering methods are unable to extract useful clusters of countries, in the sense that centroid curves cannot represent both the magnitude and the shape of the member IP curves appropriately at the same time. We also found that they suffer from the high dimensionality of data and the high correlation of the IP rates between years. Even though, the high correlation problem is solved by introducing Mahalanobis distance, this particular distance implies a linear model for the dependence of the IP rates between years. In practice, we can face different dependence for different IP rates over time. Furthermore, it was observed that Euclidian and Mahalanobis distances are not sensitive to time shifting.

Ongoing and future work involves functional data clustering or time-series clustering methods. In addition, we will study a clustering method that will be able to produce clusters relying on both the magnitude and the shape of the IP curves at the same time.

References

Arathi, M., & Govardhan, A. (2014). Performance of Mahalanobis Distance in Time Series Classification Using Shapelets. *International Journal of Machine Learning and Computing, 4*(4), 339-345.

Arena, M. (2008). Does insurance market activity promote economic growth? A cross-country study for industrialized and developing countries. *Journal of Risk and Insurance, 75*(4), 921-946.

Armean, G., & Muresan, G. (2017a). Insurance market development before and after the financial crisis in the context of ethics and corruption. *Annals of the „Constantin Brâncuşi"* (Economy Series, Issue 1/2017). Romania: "Academica Brancusi" - University of Târgu Jiu.

Armean, G., & Muresan, G. (2017b). A real map of European life insurance market – A spacial approach. *Annals of the "Constantin Brâncuşi"* (Economy Series, Issue 5/2017). Romania: "Academica Brancusi" - University of Târgu Jiu.

Ayramo, S, & Karkkainen, T. (2006). Introduction to partitioning-based cluster analysis methods with a robust example. *Reports of the Department of Mathematical Information Technology* (No. C. 1/2006). Finland: University of Jyvaskyla.

Banfield, J. D., & Raftery, A. E. (1993). Model-based Gaussian and non-Gaussian clustering. *Biometrics, 49*, 803-821.

Bensmail, H., & Meulman, J. J. (2003). *Model-based clustering with noise: Bayesian inference and estimation*. Technical report, Department of Statistics, Operations, and Management Science, University of Tennessee, Tennessee.

Dragos, S. L. (2014). Life and non-life insurance demand: The different effects of influence factors in emerging countries from Europe and Asia. *Economic Research-Ekonomska Istraživanja, 27*(1), 169-180.

Fraley, C., & Raftery, A. E. (2002). Model-Based Clustering, Discriminant Analysis, and Density Estimation. *Journal of the American Statistical Association, 97*(458), 611-631.

Gelman, A., & Hill, J. (2007). *Data analysis using regression and multilevel/hierarchical models*. Cambridge: Cambridge University Press.

Jancey, R. C. (1966). Multidimensional group analysis. *Australian Journal of Botany*, 14, 127-130.

Kass, R. E., & Raftery, A. E. (1995). Bayes factors. *Journal of the American Statistical Association*, 90, 773-795.

Krzanowski, W. J. (2000). *Principles of multivariate analysis a users perspective*. New York: Oxford University Press.

MacQueen, J. (1967). Some methods for classification and analysis of multivariate observations. *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability*, 1, 281-297.

McLachlan, G. J., & Krishnan, T. (1997). *The EM Algorithm and Extensions*. New York: Wiley.

Milligan, G. W., &. Cooper, M. C. (1985). An examination of procedures for determining the number of clusters in a data set. *Psychometrica,* 50, 159-179.

Milligan, G. W., & Cooper, M. C. (1987). Methodological review: Clustering methods. *Applied Psychological Measurement*, 11, 329-354.

Millo, G., & Carmeci, G. (2010). Non-life insurance consumption in Italy: A sub-regional panel data analysis. *Journal of Geographical Systems*, 13(3), 273-298.

Millo, G., & Carmeci, G. (2015). A sub-regional panel data analysis of life insurance consumption in Italy. *Journal of Risk and Insurance,* 82(2), 317-340.

Olayungbo, D.O., & Akinlo, A.E. (2016). Insurance penetration and economic growth in Africa Dynamic effects analysis using Bayesian TVP VAR approach. *Cogent Economics & Finance*, 5(1), 1-19.

Ord, J. K., Fildes, R., & Kourentzes, N. (2017). *Principles of business forecasting*. New York: Wessex Press.

Rousseeuw, P. J. (1987). Silhouettes: A graphical aid to the interpretation and validation of cluster analysis. *Journal of Computational and Applied Mathematics, 20*, 53-65.

Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, 6, 461-464.

Swiss Re Sigma Database. (2016). Zurich: Swiss Re Economic Research and Consulting.

Symons, M. J. (1981). Clustering criteria and multivariate normal mixtures. *Biometrics,* 37, 35-43.

Ward, D., & Zurbruegg, R. (2000). Does insurance promote economic growth? Evidence from OECD countries. *The Journal of Risk and Insurance*, 67(4), 489-506.

Implementation of SAF-T into ERP Systems in the Country of Czech Crown

Petr Hanzal

Abstract: *The aim of this paper is to compare the state of implementation of SAF-T into ERP systems in individual OECD countries and explaining the purpose of SAF-T use. Particular emphasis is then placed on the Czech Republic, where the current state of e-reporting in the area of audit and state control of legal entities is currently represented by the VAT audit report and the electronic cash record system (EET). The paper should be considered as a contribution to the application and development of Enterprise Resource Planning Information Systems in the Czech Republic.*

Key words: Enterprise Resource Planning · Accounting Data · Standard Audit File Tax

JEL Classification: M41 · C88

1 Introduction

Accounting data are an essential element of every ERP system. They are carriers of recorded facts related to the activities of the company and can also be transmitted, interpreted and processed. They include all knowledge about the micro and macro environment of the organisation, such as recorded data of economic facts and other factors affecting the value chain of a company (Sodomka, 2010). The basic function of financial accounting is to provide all its users with reliable information about the economic situation of the company. Accounts are required to provide, in particular, information on the assets and financial position (in the form of a balance sheet) and on performance (in the form of a profit and loss statement) over the relevant period of time. This serves not only to assess what use has the company's management made of the funds entrusted to it over the past period, but recently there has been ever increasing interest in forecasting the financial situation, whether and to what extent the company will be able to achieve favourable financial results in the future. Accounting information is intended for managers as well as for various external users who are interested in the company for a variety of reasons (Kovanicová, 2005, 2007). Accounting operations should always comply with the general accounting principles. The basic legal framework in Czech accounting is the Act on Accounting, implementing decrees to this Act and the Czech Accounting Standards. In Europe and the Czech Republic, financial and tax accounting systems intertwine. In addition, tax rules and laws have a significant impact on practices in financial accounting, whose results they in some cases distort significantly (Šteker, 2010). Financial accounting data are derived from the state of assets, receivables from customers, payables to suppliers, and at the same time monitor revenues and costs from the point of view of the accounting entity as a whole. They record all business cases relating to the purchase and sale of goods, materials, own products and services, including master data of suppliers and customers (Hanzal, 2009).

Accounting Information Systems

Financial accounting serves to record financial operations in the accounting journal, which information is later transferred to the main ledgers, the source of printed accounting and financial statements. Financial accounting usually does not deal with management issues, it only has a record function. The general ledger is the basis of the company's financial management and often plays a central role in the whole ERP system (Křížová, 2005). Typical structure of accounting information system is shown on the figure 1. (OECD, 2005).

Ing. Petr Hanzal, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economics, Department of Applied Mathematics and Informatics, Studentská 13, 370 05 České Budějovice, Czech Republic

Figure 1 The structure of financial accounting systems, that consists on various modules in a typical business system
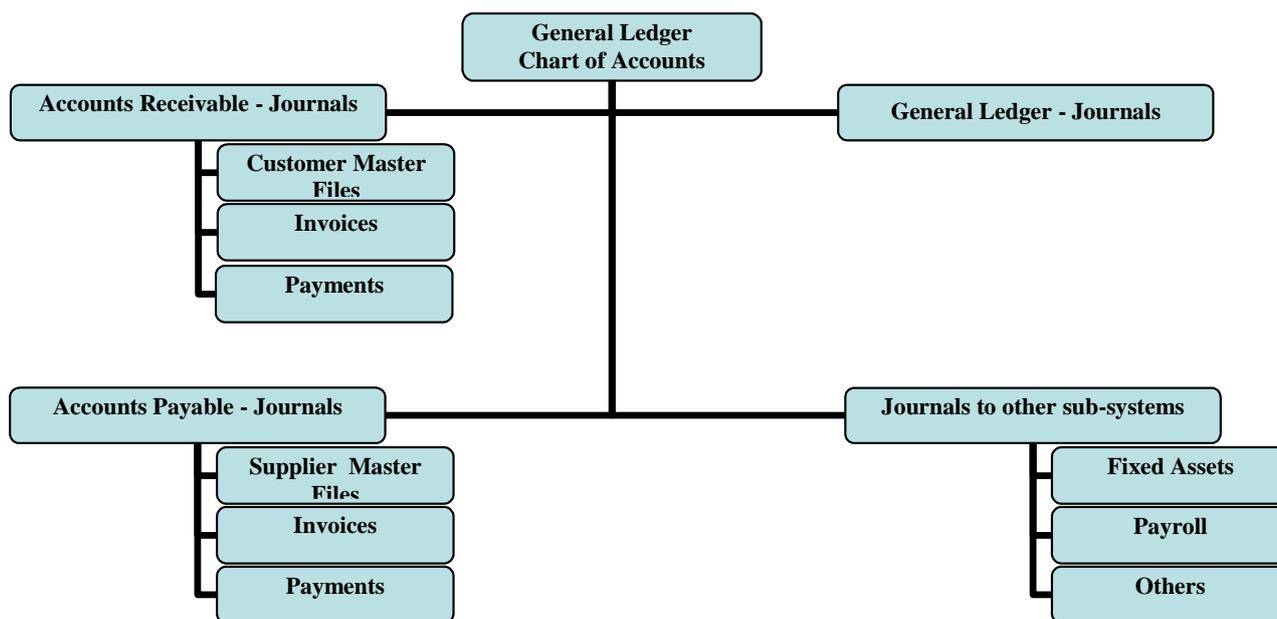
Source: OECD, 2005

The general ledger of the accounting information system is the relevant source from which to generate a file that can be used for the audit as it contains all the essential information necessary for that purpose.

2 Why to Audit Accounting by Electronic XML Files?

Globalisation of the world economy has created the new environment in which multinational businesses find themselves liable to variety of accounting requirements around the world. The development of global standards for the processing and recording accounting data call for mechanism of tax declaration that reduces costs, make better assurance of audit and enable multinational audit. The development of global standards for the processing and recording of accounting data that form part of tax declaration in some way to reduce compliance costs by improving assurance mechanisms (OECD, 2005).

For that purpose OECD has produced guidance in accordance with following principles as they apply to software products to produce XML file for tax auditing (OECD, 2018):

- Integration of effective tax protection controls into computerised accounting systems

- Production of satisfactory audit trails to prove revenue values by recording progress of individual entries to final recording in the accounts

- Audit automation in the form of built-in exception reports that allow users to check the accuracy of processing

- Production of standard audit file that will allow non-specialist to extract relevant audit data

- Software should allow users to file tax returns electronically

- Archive procedures should ensure the integrity and readability of electronic records after extended periods

3 SAF-T

SAF-T (Standard Audit File – Tax) has been designed to allow auditors access to data in an easily readable format for substantive testing of system controls and data, using proprietary audit software, as part of a methodology that provides increased effectiveness and productivity in computer-assisted audit. It's intended to be suitable for use by businesses and their auditors across the scale from SME's to LE's, with multiple branches and locations, although there may be some differences in its application. With the SAFT file, it is possible to know if a business has paid the correct tax at the right time, in accordance with tax legislation. It facilitates the extraction and processing of information, avoiding the need to specialize auditors in the various systems, simplifying procedures (Reis, 2018). SAF-T is a file containing reliable accounting data exported from an original accounting system, for a specific time period, easily readable by virtue of its

standardisation of layout and format, and one that is extensible according to need. Auditors are now faced with an increasing verification challenge whereby advances in technology and the increasing numbers of operating systems, data formats, backup and file retention options make their task increasingly complex. SAF-T has been developed in response to both this general problem and modern accounting systems that are entirely electronic. The established practice of testing the operation of internal control procedures from scrutiny of contemporary paper documents containing control information is therefore no longer universally applicable and wholly inappropriate in these systems where testing has to be performed electronically (OECD, 2005). SAF-T will be created from either entry data stored on the original accounting system at the time of processing, or from a combination of entry data and master file information current at the time of the original entry. Software developers may wish to design systems that create the SAF-T in different ways, e.g. when the transaction is recorded, or at the time of archiving data to create a permanent record of auditable transactions (OECD, 2005). In some integrated systems the data will all be available from the one system; in other systems the data may be stored in several systems e.g. order processing, financial accounting etc., and SAF-T has been constructed to allow data from either single or many sources. For example, in a single ledger system, all of the entries would be shown as general ledger entries whereas in a multi-ledger system, the summary entries would be in a general ledger and details would be in the "source documents" section of the SAF-T. It should also be noted that the audit assurance requirements for some business sectors would require auditors to seek additional information (OECD, 2005). The file is based on entries to be found in a general ledger chart of accounts, together with master file data for customers and suppliers, and details of invoices, orders, payments, and adjustments. In this connexion the data elements also include fields that support both a number of standard tests and also are desirable for audit purposes generally. The design also allows its potential application in data transfer applications to other non-tax government agencies (OECD, 2005). Tax authority auditors using a standard audit file may still need to verify original records maintained by a business. It should be recognised that incorporation of an audit file into accounting software will not remove the requirement for businesses to keep records in accordance with conditions laid down by revenue authorities (OECD, 2005). It has been designed around commonly held business data, and represents a statement of best practice in obtaining tax data for use in computer-assisted audit. However, the implementation of this guidance at a national level will be the responsibility of individual member countries, in accordance with their own tax administrative policies. There are a number of options to achieve implementation: by legislation; in conjunction with a national standards body; or by a voluntary agreement with business stakeholders. Revenue authorities begin with an implementation plan, which may include bilateral or multilateral co-operation with other revenue authorities (OECD, 2005). The structure of SAF-T is shown on the figure 2.

Figure 2 SAF-T overview block diagram

Source: OECD, 2005
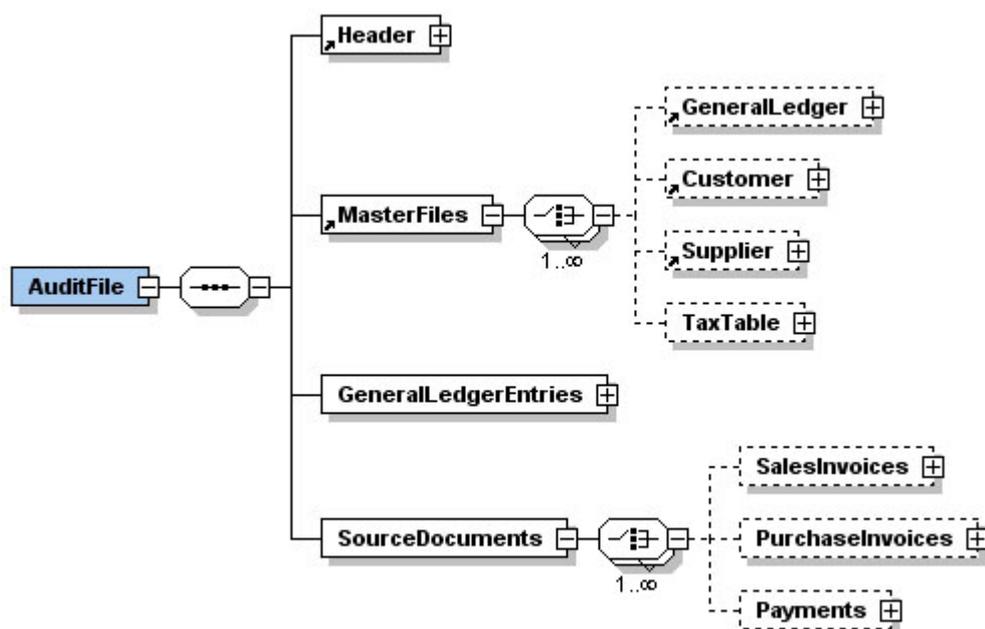
4 The State of Implementation of SAF-T in Various Countries of OECD

Figure 3 shows the state of implementation of e-audit and SAF-T in various OECD countries. There are quite large differences in the approach of individual countries to this issue. Some countries already have an e-audit, if any, SAF-T is fully integrated and is mandatory for all accounting software products and others have not yet developed a computerized e-Government infrastructure.

Figure 3 The state of implementation of e-audit and SAF-T in countries OECD
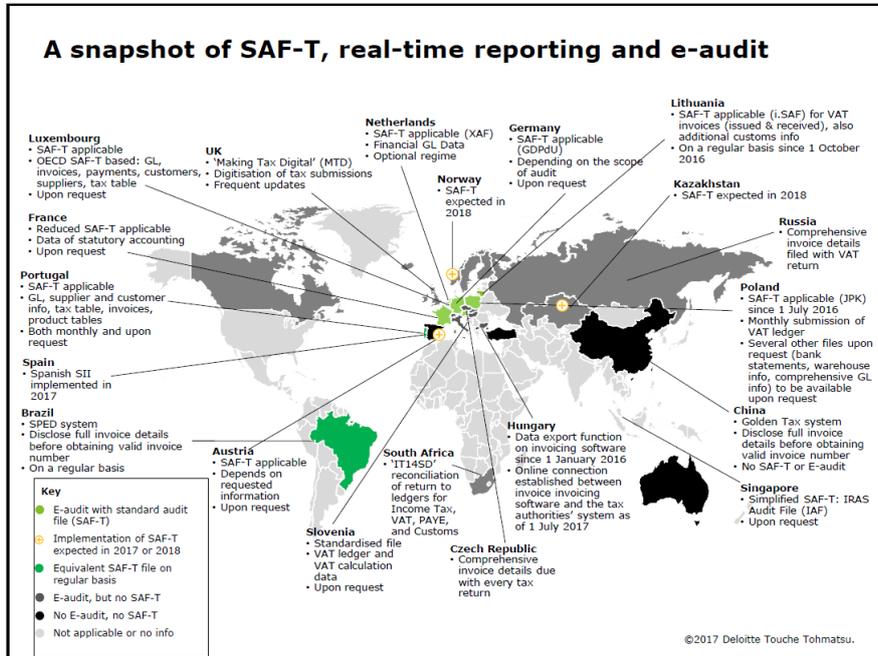
Source: Beneš, 2017

In Europe, the situation is disproportionately better. Individual states can be divided into five groups according to the state of implementation - Figure 4.

Figure 4 The state of implementation of e-audit and SAF-T in Europe
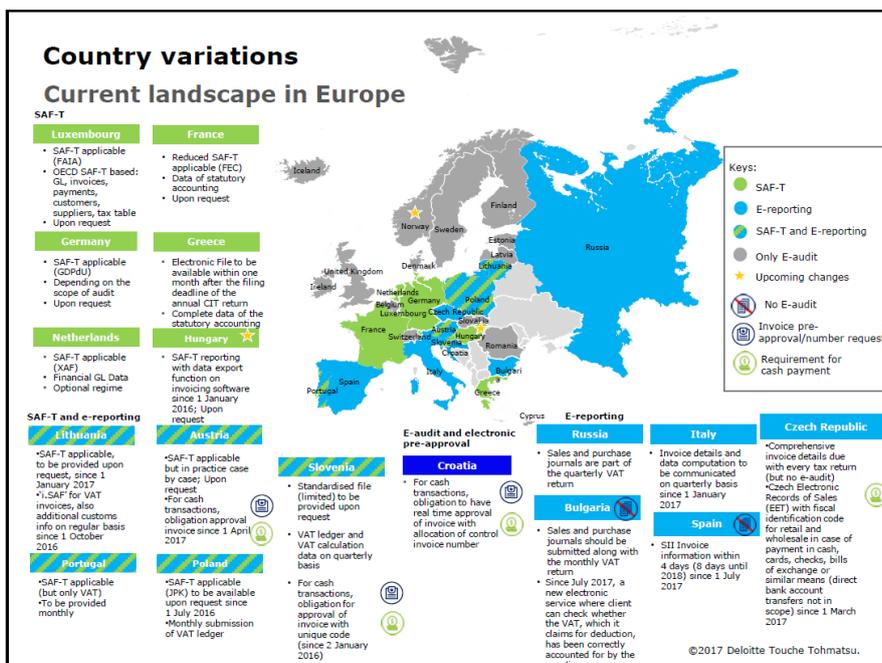
Source: Beneš, 2017

In the first group are countries that have SAF-T fully implemented or implemented with local specifications. These are Luxembourg, France, Germany, Greece, the Netherlands and Hungary. In the second group there are states where SAF-

T is applicable but there is still a national version of e-reporting. These are Lithuania, Austria, Portugal, Poland and Slovenia. In another group there are states where there is a local version of e-reporting, but where SAF-T has not yet been implemented. These are Russia, Bulgaria, Italy, Croatia and the Czech Republic. The next and most numerous group of countries has an e-audit implemented. These are Iceland, Ireland, Great Britain, Norway, Sweden, Finland, Denmark, Latvia, Estonia, Switzerland, Belgium, Slovakia and Romania. E-audit means electronic tax control – i.e. tax entities provide information in electronic form to the tax administrator - the data structure is usually not controlled / determined. E-reporting means that the taxable person has the obligation, together with the disclosure, to submit the documents for the electronic submission in a clearly defined structure (e.g. our control report). The tax administrator then conducts an e-audit.

5 What About the Czech Republic?

In the Czech Republic, at present, there are the following forms of e-reporting, which even overlap.

It is about:

- Tax record system, valid from January 1, 2016, containing all documents that fall under VAT.
- Electronic cash record system (EET), valid from 1.12.2016 (in multiple stages), containing all cash vouchers.

What is the area of overlapping? In the tax record system we also find the documents already listed in the EET. These are, for example, cash documents that are more than 10 000 CZK. Other documents, such as internal documents, asset depreciation, warehouse receipts and receipts, invoices issued to third countries, etc. are not reported at all. Table 1 shows the individual types of reporting executed by accounting postings (i.e. not summary) of the coverage area by individual types of documents. The table relates just to VAT payers.

Table 1 Coverage areas of reporting by type of reporting

	Domestic incoming/outgoing invoices up to 10 000 CZK	Domestic incoming/outgoing invoices over 10 000 CZK	Domestic incoming/outgoing invoices with reverse charge	Outgoing invoices EU	Incoming invoices EU	Cash documents	Incoming/outgoing invoices third countries	Other VAT documents over 10000 CZK	Other VAT documents up to 10000 CZK and not VAT documents over 10000 CZK
Tax record system	No	YES	YES	No	YES	No	No	YES	No
EET	No	No	No	No	No	ANO	No	No	No
SAF-T	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: own source

In October 2018, I sent a question to the Ministry of Finance of the Czech Republic with a question about the state of preparedness of state administration to introduce the Standard Auditing File - Tax (SAF-T) in the Czech Republic. The answer was that the Ministry of Finance and the Financial Administration of the Czech Republic are not preparing the implementation of the SAF-T in near future. To some extent, tax accounting is used in tax audits when the auditee can provide its financial information to the financial administration in electronic form. These data are controlled by an information system, where, for example, searches for duplicates in the provided data.

6 Conclusions

By the year 2018, out of 193 countries in the development of e-government, the Czech Republic is ranked as 54th, which is certainly not a flattering position. Whatever in the world that is not bad position, however, we lose a lot against most of the EU countries. In front of us are all our neighbours - Slovakia (49), Poland (33), Poland (20) and Germany (12).

Only Romania (67) and Croatia (55) are behind us (United Nation, 2018). The solution to this situation in the Czech Republic is, of course, one electronic file in SAF-T format, which will contain all accounting documents from the accounting. The question is when the state administration will have the ready infrastructure to receive this file format, which will set the time period for ERP vendors to embed this format into their systems.

Keeping the "only once" policy is also true for duplicate reporting of some document types. Also important is the fact that e-reporting across the EU will be standardized and that cross-border access will also be possible. According to the declaration of the current government, a central IT authority for state digitization should be established in the Czech Republic, governed by the governmental IT and digitization officer, to be directly subordinate to the Prime Minister. It will cover the creation of standards, work co-ordination, enterprise architecture, and other activities that will make it easier for ministries to develop services. At the same time, a government action plan will be created, with clear deadlines, when the agenda of individual ministries and government offices will be involved in the Digital Czech Republic. Consequently, the IT agenda will be finalized, basic standards applicable to state administration will be defined and centrally managed costs, architecture and project deliverables for which the Central IT Authority will be directly responsible. Let us believe that it will succeed in the near future!

References

Beneš, J. (2017). How is digitalization affecting professionals: Is the tax profession ready? Praha: Delloitte.

Hanzal, P. (2009). Výpočet HDP regionů a ČR produktovou metodou pomocí účetních dat podnikatelských subjektů. *Inproforum 2009.*, pp. 97-103.

Kovanicová, D. (2007). *Abeceda účetních znalostí pro každého*. Praha : Polygon. ISBN 978-80-7273-143-5.

Kovanicová, D. (2005). *Finanční účetnictví: světový koncept*. Praha : Polygon. ISBN 80-7273-129-7.

Křížová, Z. (2005). *Účetní systémy na PC*. Brno : Masarykova univerzita, p. 101. ISBN 80-210-3904-3.

OECD, Comitee on Fiscal Affairs, *Guidance for the Standard Audit File – Tax*, May 2005

OECD, Comitee on Fiscal Affairs, *Guidance on Tax Compliance for Business and Accounting Software*, May 2005

OECD, (19. 10 2018). Guidance Note Guidance for Developers of Business and Accounting Software Concerning Tax Audit Requirements. Loaded from http://www.oecd.org/ctp/administration/guidancenote-guidancefordevelopersofbusinessandaccountingsoftwareconcerningtaxauditrequirements.htm

Reis, D. S,. (2018).Distributed and scalable architecture for SAF-T processing and analysis, Universidade Do Porto.

Sodomka, P., Klčová, H. (2010). *Informační systémy v podnikové praxi*. Brno : Computer Press. ISBN 978-80-251-2878-7.

Šteker, K. (2010). *Informační systémy podniků a jejich praktická aplikace pro řízení ekonomického procesu*. Zlín : Univerzita Tomáše Bati. Ph.D. thesis.

United Nation, D. o. (10. 10 2018). E-government development index, E-government Database. Loaded from https://publicadministration.un.org/egovkb/en-us/Data-Center

The mental models of novice programmers for the assignment statement

Radim Remeš, Ladislav Beránek

Abstract: *The art of programming is a complex cognitive skill that is not easy to master. This article reports about the use of the SOLO taxonomy to study the understanding of the assignment statement by students. The students of tertiary education are trained and studied within the introductory course of programming.in the third week. The study is focused on the observation and examination of students' mental models of the assignment statement and the ways students use these models to design and program the solutions to six assigned tasks. The data in the study was obtained from students' written answers to the short code tasks related to assignment statement. Responses were mapped to individual levels using the SOLO taxonomy.*

The results show that for more complex tasks with assignment statements, approximately only one third of students reached a relational level of understanding the subject.

Key words: Program design · Novice programmers · SOLO taxonomy · Mental models · Assignment statement

JEL Classification: C89 · C99

1 Introduction

The art of programming is a complex cognitive skill that is not easy to master. Cognitive developmental processes leading to learning have been the subject of many researchers in the field of information education for many years. A number of publications in this area point out that learning to programming is difficult. (Grover, Pea, & Cooper, 2015; Lister et al., 2006; McCracken et al., 2001; Soloway & Spohrer, 1989; Perkins & Martin, 1985; Soloway , Ehrlich, Bonar & amp; Greenspan, 1983).

There have been conducted several empirical research to find out what problems students encounter in learning different language concepts (using variables, using cycles, etc.) (Izu, Weerasinghe, & Pop, 2016; Corney, Teague, Ahadi, & Lister, 2012, Kuittinen & Sajaniemi, 2004, Samurçay, 1989, Spohrer, Soloway, & Pope, 1985, Du Boulay, 1986).

Further research has focused on tracking beginners' problems in learning object-oriented programming concepts (Reges, 2006; Lister et al., 2006; Fleury, 2000).

In their study Spohrer & Soloway (1986) found that even though beginners knew the syntax and semantics of individual commands, they did not always know how to use these known constructs to generate valid code. In their research, the authors conclude that teachers should be able to improve the performance of their students by teaching strategies, how to build individual parts of the code into the resulting functional program. They will also improve their students' performance by helping them learn the syntactic and semantic constructs of the programming language.

This would point out that the ability of beginners to solve problems and difficulties in writing code requires the acquisition of other skills besides the knowledge of syntax and semantics of the specific programming language. Most of the mistakes that students make in their programs concerns the lack of organizational knowledge and problem-solving strategies. These can be, for example, an inability to see the internal connection between problems or the transfer of a good idea to solve similar problems within different contexts (Muller, 2005).

Mgr. Radim Remeš, University of South Bohemia, Faculty of Economics, Department of applied mathematics and informatics, Studentská 13, České Budějovice, e-mail: inrem@jcu.cz

doc. Ing. Ladislav Beránek, CSc, MBA, University of South Bohemia, Faculty of Economics, Department of applied mathematics and informatics, Studentská 13, České Budějovice, e-mail: beranek@ef.jcu.cz

Problems related to learning programming are also documented well in inter-institutional research. The beginner-learning programming working group found that students learning to program are less proficient in the first year of teaching than both teachers and students (McCracken, 2001). This research has initiated many other inter-institutional research in the field of teaching students who are beginning to learn programming.

A general explanation for beginner failure in writing the right and reliable high-quality code is the absence of abstraction of the problem. Students are unable to analyze the problem, divide it into simpler parts, and then concatenate the resolved parts into the desired solution. Lister et al. (2004), who continued the research of McCracken (2001), studied code understanding. In his research, he concluded that students are also failing to understand the code.

Whalley et al. (2006) also studied the students' ability to understand the code and concluded that students who can't read the code and can't explain their contexts have no good prerequisites for writing code.

Some authors have focused on the relationship between tracking, explanation and code writing (Kumar, 2013; Murphy, Fitzgerald, Lister, & McCauley, 2012; Lister, Fidge, & Teague, Whalley, Robbins, & Lister, 2008; Philpott, Robbins, & Whalley, 2007). While the results of most research show that writing is much more difficult than reading, Denny, Luxton-Reilly and Simon (2008) and Yamamoto et al. (2012) reached the opposite result. Winslow (1996) found in his research that there is no significant link between the ability to write code and the ability to read the code.

Lister et al. (2009) also questioned the succession of the hierarchy of skills used, which assumes that the appropriate level of skill hierarchy will correspond to the appropriate levels of difficulty of the problems posed to students.

Other research (Ginat & Menashe, 2015; Whalley et al., 2011; Whalley et al., 2006) focused on assessing the difficulty of reading and writing code. They came to the conclusion that one of the reasons for students' failure may be inappropriately chosen design of the course or inadequately chosen difficulty of the given program tasks.

It is verified that tertiary education is more difficult to teach than teaching other IT subjects (Oliver, Dobele, Greber, & Roberts, 2004).

This is assumed to be due to interconnection between individual programming concepts. The student must first understand one programming concept first before proceeding to learn another concept. Only then are their able to use the solution of one programming problem in solving another (Robins, 2010).

The above-mentioned studies have led to many interesting results, the learning process of the student's skills can't be identified.

In this research students of tertiary education are trained and studied in the first year of learning programming. The study is focused on the observation and examination of students' mental models of the assignment statement and the ways students use these models to design and program the solutions to six assigned tasks.

2 Methods

Nowadays, there are a number of different tools for measuring code quality. Metrics are available to measure different aspects of the code, from code size, through code complexity, code errors to code performance metrics. One of the first developers of coding metrics was Thomas McCabe (1976), who developed a technique called cyclomatic complexity that measures software control structures. This metric characterizes the software using numeric expression. The program is measured by using a graph that models the control flow of the code.

An alternative to software metrics is a more subjective measurement based on educational taxonomies such as Bloom's taxonomy (Figure 2, Bloom, Krathwohl, & Masia, 1956) and SOLO taxonomy (Figure 3, Biggs & Collis, 1982). This approach has been investigated and described in the literature featuring the classification of novices' programming tasks using both taxonomies (Whalley et al., 2006). Researchers have found that teachers are able to reliably classify problems with novices' programming using the SOLO taxonomy (Lister et al., 2009) and that the cognitive level of the task solved reflects the actual difficulty level.

2.1 SOLO Taxonomy

SOLO taxonomy provides criteria that identify the levels of increasing complexity in a students' performance when mastering new learning. The fig. 1 shows the SOLO taxonomy with sample verbs indicating levels of learners' understanding.

Lister et al. (2006) proposed the use of the SOLO taxonomy to classify the solution of programming tasks not according to their correctness but according to the level of the used programming constructs and their interconnection in the proposed algorithm for solving the presented problem. In addition to the student's own correctness, we follow the use of

the way the code is solved and understood in full context. The SOLO taxonomy describes five levels of student understanding in solving programming problems.

Figure 1 SOLO Taxonomy
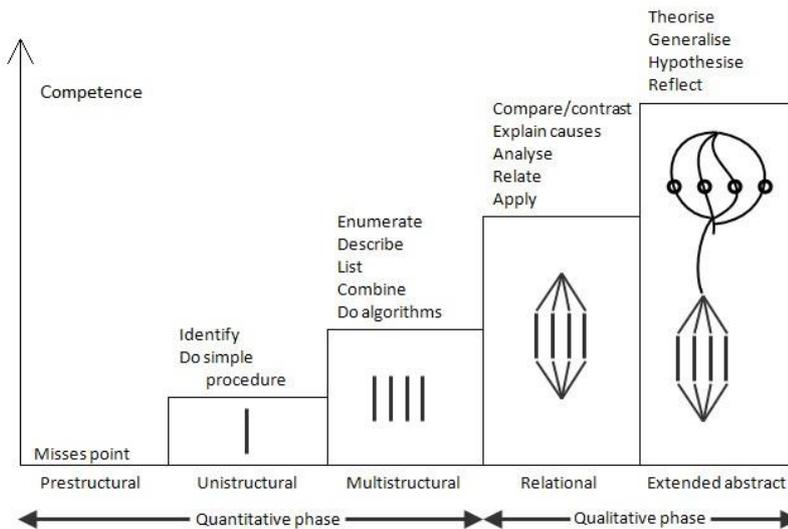
Source: Biggs & Tang (2007: 79)

According to the levels described, we assess the understanding of the programming problems presented to the novices we have been watching.

Prestructural

Student's answer to the problem is simple. The student has a misconception about the problem solution or student has an idea that is irrelevant to the programming solution of the problem. Students lack the knowledge of programming constructions. The student approaches the task inappropriately.

Unistructural

The student will understand the correct understanding of some aspects of the programming problem, but not all.

The student has a partial understanding and one or several aspects are acquired and used effectively. Students can apply an "educated estimate" (Lister et al., 2004), for example, the student correctly describes running a small piece of code.

Multistructural

The student is able to apply the correct parts of the solution to the problem, but does not take into account the mutual relations between them or within the whole code.

According to Lister et al. (2006), the student can't "see the forest for trees". For example, a student can describe individual code instructions and find the resulting value of a specific variable, but does not understand the code within the whole context.

Relational

Student's understanding corresponds to what is usually meant by a sufficient understanding of the topic being studied.

The student understands the different areas of the topic, the parts can be meaningfully connected to the whole and the resulting structures successfully applied in solving the problem. According to Lister et al. (2006), "student sees the forest".

For example, a student is able to describe a function action performed by a specific piece of code without stepping through individual instructions.

Extended abstract

Student solution goes beyond the problem to be solved. Student connects the solution of their problem with a wider context and is able to apply it in a wider field of use.

For our study, tasks focusing on supporting student performance at this level were not used.

2.2 The variable and the assignment statement

Proper and effective use of variables is essential for designing algorithms and writing programs. Mastering manipulation with variables is a prerequisite for the proper use of other programming constructs, such as arrays and its elements, cycles, code branching, counters, and more.

Dehnadi and Bornat (2009) presented that students hold eleven different mental models for the assignment statements (tab. 1).

Our goal was to find out which mental models the students use in their computer programs after three weeks enrolled in the course of the novice programmers.

Table 1 Anticipated mental models of the assignment a = b

Model	Description	Effect
M1	right to left move	$a \leftarrow b;\ b \leftarrow 0$
M2	right to left copy	$a \leftarrow b$
M3	left to right move	$a \rightarrow b;\ 0 \rightarrow a$
M4	left to right copy	$a \rightarrow b$
M5	right to left move and add	$a \leftarrow a + b;\ b \leftarrow 0$
M6	right to left copy and add	$a \leftarrow a + b$
M7	left to right move and add	$a + b \rightarrow b;\ 0 \rightarrow a$
M8	left to right copy and add	$a + b \rightarrow b$
M9	no change	
M10	equality	$a == b$
M11	swap	$a \leftrightarrow b$

Source: Dehnadi and Bornat (2009)

3 Research results

Tasks were divided by difficulty, the first two tasks contained a similar simple assignment with the requirement to overwrite the variable with a new value. The third, fourth and fifth tasks were similar, requiring two variables to be assigned in different order, respectively three variables in the fifth task. The last sixth task was most complex and abstract, no specific values were defined at the entrance. Here, students had to demonstrate an overall understanding of assignment techniques, when two variables were assigned to each other using the expressions with corresponding variables.

Figure 2 shows the distribution of solving student assignments according to the SOLO taxonomy.

In students' solutions, we have recorded new mental models of storing variables in memory and working with assigning values to variables. These models have been shown especially in the case of repeated writing of the value to the variable.

Some students mistakenly understand storing the value in the variable in the sense of the initial initiation of the constant, when another attempt to change the value of this variable is no longer permitted, because the variable already contains some value.

Other students misinterpret the storage of the value into a variable in the sense of the data structure, most often the queue, when all the values in the variable are memorized when they are repeatedly stored in the variable. When values are read repeatedly, the values are displayed in the same order in which the values were written to the memory.

The last case of a mental model indicates an empty mental representation. Students have no concrete idea of how repeatedly storing value in the same variable works. This is how students describe themselves as saying that they do not know what value is stored in the variable.

All three of these mental models are summarized in table 2, where they are progressively identified as M12, M13 and M14 models.

Figure 2 Distribution of students' solutions according to SOLO taxonomy
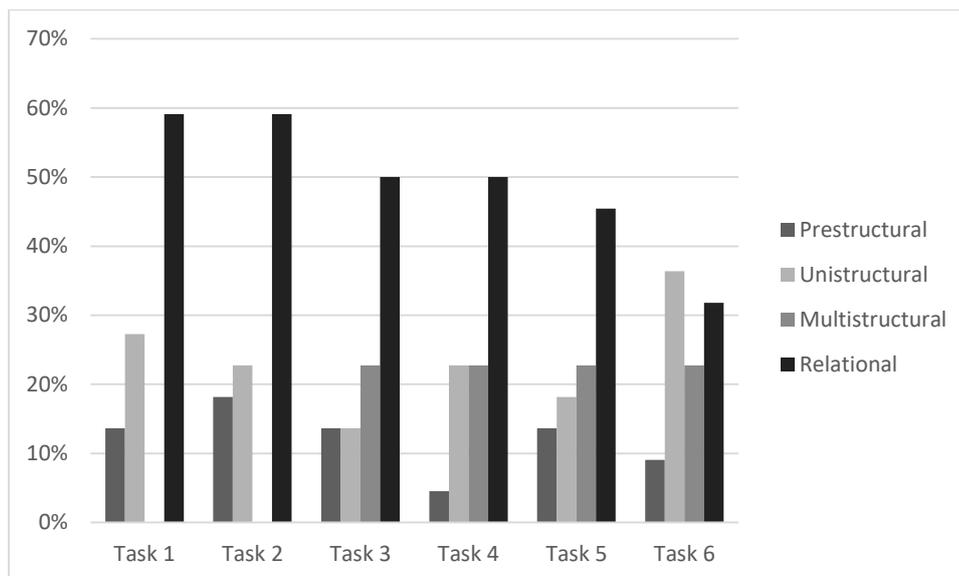
Source: own processing

Table 2 Observed new mental models of the assignment a = b

Model	Description	Effect
M12	constant variable	const a
M13	queue	a.Add(b)
M14	unclear solution	a ← ?

Source: own processing

4 Conclusions

In this paper, we investigated the use of programming concept variables and assignments for tertiary beginner students. Student solutions and solution descriptions were mapped using the SOLO taxonomy.

The results showed that approximately half of the students in the sample after three weeks of the introductory programmer's course is able to create the right representation mental models of the concept variable and the assignment statement. SOLO taxonomy represents an effective scheme for student research and assessment in the introductory course of programming.

References

Biggs, J. B., & Collis, K. F. (1982). *Evaluating the quality of learning: The SOLO taxonomy (Structure of the Observed Learning Outcome)*. New York. Academic Press.

Biggs, J., Tang, C. (2007). *Teaching for Quality Learning at University*. 3rd edition. England and NY: Society for Research into Higher Education and Open University Press.

Bloom, B. S., Krathwohl, D. R., & Masia, B. B. (1956). *Taxonomy of educational objectives the classification of educational goals*, Handbook 1: Cognitive Domain. New York: Longmans, Green & Co.

Corney, M., Teague, D., Ahadi, A., & Lister, R. (2012). Some empirical results for Neo-Piagetian reasoning in novice programmers and the relationship to code explanation questions. In *Proceedings of the 14th Australasian Computing Education Conference (ACE'12)*. (Vol. 123, pp. 77–86). Melbourne, Australia: Australian Computer Society Inc.

Dehnadi, S., Bornat, R., & Adams R. (2009). Meta-analysis of the effect of consistency on success in early learning

of programming. In *Psychology Programming Interested Group (PPIG) Annual workshop*. Limerick, Ireland. [cit. 2018-12-14]. Available from: http://www.eis.mdx.ac.uk/research/PhDArea/saeed/SD_PPIG_2009.pdf.

Denny, P., Luxton-Reilly, A., & Simon, B. (2008). Evaluating a new exam question: Parsons problems. In *Proceedings of the 4th international workshop on Computing Education Research (ICER'08)*. (pp. 113–124). Sydney, Australia: ACM.

Du Boulay, B. (1986). Some difficulties of learning to program. In *Journal of Educational Computing Research*. 2(1), 57–73.

Fleury, A. E. (2000). Programming in Java. In *ACM SIGCSE Bull*. 32(1), 197–201.

Ginat, D., & Menashe, E. (2015). SOLO Taxonomy for assessing novices' algorithmic design. In *Proceedings of the 46th ACM Technical Symposium on Computer Science Education (SIGCSE'15)*. (pp. 452–457). Kansas City, Missouri, USA: ACM.

Grover, S., Pea, R., & Cooper, S. (2015). Designing for deeper learning in a blended computer science course for middle school students. In *Computer Science Education*. 25(2), 199–237. DOI: 10.1080/08993408.2015.1033142

Izu, C., Weerasinghe, A., & Pop, C. (2016). A study of code design skills in novice programmers using the SOLO taxonomy. In *Proceedings of the 16th International 248 workshop on Computing Education Research (ICER'16)*. (pp. 251–259). Melbourne, Australia: ACM.

Kuittinen, M., & Sajaniemi, J. (2004). Teaching roles of variables in elementary programming courses. In *Proceedings of the 9th annual SIGCSE conference on Innovation and Technology in Computer Science Education (ITiCSE'04)*. (pp. 57–61). Leeds, United Kingdom: ACM.

Kumar, A. N. (2013). A study of the influence of code-tracing problems on code-writing skills. In *Proceedings of the 18th conference on Innovation Technology in Computer Science Education (ITiCSE'13)*. (pp. 183–188). Canterbury, United Kingdom: ACM.

Lister, R., Adams, E. S., Fitzgerald, S., & Al. (2004). A Multi-National study of reading and tracing skills in novice programmers. In *Working group reports from ITiCSE on Innovation and Technology in Computer Science Education (ITiCSE-WGR'04)*. (pp. 119–150). Leeds, United Kingdom: ACM.

Lister, R., Clear, T., Simon, B., & al. (2009). Naturally occurring data as research instrument: Analyzing examination responses to study the novice programmer. In *SIGCSE Bull*. 41(4), 156–173.

Lister, R., Fidge, C., & Teague, D. (2009). Further evidence of a relationship between explaining, tracing and writing skills in introductory programming. In *Proceedings of the 9th conference on Innovation and Technology in Computer Science Education (ITiCSE'09)*. (Vol. 41, pp. 161–165). Leeds, United Kingdom: ACM.

Lister, R., Schulte, C., Whalley, J. L., & al. (2006). Research perspectives on the objects-early debate. In *SIGCSE Bull*. 34(4), 146–165. 250

Lister, R., Simon, B., Thompson, E., Whalley, J. L., & Prasad, C. (2006). Not seeing the forest for the trees: Novice programmers and the SOLO taxonomy. In *Proceedings of the 11th annual SIGCSE conference on Innovation and Technology in Computer Science Education (ITICSE'06)*. (pp. 118–122). Bologna, Italy: ACM.

Mccabe, T. (1976). A Complexity Measure. In *IEEE Transactions On Software Engineering*. Vol. SE-2, no. 4, pp. 308-320. December 1976.

Mccracken, M., Almstrum, V., Diaz, D., Thomas, L., Guzdial, M., Utting, I., & Hagan, D. (2001). A multi-national, multi-institutional study of assessment of programming skills of first-year CS students A framework for first-year learning objectives. In *SIGCSE Bull*. 33(4), 125–140.

Muller, O. (2005). Pattern oriented instruction and the enhancement of analogical reasoning. In *Proceedings of the 5th International workshop on Computing Education Research (ICER'05)*. (pp. 57–67). Seattle, WA, USA: ACM.

Murphy, L., Fitzgerald, S., Lister, R., & Mccauley, R. (2012). Ability to "Explain in Plain English" linked to proficiency in computer-based programming. In *Proceedings of the 9th International workshop on Computing Education Research (ICER'12)*. (pp. 111–118). Auckland, New Zealand: ACM.

Oliver, D., Dobele, T., Greber, M., & Roberts, T. (2004). This course has a Bloom rating of 3.9. In *Proceedings of the 6th Australasian Computing Education Conference – Volume 30 (ACE'04)*. (pp. 227–231). Dunedin, NZ: Australian Computer Society, Inc.

Perkins, D. N., & Martin, F. (1985). Fragile knowledge and neglected strategies in novice programmers. In Soloway and S. Lyengar (Eds.), *Empirical studies of programmers*. Hillsdate, NJ: Ablex.

Philpott, A., Robbins, P., & Whalley, J. (2007). Assessing the steps on the road to relational thinking. In *Poster paper in the 20th Annual NACCQ*. Nelson, NZ.

Robins, A. (2010). Learning edge momentum: a new account of outcomes in CS1. In *Computer Science Education*. 20(1), 37–71.

Reges, S. (2006). Back to basics in CS1 and CS2. In *Proceedings of the 37th SIGCSE technical symposium on Computer Science Education (SIGCSE'06)*. (pp. 293–297). Houston, Texas, USA: ACM.

Samurçay, R. (1989). The concept of variable in programming: Its meaning and use in problem- solving by novice programmers. In E. Soloway, & J. C. Spohrer (Eds.). *Studying the novice programmer*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Soloway, E., Ehrlich, K., Bonar, J., & Greenspan, J. (1983). What do novices know about programming? In *Human--Computer Interactions*. 6(1), 27–54.

Soloway, E., & Spohrer. (1989). *Studying the Novice Programmer*. Hillsdale, NJ, Lawrence Erlbaum Associates.

Spohrer, J., Soloway, E., & Pope, E. (1985). A goal/plan analysis of buggy Pascal programs. In *Human – Computer Interaction*. 1, 163–207.

Spohrer, J. C., & Soloway, E. (1986). Novice mistakes: are the folk wisdoms correct? In *Communications of the ACM*. 29(7), 624–632.

Whalley, J., Lister, R., Thompson, E., Clear, T., Robbins, P., & Prasad, C. (2006). An Australasian study of reading and comprehension skills in novice programmers, using the Bloom and SOLO Taxonomies. In *Proceedings of the 8th Australasian Computing Education Conference - Volume 52 (ACE '06)*. (Vol. 52, pp. 243–252). Darlinghurst, Australia: Australian Computer Society, Inc.

Whalley, J., Clear, T., Robbins, P., & Thompson, E. (2011). Salient elements in novice solutions to code writing problems. In *Proceedings of the 13th Australasian Computing Education Conference - Volume 114 (ACE'11)*. (pp. 37–46). Darlinghurst, Australia: Australian Computer Society, Inc.

Wilson, L. O. (2001). *Anderson and Krathwohl – Bloom's Taxonomy Revised: Understanding the New Version of Bloom's Taxonomy*. [cit. 2018-12-14]. Available from: https://thesecondprinciple.com/teaching-essentials/beyond-bloom-cognitive-taxonomy-revised/

Winslow, L. E. (1996). Programming pedagogy-a psychological overview. In *ACM SIGCSE Bull*., 28(3), 17–22.

Yamamoto, M., Sekiya, T., Mori, K., & Yamaguchi, K. (2012). Skill hierarchy revised by SEM and additional skills. In *Proceedings of the International Conference on Information Technology Based Higher Education and Training (ITHET'12)*. (pp. 1–8). Istanbul: IEEE.

Model of e-commerce network with price comparison sites

Ladislav Beránek, Radim Remeš

Abstract: *In general, relationships within e-commerce can be modeled using a bipartite graph (network). One part of this graph is made up of customers and the second part is formed by e-shops (sellers). Edges show customer activities as they visit websites of different e-shops. However, online price comparison sites (PCSs, comparators, shopbots), such as Heureka, enter into these relationships. PCSs allow easily to compare the prices of desired product in different e-shops. These price comparators do not only show the price in different e-shops, but also the rating of the relevant e-shop made by customers. The questions addressed by this contribution are what strategy was chosen by the price comparator for market entry, when it is worth to terminate services of online price comparator, etc. In this paper, we use network analysis and simulation methods to model network dynamics to address these issues.*

Key words: E-commerce · Network-based inference · Simulation · Price comparison site

JEL Classification: D85 · L81

1 Introduction

Simultaneously with the development of e-commerce, related business applications have been developed and many new approaches have been widely used, for example, as a recommendation system for various online services or others. Online price comparators, which allow comparison of prices in various online stores, belong to successful applications. These sites are also known as price comparisons, sales points or retailers on the internet. Buyers online use them to get price information or to get user references for the relevant deals. They reduce buyer search costs and help them make decisions by providing price information that is rarely found in the context of physical retail purchases (Brynjolfsson & Smith, 2000).

One of the areas most extensively researched in recent years are the different types of online networks where research has, among other things, focused on the characteristics of these networks, their topology, and how links and their types affect the positions of agents in these networks, such as (Borgatti and Halgin, 2011) and vice versa, how the position allows for influencing other agents. One of such online systems is the e-commerce shopping and sales network, which can be described using interconnected graphs (networks).

In this paper, we will focus on explaining the formation of the business to customer e-commerce market structure with the emergence of an online price comparator. We will consider two groups of agents, buyers and traders. We can model these business networks as bipartite charts that include two sets of buyer and trader nodes (e-shops). The edges link buyers to e-shops, see Figure 1a. The principles of the network model may also include edges that link merchants to other merchants, but we do not think here. We will now consider a situation where the binder of a commodity that acquires a central position enters into the bonds of this bipartite graph. It will then act as an intermediary that will collect and provide users with information on the pricing of different products in a variety of e-shops (merchants). At the same time, the network topology changes see Figure 1b.

doc. Ing. Ladislav Beránek, CSc, MBA, University of South Bohemia, Faculty of Economics, Department of applied mathematics and informatics, Studentská 13, České Budějovice, e-mail: beranek@ef.jcu.cz

Mgr. Radim Remeš, University of South Bohemia, Faculty of Economics, Department of applied mathematics and informatics, Studentská 13, České Budějovice, e-mail: inrem@jcu.cz

Figure 1 Model of e-business relationships without (a) and with the presence of PCS (b)
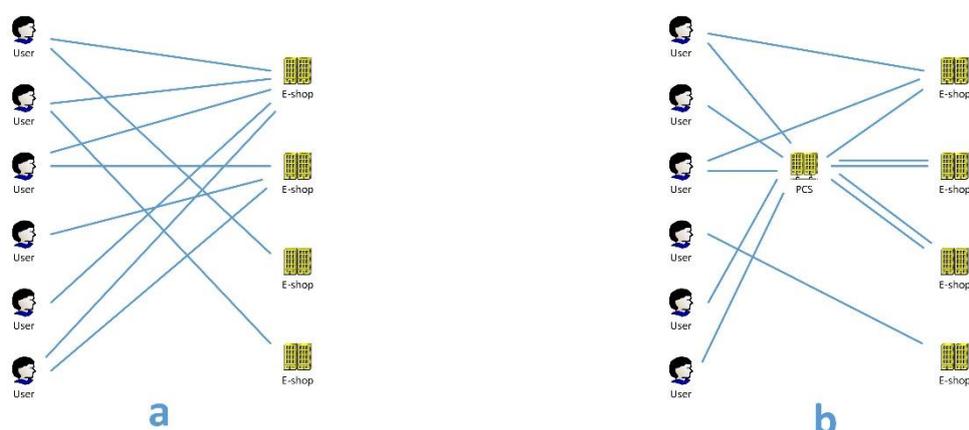
Source: Own processing

2 Methods

This article addresses the question: How does a newly arrived information broker (price comparator) integrate into existing bipartite network bindings? What is the strategy used? Our work is based on two assumptions: (a) We are focusing on bi-partite networks that model well e-commerce relationships; and (b) we examine the process of building relationships after price comparison sites appear.

We will deal with two approaches: (1) The first concerns the central position and the way to achieve this position. Here, we will use the frameworks described in (Moskvina and Liu, 2016). In line with this work, we will consider traders (eshops) as agents that give newcomers a pricing information about the products offered by these e-shops. The customer will be able to access e-shops via the intermediary's website. (2) The second approach is to model network dynamics. The network will evolve in the form of a sequence of images in discrete time that is determined by the initial network, the custom network evolution path, and the newcomer strategies for adding links. The goal of the newcomer is to adopt a tactic that moves it to the center in a limited number of steps, regardless of dynamic network changes.

2.1 Related work

The comparison of price pages concerned mainly the impact of price comparison sites on prices of products and services and the sensitivity of Internet customers to the price (Takayuki & Tsutomu, 2013; Pathak, 2012). Degeratu et al. (2001) states that the existence of price comparison sites increases price competition and sensitivity to buyers. We can also look at e-commerce as a network. Social and business networks are increasingly important areas of research in many fields (Borgatti & Halgin, 2011; Easley & Kleinberg, 2010; Lamanauskas et al., 2013). However, stable equilibrium and models focused primarily on this, while their dynamics and productivity were limited to research. One of the main tasks is to better understand, predict and control their dynamics, including how creates, develops and shapes their behavior and performance (Rauch, 2010; Schweitzer, Fagiolo & Sornette, 2009). Enough progress has been made in e-commerce applications so far, and e-commerce plays a very important role in the economy. A large number of buyers and sellers collaborate through transactions on websites (Beranek & Nydl, 2013; Beranek, Tlusty & Remes). These interactions support the development and shape of complex e-commerce structures. Getting a deep look at ecommerce research is of deep and lasting importance.

Most of the work examining the development of network formation is based on gaming-theoretical research and takes into account the balance between rational agents (Jackson, 2010). Graph chart definition is the standard role of graph theory as well as eccentricity. Both scales belong to the family of center-based indexes based on distance. The issue of the core / peripheral structure is dealt with, for example, in (Borgatti and Everett, 2000). In principle, a particular center can be identified for any real network. The observation of such stupendous structures is based on economics where the world is divided between industrial, "core" nations and agricultural, "peripheral" nations (Krugman and Venables, 1995). Similar structures are subsequently recorded, for example, in social networks and business networks (Fricke and Lux, 2015). Core agents that are hubs have many benefits, such as information control and resource control. A key feature of the nucleus, in addition to its central location and density, is stability over time (Rombach et al. , 2017).

Our article complements these work by examining modeling of relationship changes and related strategy within e-commerce processes after a price comparison site appears.

2.2 Building a structure in a dynamic network

In general, the dynamic network evolves in discrete time, that is, $G_i = (V_i, E_i)$ is a network instance at a certain time point $i \geq 0$. We define a set of vertices of the dynamic network G as a set $V_G = \cup_{i \in N} V_i$. Since G can contain infinitely many time stamps, the set of V_G can be infinite. For each vertex $v \in V_G$, the set of neighbors $E_G (v)$ is $\{u \in V_G \mid vu \in E_i, i \in N\}$. Since individuals have only limited number of transactions, the set $E_G (v)$ will be finite for all v. Thus, the graph $(V_G, \cup_{i \in N} E_i)$ remains locally the final graph.

We will define two limitations: First, basically, any addition or removal of vertices or edge edges can occur. However, we focus on a simpler form of dynamics in this paper, when we only consider adding vertices or edge edges. Secondly, we will only show the network when dynamics modeling occurs when updates occur. The exact meaning should correspond to the actual application scenario. When a customer finds one reseller and clicks (buy or buy the product), he does not search for the goods back on the search engine.

The E-commerce network is modeled as a bipartite graph G (U, V, E) whose vertices can be divided into two disjoint and independent sets U and V such that each edge *uv* joins a vertex *u* in *U* with vertex *v* in *V*. We designate the set of edges as *E*. In our concept, *U* denotes a set of buyers (users), *V* denotes a set of e-shops (see Figure 1).

Every user u ∈ U gains the benefit from the G network in terms of communicating information about prices of goods and services connected (information on goods transport, etc.). Although e-shops can only connect to their immediate users, they also use indirect communication streams with those agents (users, eshops) with which their direct neighbors are connected, etc. The flow of communication or knowledge flows from other agent shrinks away from players represented by the spatial depreciation rate of $0 < \delta < 1$, which captures the idea that the value that results from the connection k_j is proportional to the distance between these two agents. Furthermore, there exists an "internal value" $w_{ij} \geq 0$, that agent *i* gives agent *j*. In the following cases, it is assumed that all users and all eshops are identical except for one so-called "key-player" *k*, which provides higher value than any other agent (this could be interpreted as leading technology or an e-commerce platform provider).

Imagine an external agent now trying to be an information medium between the two parts of the bipartite network. This means passing information about the prices of certain products to individual eshops by users. At the beginning, this agent has to choose a way to take the appropriate position. This means ensuring that a certain group of eshops (referred to as initial seed) initially opts for this agent's information service and provides information about the prices of their products.

More formal description. Let $G_1 = (U_1, E_1)$, $G_2 = (U_2, E_2)$ are graphs (U, V may or may not overlap), we denote the operation of unification with the symbol $\oplus$, i.e., $G_1 \oplus G_2$ indicates the network $(V_1 \cup V_2, E_1 \cup E_2)$. Next, we will mark the new intermediate agent with the sign *w*.

For any subset $S \subseteq V$ we define $S \otimes w$ as $(S \cup w, \{vw \mid v \in S\})$. So $G \oplus (S \otimes w)$ is the resultant network obtained after the integration of w to G by building the connection between w and every vertex in S (i.e., the middle and a set of e-shops that initially provide information on the prices of their products).

We designate a set of initial seed as $S \subseteq V$. Through the contacts with the members of the initial seed set, w obtains access to the network and a certain central position in the network (see Figure 1). S must be of a certain magnitude so that w can act as an intermediary. Generally, this is the problem of a minimum set of brokers that is NP-complete [Moskvina and Liu, 2016].

Creating a relationship with agents of the initial seed set is a dynamic process. Since the relationship requires effort and time, the set of these are iterated, where edges are added at one after the other. Behind the dynamic network G, it would act while the network is developing (Yan et al. , 2017).

Incorporating w into the bipartite network is based not only on your own actions, but depends on the actions of other network agents. At each time stamp, the relationship w and e-shops evolve, and this affects another part of the bipartite network - the user. There are two types of updates, and e-shops send information to the node w, that is to say in our concept of edge creation to w, and users (buyers) create new edges to node w. The last update can be described similarly as creating a relationship with e-shops, i.e., formally for any subset $R \subseteq U$ we define $R \otimes w$ as $(R \cup w, \{uw \mid u \in R\})$. So $G \oplus (R \otimes w)$ is the resultant network obtained after the integration of w to G by building the connection between w and every vertex in R (i.e., the middle and the set of users (buyers).

Definitions 1. Correct the initial network $G_0 = (V_0, U_0, E_0)$ and the new incoming w not belonging to V_0 or U_0. For k, $\ell \in N$ is the integration process (IP) is a dynamic network $I = G_0, G_1, G_2, ...$ where $\forall i \geq 0$

$$G_{i+1} = G_i \oplus (S_i \otimes w) \oplus (R_i \otimes w)$$

where S_i is a subset of vertices in V_i and R_i is a subset of U_i.

Conceptually, IP (integration process) can be seen as an iterative interaction between w and a network. The progress from iteration $i \geq 0$ to $i +1$ will change in the network by (i) "connecting" the parts U_i a V_i of a graph G_i and (ii) adding an edge between w and vertices in S_i and R_i. The sequence of edges (i) and (ii) is called the evolution of the trace and the sequence of $S_1, S_2, ...$, is called the newly arrived strategy of a newcomer w. IP is uniquely determined by the initial network G_0 and network actions (in the form of tracing evolution). We will define these processes by the following rules:

The network grows as follows. At any time $t > t_0$, a new user or eshop is added. A new edge is added following the rule a) A percentage $\alpha \in [0; 1]$ of them at random; b) The rest by linear preferential attachment according to eshop's degree, so the higher the current links to a eshop, the higher the probability to be visited by user; c) when user visit PCS w the two edges are created, from user to PCS and from PCS to eshop with the use of linear preferential attachment.

The question arises as to how a newcomer (PCS) can choose his strategy during the initial integration process to get the more link as possible. To analyze the factors that impart tactical performance, we run following adapted models of dynamic networks in our simulation:

- Dynamic BA model. This well established dynamic model takes the parameter $d \in N$ and adds a new vertex to each time stamp that randomly associates d vertices with the preferential attachment mechanism. With multiple iterations, the graph develops a scale-free property, but does not achieve a highly clustered core.

- Dynamic JR model. The model proposed by (Jackson and Rogers, 2007) simulates stochastic friendship making among an agent population. An agent may link with a friend-offriends or a random individual. At each timestamp, the model randomly samples for every vertex v a set $S_1(v)$ of m nonadjacent vertices from the entire network, and another set $S_2(v)$ of m vertices who are at distance 2 from v ($S_1(v)$ and $S_2(v)$ may not be disjoint). It then builds edges between v and every vertex in $S_1(v) \cup S_2(v)$ with probability p. As argued in (Jackson and Rogers, 2007), the model meets most of the desired properties such as scale-free and small-world properties. The value $m \approx d/4p$ relies on p and an expected average degree $d \in N$ which are parameters of the model. We pick $p = \{0.25, 0.5, 1\}$ to resemble the fitted values on the real-world networks in (Jackson and Rogers, 2007).

- Dynamic rich club. The rich club is a "go-to" model of a core / peripheral structure that develops a dense central core with a thin edge (Csermely et al. , 2013). At each time stamp, the process adds a new vertex with probability $\alpha \in [0, 1]$ (and links it to a random vertex), or a relationship between two existing vertex with a probability of 1 - α. We choose in the second case a random source $w \in V$ and connect it to the target in the following way: For each $k \in N$ we set $[k] = \{v \in V \mid \deg(v) = k\}$; the probability that $z \in [k]$ is $\alpha k [k]$. The probability α, calculated as $\alpha = 2 (N + 1) / (Nd + 2)$, depends on the target diameter of the d scale and the N-size graph, which are the model parameters.

- Dynamic onions. The onion is a core / periphery structure, but unlike in a rich club, the peripheral vertex are joined here, forming the e or several layers surrounding the core, reminiscent of very elastic meshes, for example, criminal rings (Csermely et al. , 2013). The original model of a static onion creates a network with a fixed distribution of degrees of power law $q(k) \sim k - \gamma$ (where $\gamma \in R$ depends on the average degree d). We modify this model by following ways. In each time interval, (1) we add a new vertex v, whose degree is $\deg(v) = k$ with the probability $q(k)$; (2) to add v to G while preserving the degree distribution, create a pool of "half-edges" initially containing k studs attached to v; (3) randomly severe k existing edges into 2k vertex which are added to L; (4) repeatedly "join" random pairs of vertex v,w in L to form edge vw with probability $p(vw) = (1+3|sv-sw|)-1$, taking care to avoid self-loops and duplicates, until $L = \emptyset$ (Wu and Holme, 2011).

3 Research results

In this section, the numerical results are presented in Fig. 2. All the results are the average of 10 simulations for different realization of e-business networks under the same parameters. The step of all generated networks all reach 4000 nodes. We have also did the simulation to 1000 steps. A network with 4000 nodes could give us a nice description for asymptotic distribution. The degree distribution of authors is far from a power law distribution. The simulations are consistent with the scale free property observed from empirical data.

Figure 2 Result of numerical simulation
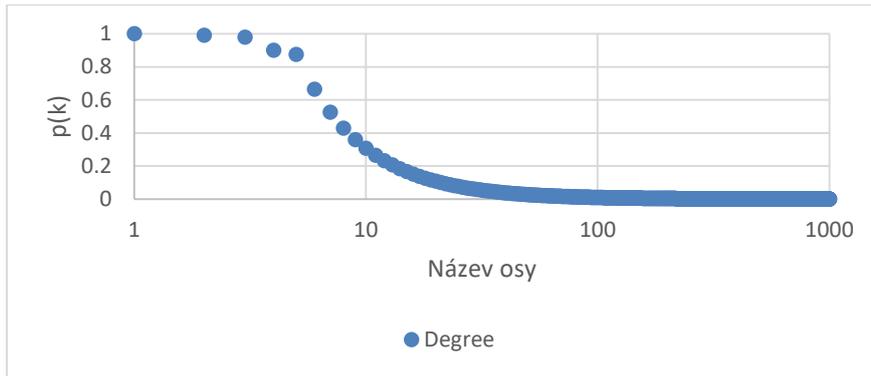
Source: Own processing

Figure 3 The increase of the degree of intermediate PCS for various seed sets
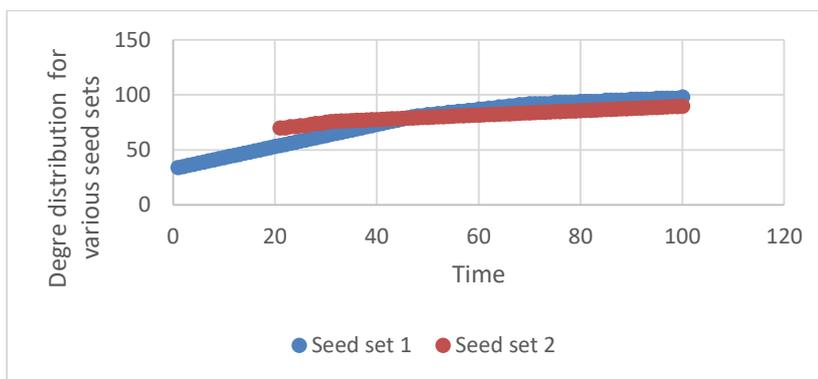
Source: Own processing

Numerical simulations indicate that this network evolves into a scale-invariant state with the probability that a node has k edges (here eshops, see Figure 2) following a power-law with an exponent c = 1.43 The scaling exponent is independent of m, the only parameter in the model. Fit-get-richer mechanisms are proposed which is better adapted to model certain networks where topological properties are essentially determined by ''physical'' information intrinsically related to the role played by each node in the network, such as the ability of an individual, the content of a web page, or the innovation of a scientific article.

In this paper, we focus on B2C e-commerce market network which involves three kinds of nodes—e-business website nodes and buyer nodes with the presence of price comparison sites. In the network model with two layers, each buyer node connects to at least one website node, even much more. We neglect the direct internal relations in each layer. It implies that the competitions among websites exist by way of attracting buyers. The theoretical background is drawn from niche competition theory. In the theory, businesses that have the same niche (resources, customers or market share) compete with each other. Figure 3 shows the course of the degrees of price comparison sites. The position depends on the strategy of during integration process to get into the network center (seed sets, the time of entering into e-commerce relationship (Figure 3).

4 Conclusions

So far there are very limited studies about e-commerce market with a network science perspective. Our study is a multi-disciplinary research intersected by marketing, economy and network science. We believe that the study of a real e-commerce market network will lead to further research that will reveal the hidden mechanism of economic and social system. Based on our empirical analysis of e-commerce market, we modify and expand evolutionary mechanisms of network evolving model. Our model can not only reveal how the structure of e-commerce market in the presence of price comparison site takes shape.

The fitness in our model is static. However, in real market, websites are growing and adjusting themselves, and dynamic fitness should be researched in future. In addition, the prerequisite for our research is that social, economic and technical environments are almost stable for a time. Environmental impact should be considered for future work.

Network dynamics modeling poses a number of challenges. Many future works remain: (1) It is a natural question to explore dynamic models where separate links are added. (2) There is a difference between the concept of core network and center (Borgatti and Everett, 2000); The future question would be to investigate tactics that instead of the newcomer to the kernel, rather than the center of the network. (3) The community structure is another predominant property on a scale and the same issue could be focused on dynamic models of community structure. (4) Transferring from a single agent's tactic to a population of agents can formulate and explore game theoretical models of networking based on social capital concepts.

A further challenge arises from the using real networks data about e-commerce. While available online networks can include thousands or millions of users, and thus give strong statistical correlations, detailed information on why users form links is usually lacking. Thus, it is difficult to distinguish links arising from prior similarity from influence of linked individuals creating similar preferences. In our future work, we want to explore further insight into the network of interest and make a more dynamic analysis of the network possible.

References

Beranek, L., & Nydl, V. (2013). The Use of Belief Functions for the Detection of Internet Auction Fraud. In: *Proceedings of the 31st International Conference Mathematical Methods in Economics 2013*. Jihlava: College of Polytechnics Jihlava, 2013, 31 - 36.

Beranek, L., Tlusty, P., & Remes, R. (2010). The Usage of Belief Functions for an Online Auction Reputation Model. In: *Proceedings of the 28th Conference on Mathematical Method in Economy 2010*. Economical faculty. University of South Bohemia, Ceské Budejovice, Czech Republic, September 2010, 49-54.

Borgatti, S., & Everett, M. (2000) Models of core/periphery structures. *Social networks*, 21(4), 375–395.

Brynjolfsson, E., & Smith, M.D. (2000). Frictionless Commerce? A Comparison of Internet and Conventional Retailers. *Management Science* 46, 563–585.

Borgatti, S., & Halgin, D. (2011). On network theory. *Organization science*, 22(5), 1168 – 1181.

Moskvina, A., & Liu, J. (2016). How to build your network? a structural analysis. In: *IJCAI-2016*, AAAI Press, 2597–2603.

Takayuki, M., & Tsutomu, W. (2013). Why Are Product Prices in Online Markets Not Converging? *PLOS ONE*, 8(8), 1 - 7.

Pathak, B. K. (2012) Comparison Shopping Agents and Online Price Dispersion: A Search Cost based Explanation. *Journal of Theoretical and Applied Electronic Commerce Research*, 7(1), 64 - 76.

Degeratu, A.M., Rangaswamy, A., & Wu, J. (2001). Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes. *International Journal of Research in Marketing*, 17(1), 55–78.

Easley, D., & Kleinberg, J. (2010). *Networks, Crowds, and Markets*. Cambridge: Cambridge University Press.

Lamanauskas, V., Slekiene, V., Balog, A., & Pribeanu, C. (2013) Exploring the Usefulness of Social Net-working Websites: a Multidimensional Model. *Studies in Informatics and Control*, 22(2), 175-184.

Rauch, J. E. (2010). Does Network Theory Connect to the Rest of Us? A Review of Matthew O. Jackson's Social and Economic Networks. *Journal of Economic Literature*, 2010, 980-986.

Schweitzer, F., Fagiolo, G., & Sornette, D. (2009). Economic Networks: The New Challenges. *Science*, 325 - 422.

Jackson, M. (2010). *Social and economic networks*. Princeton university press.

Krugman, P, & Venables, A. (1995). Globalization and the inequality of nations. *The Quarterly Journal of Economics*, 110(4), 857–880.

Fricke, D., & Lux, T. (2015) Core–periphery structure in the overnight money market: evidence from the e-mid trading platform. *Computational Economics*, 45(3), 359–395.

Rombach, P., Porter, M., Fowler, J., & Mucha, P. (2017) Core-periphery structure in networks (revisited). *SIAM Review*, 59(3), 619–646.

Yan, B., Chen, Y., & Liu, J. (2017). Dynamic relationship building: Exploitation versus exploration on a social network. In *International Conference on Web Information Systems Engineering*, Springer 2017, 75–90.

Jackson, M., & Rogers, B. (2007). Meeting strangers and friends of friends: How random are social networks? *American Economic Review*, 97(3), 890–915.

Csermely, P., London, A., Wu, L.Y., & Uzzi, B. (2013). Structure and dynamics of core/periphery networks. *Journal of Complex Networks*, 1(2), 93–123.

Wu, Z.X, & Holme, P. (2011). Onion structure and network robustness. *Physical Review E*, 84(2), 026106.

SESSION

MARKET RESEARCH AND SUSTAINABLE MARKETING IN TRADE
AND TOURISM

Integrated Marketing Communications of an Independent Pharmacy

Jaroslav Písek

Abstract: *Seasonal leaflets are the leading and dominant form of the communication mix in the promotion of pharmaceuticals, from which the various types of sales promotion are derived. Independent pharmacies compete with chain pharmacies and e-shops. There are two ways how to revive their integrated marketing communications. They can either follow an example of successful chains or strengthen their competitive advantages given by their independence and flexibility. As it is not economically feasible to compete on a flat-rate basis in patient participation payments and over-the-counter assortment prices, it is not smart to imitate marketing communication. A community pharmacy can utilise knowledge of its customers and concentrate on the medicines most burden their patients. We recommend focusing on a few essential products (one to three) and making these offerings more visible in the pharmacy's retail space. We would follow the principle of "less is sometimes more" and focus on the quality of personal sales and expert advice.*

Key words: Independent pharmacy · Communication mix · Czech Republic

JEL Classification: H51 · I11 · M31

1 Introduction

Pharmacies all over the world have exposed to a change that affects retail outlets around the world. Most retailers currently offer similar assortment and similar services. Customers are much better informed and are willing to find and compare the prices of the goods. Current trends are: forming new forms of retailing and their combination, increased competition across different kinds of retailing (especially between retailers and dealers) and the growth of retail giants. A noticeable trend is increasing investment in technology. Multinational companies expand their retail sales to new markets.

Independent pharmacies face competition from chains and virtual associations that use their bargaining power with suppliers to achieve favourable purchasing conditions. Prices and product offers are communicated to their customers. Marketing teams design plans to make a higher turnover, market share or profit for businesses, and then present their achievements to the public and their employees. Some independent pharmacies try to copy marketing communications of the most successful chains; others rely on personal sales supported by knowledge of local conditions and customers.

This paper aims to analyse the marketing activities used by pharmacies, chains of pharmacies and virtual organisations. Identified activities are evaluated for pharmacies communication of an independent pharmacy to suggest an appropriate integrated marketing communication.

2 Methods

The article aims to supplement the theoretical knowledge about integrated marketing communication in the pharmacy segment using the support of professional literature, scientific publications and the results of marketing activities analyses used by pharmacies, pharmacy chains and virtual organisations associating pharmacies. The second step is to design the proper integrated marketing communication for an independent pharmacy.

Resolved research questions will be:

1." What are the elements of marketing communication currently used by individual companies (chains with more than ten subsidiaries and virtual chains)?"

2."Does the current marketing communication of individual companies target the decisive factors of the consumer decision-making process when choosing a pharmacy to pick up or buy medicines?"

The source of information for the analysis will be secondary data from previously conducted research and personal work experience.

PharmDr. Jaroslav Písek, University of South Bohemia in České Budějovice, Faculty of Economic, Department of Trade and Tourism, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: pisekj00@ef.jcu.cz

3 Research results

The Dr.Max website covers pharmacies and e-pharmacy (e-shop). The leaflet is issued every month, the central theme for May 2018 was a safe stay in nature; means sun protection alleviation of allergy, tick protection and more. The flyer has 14 pages and contains promotion of 98 products. Sales promotion divides into five groups - discounts, 1 + 1, 3 for price 2 (mainly for own brand products), gifts, special offers and news. The "Dr.Max Benefit Card" client card main claim is: "Discount of up to half of the co-payment for everybody and every day. " The card can also take the form of a mobile phone application. Dr.Max provides customers with the magazine of Maximum, which combines news and interviews with celebrities with PR articles and ads on 48 pages. Dr.Max very actively uses advertising on TV channels, not only to promote action prices and benefits cards but also for the image campaign which started the last year. The company has its channel on youtube.com with 187 subscribers. Dr.Max's Facebook communication is tracked by 37,000 people, mostly about alerts on prices, product competitions, PR reports, or job search. In March 2018, the company placed nine stories on the profile and another nine in April 2018.

BENU pharmacies have the communication with customers similar to Dr.Max. BENU focuses on the current monthly promotion cycle, but without a precise topic. The products offered are divided into sections - top brands (Ibalgin, Centrum, Olfen and others), sunbathing, digestion, vitamins. A product for mother and child occupies significant space. The flyer has 14 pages and 65 products. The customer card has as its primary theme the "monitoring of your drug interactions", each purchase adds points to the customer account. The company sends discount vouchers by post, email, or displays it on an account on a website. BENU run TV advertising in a campaign in 2016, and the main theme was "Your health is in our charge". BENU is now continuing with TV ads, but to a relatively small extent (compared to Dr.Max). The channel on YouTube has 21 subscribers. On the website of benu.cz, it is possible to ask a question to the pharmacist, and a relatively large amount of space is devoted to job opportunities, where the company is currently looking for 91 new employees (May 6, 2018). The BENU magazine is also available on the website; now (May 2018) is available number 1/2018. 7,500 people, track BENU's Facebook account. BENU add 16 new messages to its profile in April 2018.

The IPC website (ipcgroup.cz) is entirely different; the primary information is a map with individual branches. The news section has the latest report of 27 March 2018 on Job Opportunities; the "New" Action Leaflet is dated February 27, 2018, and has eight pages with 41 products. The e-pharmacy is not very attractive and contains 12,000 items, probably the full range of Alliance Healthcare's supplier. The company organises events for its customers, especially from the field of healthcare providers, and sponsors local sporting events. Facebook has only a few pharmacies from the chain; the most active is the IPC Palladium in Prague.

Pilulka's internet presentation is very similar to Dr.Max or BENU-style graduation. Pilulka focuses on online orders, which is also evident from the fact that the current action flyer is valid from March 8 to April 30, 2018 (as of May 6, 2018). The main topic of the e-pharmacy is summer. Benefits program is in the form of an electronic card or points are loaded into the registered customer account. The primary reward is a 1% discount on the price of the purchased goods. The company publishes Magazine Pilulka four times a year with similar content to Dr.Max magazine. Pilulka has a Facebook profile with 23 users who are following it.

Agel is the operator of hospitals and polyclinics. The pharmacy promotion leaflet has four pages and is for the period from March 12 to April (status as of 6 May 2018). The e-pharmacy is of the standard type as for IPC. The client card is used to retrieve credits for purchases.

Devětsil informs about its branches on the Internet. It has an action offer for 27 products for the period from May 1 to June 30. The client card is used to retrieve points for purchases.

The DRFG Group states as the main advantages that they always prescribe a medicine prescribed by a doctor. Each pharmacy offers an own assortment that matches local demand. Most of the medications are free of charge. There are no promotional offers or client card or PR presentations on the website.

Teta has an action offer for a range of drugstore, magazine, and Teta club. There is no specific communication activity for the pharmacy assortment.

EUC is a provider of polyclinics. It has a promo flyer for 26 products from the pharmacy assortment and operates an e-pharmacy where it offers a similar variety and benefits to Agel.

The wholesaler of Pharmos operates Moje lékárná Virtual Association. Moje lékárna also offers own brand products. Pharmacists are regularly trained under the professional guarantee of the Czech gerontological and geriatric society to advise a group of elderly patients with the highest frequency of use of several types of drugs. The company operates an e-pharmacy where it offers a similar assortment as Agel. Information leaflets are not focused on products but the most common health problems associated with higher age. Moje lékarna magazine comes out six times a year. In March and

April 2018, a TV campaign on the Prima and Barrandov channels took place, containing two spots with product promotion.

Alphega is a pan-European project of the Walgreens Boots Alliance, both own and partner pharmacies. In the Czech Republic, Alliance distributor does not own any pharmacies, but their best customers joined its virtual network. Pharmacies have a unified exterior designation and interior and promote the Alphega brand. The Special Offers Leaflet (four pages, 31 products) is issued monthly, and the magazine comes out six times a year. The current themes of both are sun and allergies. Alphega does not have a client card, but many members have their customer loyalty programs. Twice a year, events are organised for members of the network, combined with cultural or sporting events.

Pharma Point is a virtual chain organised by the Phoenix wholesaler who owns BENU. Pharma Point has its monthly flyer, a quarterly magazine and client card, all work very similar to BENU, just under another brand.

Pilulka runs the CoPharm chain and offers negotiation of better delivery conditions for combine supply from suppliers. Latest leaflets with special offers are from autumn 2016. According to the information on the website, the loyalty program is in preparation.

Magistra has an action flyer six times a year. On the website, there is a list of co-payment free drugs, which is based on real product prices rather than on discounts applied in the pharmacies. On the website are short articles about individual health problems with a recommendation for self-medication. The loyalty program is called the Multiple Benefit Card, and special offers for cardholders are part of the action offer. Magistra used TV advertising in marketing communications. In 2015 and 2016, it presented the brand and prices of products on the secondary channels of Prima TV and Barrandov TV groups.

Czech pharmacists initiated the foundation of Družstvo lékáren (Drug Cooperative) in response to the situation on the pharmaceutical market in 2002. The Drug Cooperative aims to strengthen the economic and commercial position of the pharmacies' operators the members of the cooperative society to get closer to the conditions of the chains. However, it is essential to maintain the individual form of pharmacy ownership and at the same time a high level of healthcare services. The cooperative offers "marketing services aimed at streamlining the purchase of goods, services, and lowering the operating costs of the pharmacies "(source dlekaren.cz). The current offer of favoured products does not contain any bids. The cooperative offers own customer cards to identify the customer and provide bonuses and discounts, but these are not specified on the website.

Table 1 Companies and their marketing activities

Company	No of pharmacies	Advertising	Sales Promotion	Events	PR	Direct Marketing	WOM	Personal Selling
Dr.Max	423	+++	+	+	++	+	-	+
BENU	211	++	+	+	++	+	-	+
IPC	36	+	+	+	+	+	-	+
Pilulka	31	+	+	+	++	+	-	+
Agel	25	+	+	-	+	+	-	+
Devětsil	20	+	+	-	-	-	-	+
DRFG	16	+	+	-	-	-	-	+
Teta	14	+	+	-	+	-	-	+
EUC	12	+	+	-	++	-	-	+
Moje lékárna	380	+	+	-	-	-	-	+
Alphega	270	+	+	+	+	-	-	+
PharmaPoint	230	+	+	-	-	-	-	+
CoPharm	210	+	+	+	+	-	-	+
Magistra	202	++	+	-	-	-	-	+
Družstvo	57	+	+	+	-	-	-	+

Source: Own processing. Collection of May 2018 data.

3.1 Results of literary research

Authors Kostřiba, Kotlářová and Vlček (2015) presented the results of their research on the Determinants of selection pharmacies by citizens of the Czech Republic on the XVI. Symposium of Clinical Pharmacy René Mach in Mikulov and subsequently form the article. A sociological survey conducted by 303 professional interviewers to 1,797 respondents in late 2011. The self-medication, 54% of respondents said that they often seek treatment for their health problems without consulting a doctor and 31% occasionally heals itself. Identified motivation factors for the selection of pharmacies are most often the proximity of a pharmacy (41.3%), personal experience (28.7%) and lower prices (21.3%). No specific motivation factor for selection has 8.4% of the people in the sample. Men more often said they were choosing the closest pharmacy (46%) or no preference (11%). Women seem to prefer more personal experience (32%) and lower prices (24%) than men. Oldest citizens (aged 65 and over) rated 30% as the critical factor for lower prices. 96.1% of respondents buy over-the-counter pharmaceuticals in the pharmacies, and 7.4% of them also tried an e-pharmacy. The results of this re-search could be affected by the introduction of direct healthcare payments in January 2008, which of course increased the motivation for self-treatment and the search for pharmacies that did not collect the fees. Last year, Jitka Mikulcová (2017) continued this research, completing the findings in her diploma thesis led by Jan Kostřiba. The data was collected in January 2017 using an electronic questionnaire (Facebook and website) and paper forms addressed by Beta pharmacy customers in Beroun. The total number of respondents was 502. Only one pharmacy attended by a quarter of respondents. Nearly half of them regularly go to two pharmacies and less than fifteen per cent to three. More than three pharmacies visit 6.4% of respondents. Determinants for choosing a pharmacy - distance 53%, personal experience 34%, lower prices 12%. 63% of respondents said they were taking part in the loyalty program of some pharmacies. 37% of respondents do not own any client card. One-third of the respondents have their client card of one pharmacy, one fifth has cards two, 2.4% of respondents attend three programs, and more than three client cards own 1%. The most popular event is the discount product offer (39% appreciate this benefit), followed by pharmacies loyalty programs (25.2%), and supported by specific products purchased by discount (9.0%). Respondents also answered the question of whether these actions affect them when choosing a pharmacy. It is felt to be affected by 6.4% of respondents. Slightly, it affects almost a quarter of them (24.5%). 41% of respondents tend not to feel the impact of marketing on their choice of pharmacy and more than a fifth (22.3%) do not influence. For 66% of people surveyed, it is not essential a pharmacy presentation on the Internet. 80% do not follow pharmacy websites, and 90% do not monitor the pharmacies profiles on Facebook. Analysis of the Beta pharmacy in Beroun brought interesting data. As part of the promotional campaign, the pharmacy distributed nearly 600 coupons but only 25% used. 30% of people who have received a gift voucher have picked up their lips for free. The most used was a 55% discount on a prescription drug co-payment (37.3% of the vouchers distributed) and a 10% discount on the purchase of an additional assortment (35.3% coupons). The newly created Facebook profile tracks 85 people. The number of pharmacy customers in December 2016 was 113 people per day, in January 2017 it was 120 customers per day, in February 116 and in March it dropped to 99. It is clear from the data that during the few months immediately following the start of the campaign did not bring significant changes in pharmacy. Mikulcova (2017) also reports sales of pharmacies in the reference period, which range from 700 to 800 thousand CZK per month. Similar sales generated this pharmacy already in 2002 when I assessed its economic performance. Beta, due to lower turnovers, is changing the op-erator quite often, and as shown in the results, the promotional campaign did not bring the desired increase.

Trnka (2011) analysed in his work a marketing mix of the pharmacy "Na Václavském náměstí" in Kutna Hora (inde-pendent pharmacy). The owner has been running a pharmacy since 1994, but in 2009 she was forced, due to the termina-tion of the lease, to move the pharmacy from the clinic to new premises about 500 meters away. The owner arranges the transfer of patients from the clinic to his new pharmacy, which he finances from his resources. Pricing policy only deals with over-the-counter products. For cheaper products, the margin is higher, but not more than 25% (it is probably a mark-up, not a margin). Wobenzym margin is less than 8%, Olynth 18% and Ibalgin 20%. The biggest source of prescriptions is psychiatric surgery (415 thousand CZK per month), a practitioner (301), a pulmonary surgery (164) and two other practitioners (each 100 thousand). The owner considers the most important communication in personal sales, which he personally constantly supervises. The pharmacy is the so-called community type. The staffs have a deep knowledge of the customers. The owner considers an advertisement to be ineffective. PR activities are not run. Suppliers provide sales support through their seasonal promotional activities. It does not use direct marketing. The author of the thesis proposes: "Kutna Hora is a small, modern marketing intact city, so I believe that an unconventional or even partially, guerilla campaign among local people will stir up. However, it is very it is important that this campaign be new but not provocative and rather conservative there was no negative impact on older customers " (Trnka, 2011). For the campaign, he would use a discount, material rewards, competition, and a loyalty program.

Palátová (2011) analyses the influence of marketing communication of Aura pharmacy in Velká Bíteš (independent pharmacy) on consumer behaviour. The pharmacy opened in 2001 in a building opposite the polyclinic in which another pharmacy works. The paper deals with the results of the Coldrex promotion, which is very strongly supported by the

producer of GSK. The research conducted by 54 interviews with Aura pharmacy clients. Half of the customers explain their problem to the pharmacist and follow his/her recommendation, one-third of them know what they want, and the only question is the brand of product, one-fifth of respondents know what the product and its brand want. One-third of consumers are comfortable when the goods in pharmacies are exposed in shelves and can choose themselves. For a half, it is not crucial whether the products displayed in racks and less than a quarter are not looking at shelves at all and preferring personal sales. In conclusion, the author states: "The largest percentage of respondents opts for OTC (over-the-counter) drug purchases based on pharmacist's recommendations."

The diploma thesis (Slováková-Drábová, 2012) focused on increasing the competitiveness of the pharmacy "U Radnice" in Valašské Klobouky (independent pharmacy) using the marketing mix tools. The pharmacy opened in 2006 in the city centre by entrepreneurs whose original business is freight road transport. For promotional activities, the author writes: "From interviews with one of the directors, he does not need a promotion pharmacy. Advertising is essentially done by all pharmaceutical companies that spend much money on the visibility of their products, and the pharmacy is only the intermediary selling it. As far as the marketing mix is concerned, the company does not solve it; they do not have any idea about it. The pharmacy does the way it does, it earns, and so why do it more? " (Slováková-Drábová, 2012). She also states: "There are almost no differences in dispensing prescription drugs, doctors usually prescribe the same medications with a few exceptions, and therefore the only area where the offer may vary is the sale of OTC (over-the-counter) medicines, vitamins, cosmetics, nutrition, etc. The pharmacy offers a wide range of products from different manufacturers and brands, but it does not differ significantly from the competition. It is a typical pharmacy with common goods " (Slováková-Drábová, 2012). The author proposes these marketing communication tools for the campaign - advertising in the form of a leaflet and redesigns the advertisement used in the regional monthly magazine; PR articles of addressing health problems publish in the City Newsletter and on the web; introduce a loyalty program and send out newsletters to registered email addresses. Another recommendation is to create and run a website, e-pharmacy and profile on Facebook.

Hajdová (2017) evaluates Loyalty Programs by Dr.Max, BENU, Alphega, and Moje lékárna (chains). The author appreciates Dr.Max as the most advanced. It also states: "The pharmacy should differ from others, and the great advantage of independent pharmacies over corporations is good knowledge of the local environment and rapid or even immediate reaction when needed." According to survey results (only 66 subjects), almost half of respondents do not own a pharmacy loyalty card, and approximately the same part refuses to register for such a program. 80% is not interested in receiving email offers. The e-pharmacy services use 36%. 71% of respondents use the nearest pharmacy, and the same share does not actively look for pharmacy action offers.

Šafová (2017) of the ppm factum research company presented an omnibus survey that compared the results of the 2006 and 2017 studies in the field of addressing common health problems. According to the results, people more often than not in 2006 want to manage their disease without drugs, they either do not use anything, they are at rest, do not hesitate or use herbal teas, heating and cooling pads. Significantly less frequently than in 2006, OTC (over-the-counter) products are used to treat common health problems. People are more likely to choose a telephone consultation with a physician than personal contact, and they rarely go to a pharmacy.

4 Conclusions

From a comprehensive theoretical range of Integrated Marketing Communications tools, pharmaceutical chain operators use traditional and proven tools to meet the needs of customers looking for the most cost-effective deals. Seasonal leaflets are the leading and dominant form of the communication mix, from which the various types of sales promotion are derived. Events are not focused on customers/patients, but preferably on partners or B2B customers. Direct marketing associates with a loyalty program. Registered customer regularly receives news and promotional materials. Interactive marketing is mostly present in websites and profiles on social networks. I did not notice any attempt to influence WOM in the Czech Republic in the pharmacy segment. The principal activity remains personal sales, where we can find the crucial difference between chain employees and independent pharmacists. While employees are motivated to produce or sell what is best for the business, the majority of independent pharmacists try to offer a product recommendation that best suits a particular customer and thus built a relationship with the customer, who seek for on best previous experience. Most customers visit the closest and "proven" pharmacy. It is not economically feasible to compete on a flat-rate basis in co-payments and over-the-counter assortment prices, as a pharmacy does not have enough strength to negotiate with suppliers as a chain. A community pharmacy can leverage knowledge of its customers and focus on drug supplements that are the most burdened by their patients. The ways to achieve this are more. Choose a substitution drug within the same drug group with a lower or zero surcharge. Make a substitution in the form of an individually prepared medicinal product if a technological prescription is available or the European Pharmacopoeia describes a substitute. The simplest is to negotiate a discount with a supplier or reduce the margin.

In the same way, we can reduce our customers' prices even in the OTC (over-the-counter) assortment. Due to the overwhelming advertising and sales support, I recommend focusing on the key products (one to three) and making these offerings more visible in the pharmacy's retail space. Most independent pharmacies are a micro-enterprise with low turnover and limited profit. I would propose to follow the principle of "less is sometimes more" and focus on the quality of personal sales and expert advice. Financially strong pharmacies can use all the modern tools of integrated marketing communications and then evaluate achieved results. From the study of Beta pharmacy in Beroun, we can deduce that marketing communication could not balance the fundamental problem of this pharmacy, which is low profit compared to costs.

Acknowledgement

References

Hajdová, K. (2017). *Věrnostní programy ve farmacii.* (Master), Univerzita Tomáše Bati ve Zlíně, online. Retrieved from http://digilib.k.utb.cz/handle/10563/41346

Kostřiba, J., Kotlářová, J., & Vlček, J. (2015). Opinions and Attitudes of Czech Citizens on Selected Issues of Drugs in Society. *Acta Poloniae Pharmaceutica - Drug Research, 75*(5), 1027-1038. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26665410

Mikulcová, J. (2017). *Analýza marketingových strategií lékáren.* (Master), Univerzita Karlova, Farmaceutická fakulta, online. Retrieved from https://dspace.cuni.cz/handle/20.500.11956/85363

Palátová, J. (2011). *Vliv marketingové komunikace na spotřební chování.* (Master), Vysoká škola ekonomická v Praze, online. Retrieved from https://vskp.vse.cz/eid/31083

Slováková-Drábová, V. (2012). *Projekt zvýšení konkurenční schopnosti Lékárny U Radnice ve Valašských Kloboukách využitím nástrojů marketingového mixu.* (Master), Univerzita Tomáše Bati ve Zlíně, online. Retrieved from http://digilib.k.utb.cz/handle/10563/18940

Šafová, M. (2017, October 3). *Nákupní zvyklosti obyvatel ČR v jednotlivých kategoriích a vlastní odpovědnost ke zdraví.* Paper presented at the XX. OTC konference, Prague, Czech Republic.

Trnka, Š. (2011). *Analýza marketingového mixu lékárny.* (Bachelor), Vysoká škola ekonomická v Praze, online. Retrieved from https://vskp.vse.cz/eid/29318

Geomarketing as a Tool for Market Size Estimation

Radim Dušek, Viktor Vojtko

Abstract: *This paper deals with a market size estimation tool that is based on a combination of geomarketing methods and consumer spending datasets. The analyzed data were drawn from publicly available sources, mainly collected by the Czech Statistical Office over the period 2011-2016. With the use of QGIS software, the method allows to estimate the local market size and its annual growth rate at the level of municipalities, districts and various consumption categories such as food and non-alcoholic drinks, alcoholic drinks and tobacco or clothing and footwear. These kind of results can be used as an assumption for marketing decision-making process as well as guidance about where the biggest opportunities and threats in the local market size and growth are.*

Key words: Consumer spending · Geomarketing · Market Share · GIS Software

JEL Classification: M31 · D10 · L11

1 Introduction

These days, enterprises are operating in highly globalized world and this situation brings them many disadvantages and limitations they have to face in management and marketing decisions implementation compared to their larger competitors. According to Barnett (1988), market demand and share forecasting is not a guarantee of success, but without it, marketing decisions will be based often on unsubstantiated assumptions. That is why it would be benefical to use simple and low-cost methods and tools that can help to estimate local market size and growth. The use of geomarketing tools could be the solution.

Geomarketing is a discipline that uses geographic information in the process of planning and implementation of marketing activities (Cross et. al., 2015; Tynan and Drayton, 1987). It can be applied in different marketing aspects, such as marketing communication, pricing, segmentation of the market and geographical targeting (Fischer and Staufer-Steinnocher, 2001; Bloom, 2005). In combination with the historical sales datasets and demographic information, geomarketing can be applied to estimate and visualise local market size and its structure (Touzani and Van Buskirk, 2016; Wang, Fan and Gong, 2018).

Especially for the small and medium-sized enterprises, there are two big advantages of implementing geomarketing tools into marketing decision-making process. Various big datasets are publicly available, usually for free by statistical offices or Eurostat, and the final results visualised by QIS software are easy to create and understand.

2 Methods

The aim of this paper is to present a method that allows to calculate estimated consumer spending in selected local market as well as its average annual growth rate in consumer spending and shown the results graphically. For this research, we have decided to focus primarily on spending estimation in these categories: food and non-alcoholic beverages; alcoholic beverages and tobacco; clothing and footwear.

This method is based on existing publicly secondary data that are available for any defined local market in the Czech Republic. We joined together data set about total consumer spending (obtained by the Czech Statistical Office over the period from 2011 to 2016) with geographic and demographic data about 6253 Czech individual municipalities to estimate

Ing. Radim Dušek, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economic, Department of Trade and Tourism, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: dusekr@ef.jcu.cz

Ing. Viktor Vojtko, Ph.D., University of South Bohemia in České Budějovice, Faculty of Economic, Department of Trade and Tourism, Studentská 13, 370 05 České Budějovice, Czech Republic, e-mail: vojtko@ef.jcu.cz

the local consumer spending with the formula (1) as well as the average annual consumer spending growth over the period 2011 – 2016 with the formula (2):

$$CS_{M,y} = AS_{NUTS2,y} \times I_{M,y} \qquad (1)$$

where:

CS   local consumer spending

M   municipality

Y   year

AS   average consumer spending

NUTS2 municipality NUTS2 region

I   number of inhabitants

$$CSG_M = \sqrt[5]{\frac{CS_{M,2016}}{CS_{M,2011}}} - 1 \qquad (2)$$

Dew;

where:

CSG   average annual consumer spending growth

   In the next step, the results imported into the QGIS software allowed us to generate maps with estimated consumer spending or growth rate in all Czech municipalities, districts or regions or calculate the respective figures for selected local markets as covered by the case study. It is focused on estimating local market size and growth rate using circle with approximately 12 kilometres radius from the České Budějovice city. We applied the descibed method to 61 municipalities to estimate total consumer spending in 2016, annual growth rate over the period from 2011 to 2016 as well as estimated consumer spending in three consumption categories in 2016.

3 Research results

This chapter deals with visualising estimated Czech Republic's municipalities and districts consumer spending in 2016 as well as the average annual consumer spending growth over the period from 2011 to 2016. All figures were created using existing publicly available secondary datasets.

3.1 Estimated consumer spending and average annual growth rate

As shown in Fig. 1, the highest consumer spending estimation in 2016 have been calculated in these cities: Prague, Brno, Ostrava and Plzeň. On the other hand the total consumer spending in nearly all Czech municipalities didn't exceed 3.78 hundred million CZK in 2016.

Figure 1 Czech Republic municipalities' estimated total consumer spending in 2016
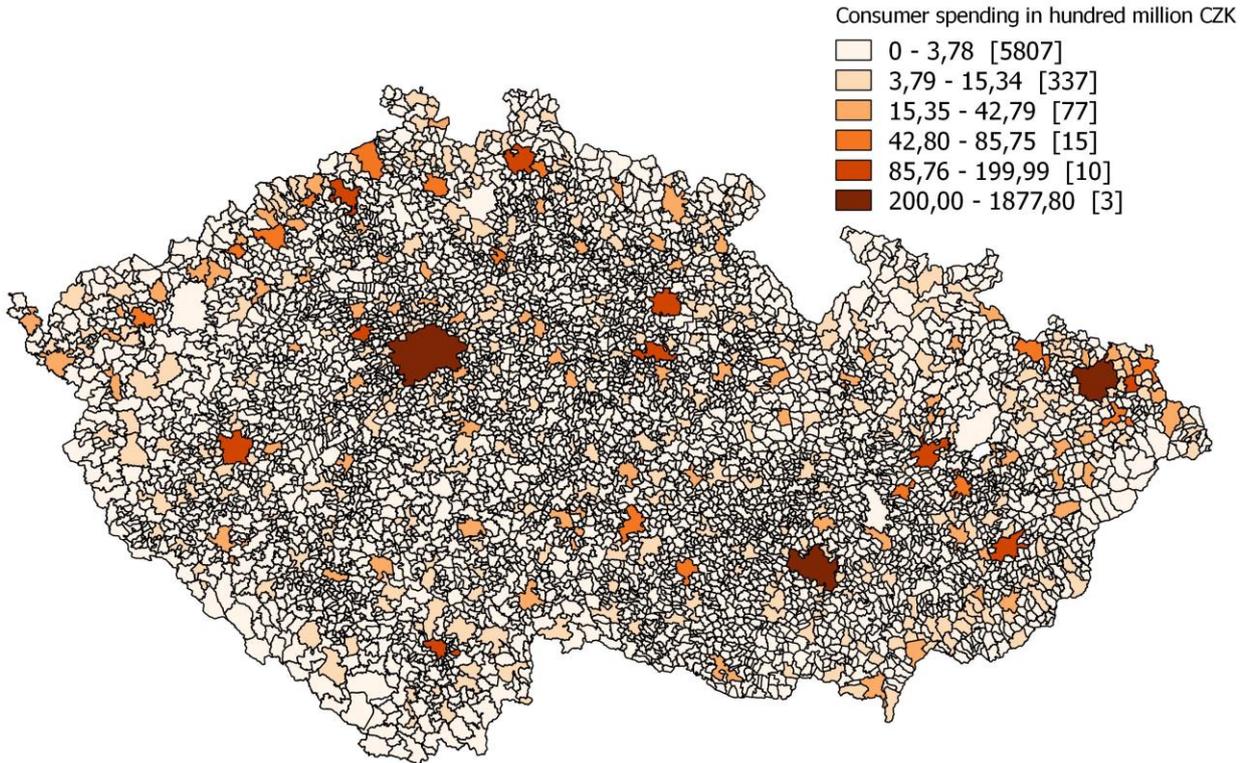
Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

In the decision making process it is also important to know if the spending in specific area is significantly increased or decreased at a certain time. To answer this question, the average annual growth rate of consumer spending over the period 2011-2016 was calculated in all districts. Besides the expected high growth areas near Prague and Brno, the significant consumer spending increasing over the last years can be seen in the northeastern districts such as Pardubice, Liberec and Hradec Králové (Fig. 2).

Figure 2 Czech Republic districts' average annual growth rate in consumer spending over the 2011-2016 period
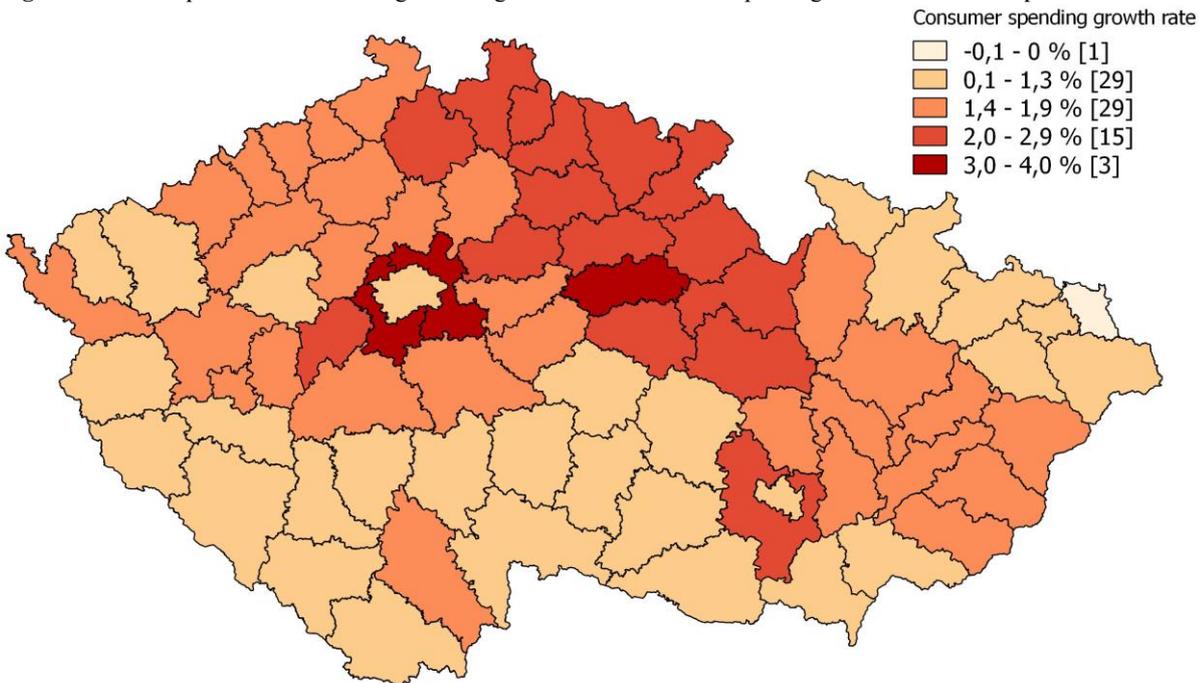
Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

3.2 Estimated consumer spending and average annual growth rate

In this part of results chapter are shown figures with estimated Czech consumer spending in 3 consumption categories: food and non-alcoholic drinks; alcoholic drinks and tobacco; clothing and footwear. In this case, we calculated the spending estimates at the district level for greater clarity of results.

Figure 3 Czech Republic districts' total food and non-alcoholic drinks spending in 2016

Food and non-alcoholic drinks spending
- 0,95 - 2,29 billion CZK [23]
- 2,30 - 3,69 billion CZK [37]
- 3,70 - 5,59 billion CZK [12]
- 5,60 - 8,99 billion CZK [4]
- 9,00 - 35,05 billion CZK [1]
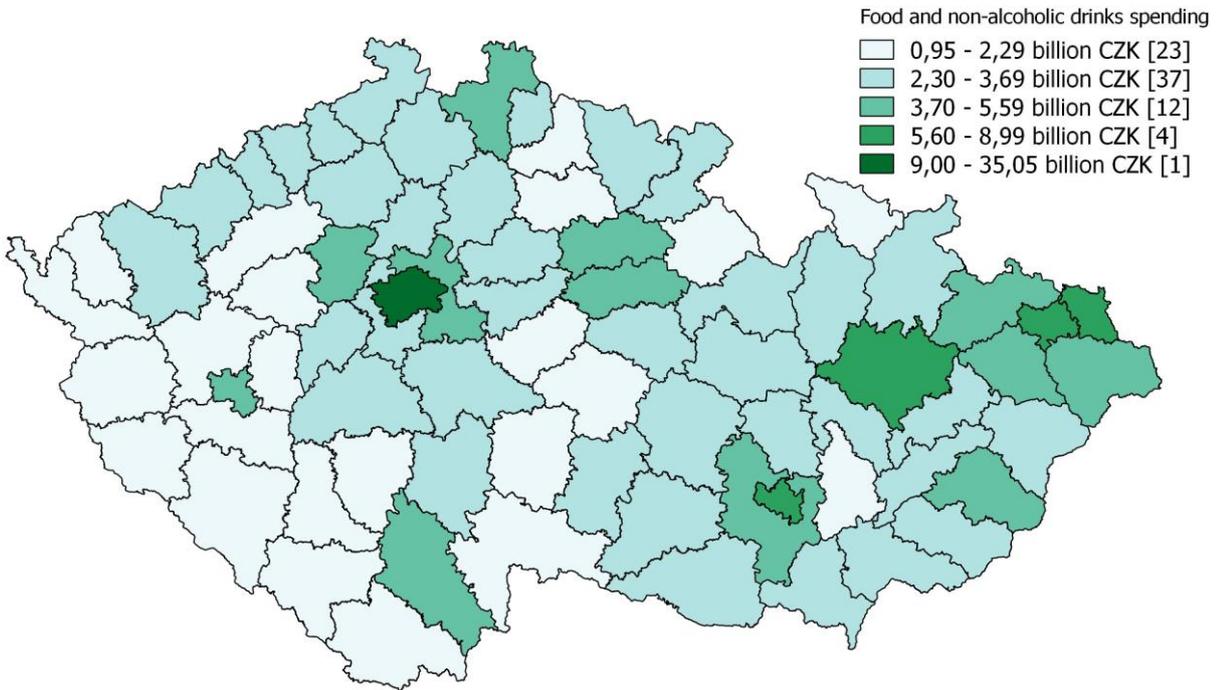
Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

Figure 4 Czech Republic districts' total alcoholic drinks and tobacco spending in 2016

Alcoholic drinks and tobacco spending
- 0,13 - 0,39 billion CZK [39]
- 0,40 - 0,59 billion CZK [24]
- 0,60 - 0,79 billion CZK [8]
- 0,80 - 1,49 billion CZK [5]
- 1,50 - 4,91 billion CZK [1]
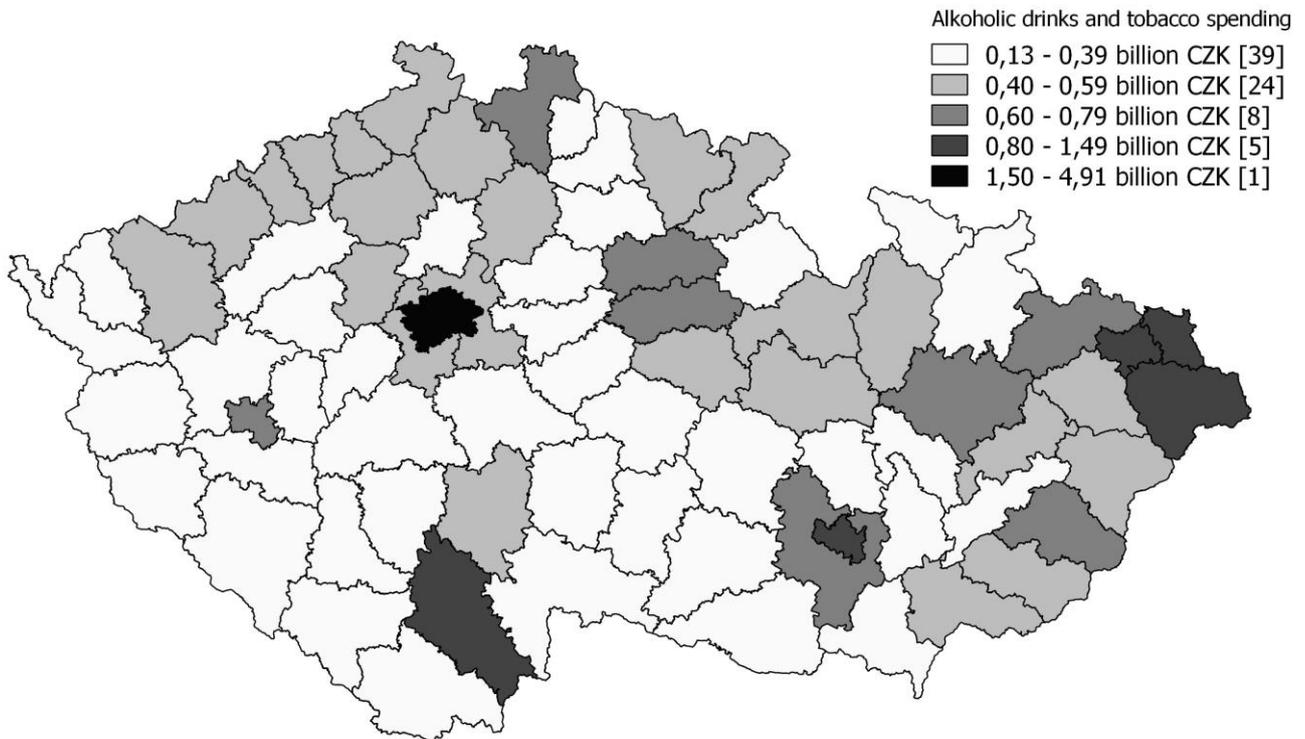
Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

Figure 5 Czech Republic districts' total clothing and footwear spending in 2016
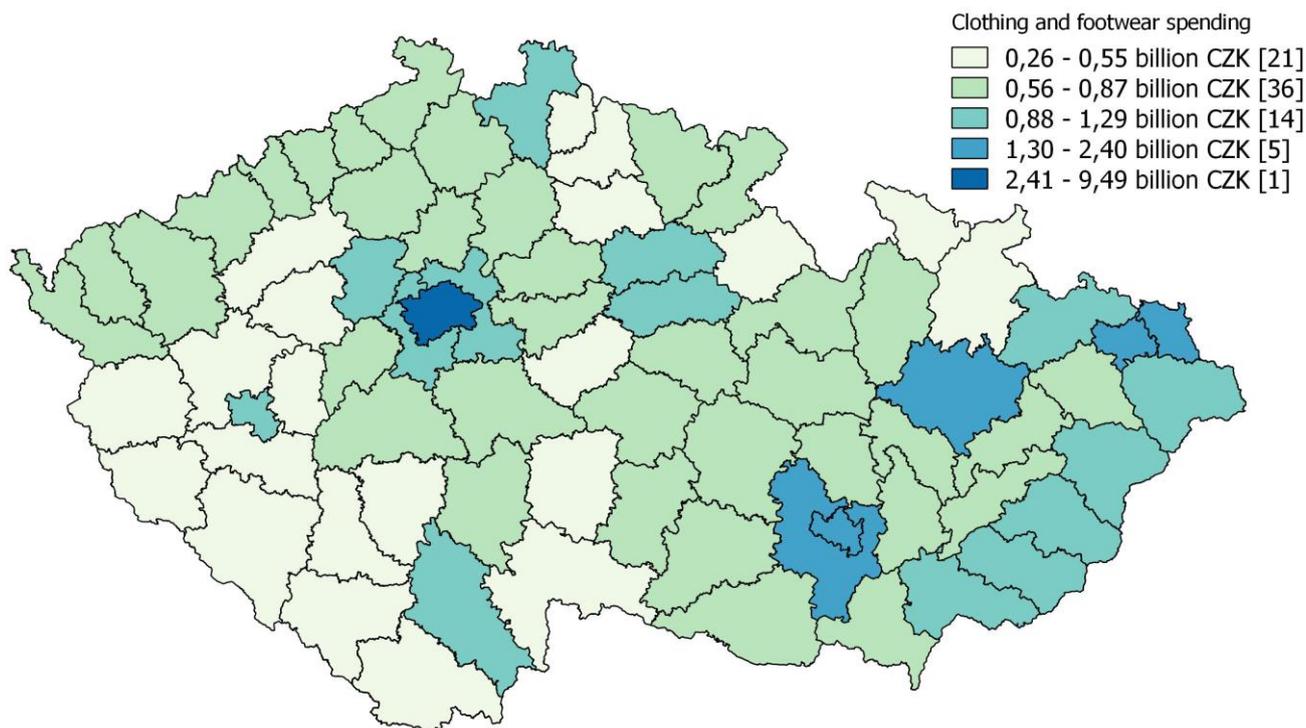
Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

3.3 Case study

The mentioned method could be of course applied on smaller local market that is relevant for a particular small or medium-sized enterprise as demonstrated by case study. As an example, 61 municipalities in the České Budějovice district have been selected using 12 kilometers circle in the QGIS software. The outputs for 2016 are shown in Tab. 1. The generated basic information about selected area includes number of inhabitants, estimated total consumer spending and average annual growth rate of consumer spending as well as consumer spending in chosen 3 consumption categories.

Figure 6 Case study - estimated total consumer spending in the selected area in 2016
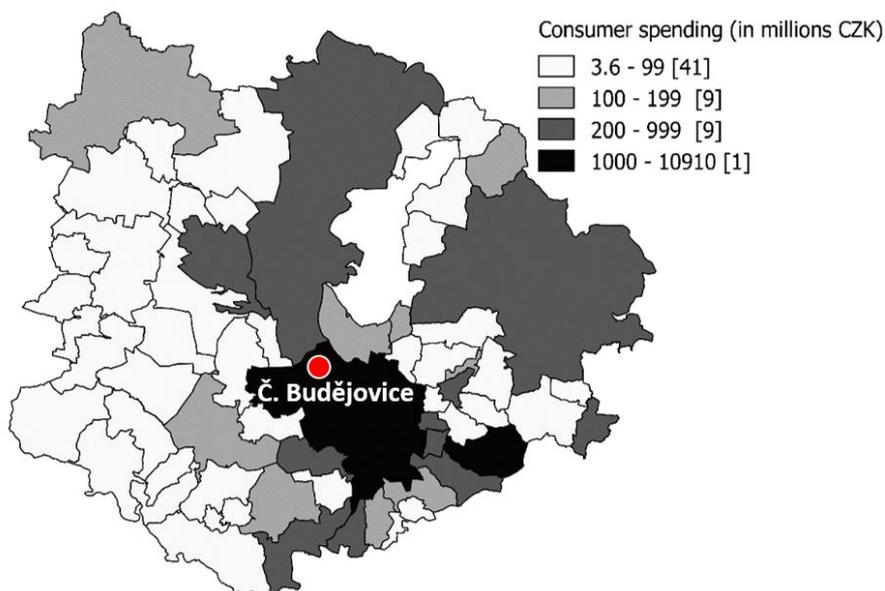
Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

Table 1 Case study – estimated local market size

Selected area information	
number of municipalities	61
number of inhabitants (2016)	147 845
estimated total consumer spending (2016)	17 256 000 000 CZK
average annual growth rate of consumer spending (2011-2016)	+2.79%
Estimated consumer spending in chosen categories	
estimated food and non-alcoholic beverages spending (2016)	3 486 480 000 CZK
estimated alcoholic beverages, tobacco spending (2016)	615 479 000 CZK
estimated clothing and footwear spending (2016)	881 895 000 CZK

Source: Own processing based on Czech Statistical Office data (ČSÚ, 2017)

4 Conclusions

In this paper, we have introduced a market size estimation method that is based on a combination of geomarketing tools and dataset that includes total consumer spending over the period 2011 – 2016. With the use of GIS software, it allows to estimate the local market size and growth in Czech Republic that can be defined by relevant municipalities and various consumption categories. These kind of results can be used as an assumption for management and marketing decision-making process.

Using this method, we have created maps with estimates of total consumer spending in all Czech Republic municipalities in 2016 as well as the consumer spending average annual growth rate in 2011-2016. To estimate local market size at the category level, we have chosen 3 consumption categories for which consumer spending estimation was calculated: food and non-alcoholic beverages spending; alcoholic beverages, tobacco spending and clothing and footwear spending. Case study with the estimated spending in mentioned categories is an example of which results can be provided by this tool to enterprises and that it may serve as a guidance about where the biggest opportunities and threats in the local market are.

References

Barnett, W. (1988). Four Steps to Forecast Total Market Demand. *Harvard Business Review,* 4, 28-34.

Bloom, J. Z. (2005). Market segmentation: a neural network application. *Annals of Tourism Research*, 32(1), 93-111.

Cross, J. C., Belich, T. J., & Rudelius, W. (2015). How marketing managers use market segmentation: an exploratory study. In: *Proceedings of the 1990 Academy of Marketing Science (AMS) Annual Conference,* Cham: Springer International Publishing, 531–536.

ČSÚ. (2017). Vydání a spotřeba domácností statistiky rodinných účtů. [Online]. Available at: https://www.czso.cz/csu/czso/vydani-a-spotreba-domacnosti-statistiky-rodinnych-uctu-2016. [Accessed: 2017, November 16].

Fischer, M. M., & Staufer-Steinnocher, P. (2001). Business GIS und Geomarketing: GIS für Unternehmen. Institut für Geographie und Regional forschung der Universität Wien. *Geographischer Jahresberichtaus Österreich,* Wien: Universität Wien, 9–24.

Touzani, S., & Van Buskirk, R. (2016). Estimating Sales and Sales Market Share from Sales Rank Data for Consumer Appliances. *Physica A: Statistical Mechanics and its Applications,* 451, 266-276.

Tynan, A. C., & Drayton, J. (1987). Market segmentation. *Journal of Marketing Management*, 2(3), 301-335.

Wang, L., Fan, H., & Gong, T. (2018). The Consumer Demand Estimating and Purchasing Strategies Optimizing of FMCG Retailers Based on Geographic Methods. *Sustainability*, 10, 466-484.

Social network Facebook and customer engagement: A pilot case study from the Czech Republic

Ludvík Eger, Dana Egerová

Abstract: *In recent years social media has provided new ways for companies to communicate with the public. Companies need to interact with current and potential customers using social media such as Facebook, which is very popular with target groups. The purpose of this study is to explore the communication of selected hotels with the public focusing on company communication that facilitates consumer sociability behavior on Facebook. This pilot study uses a mixed methods research approach and integrates quantitative data analysis in the first phase, using tools such as Power BI and Netvizz, with qualitative content analysis of company messages using Atlas.ti software. The data were obtained from six four-star hotels on Facebook in September 2018. The findings provide evidence of how hotels use Facebook for company–customer communication. The findings also indicate that different message features generated different customer behavior. The study contributes to a better understanding of marketing on social media in the hotel industry.*

Key words: Hotel · Social media · Facebook · Engagement

JEL Classification: M31 · Z39

1 Introduction

Current company websites and social media give companies a greater opportunity to provide content that matters to current and potential customers and other public. Social networks are user-friendly technologies that allow people to rapidly update, analyze, and share information and ideas. The number of social network users worldwide reached 2.46 billion in 2017 (Statista, 2018). The most popular social media website for people is Facebook, which has more than 2 billion active users worldwide. As many organizations invest in social media, it is important to identify the factors that are associated with the successful adoption of these technologies for marketing targets.

2 Social media and marketing

Social media has become extremely popular and plays an important role in consumers' everyday lives. "Social media is a term used to describe the type of media that is based on conversation and interaction between people online" (Strauss & Frost, 2012, p. 306). Organizations seek to attract more attention from the public. Organizational use of social media is changing the way organizations communicate with the public. A growing number of companies have established and maintain an interactive online presence via social media to engage with current and potential customers and other public (Hudson et al., 2016; Mičík & Mičudová, 2018; Vendemia, 2017; Williams & Hausman, 2017). Social media platforms have emerged as a dominant digital communication channel via which consumers learn about, share information on, and interact with brands they consider, purchase, and evaluate (Hudson et al., 2016).

Strauss and Frost (2012) argue that where customers go, organizations follow. Successful company-consumer interactions foster customer loyalty, willingness to try new offerings, and resistance to negative information about the company (Bhattacharya & Sen, 2003). In the context of social media, literature claims that it can have a positive impact on organizations in digital advertising and promotion, in creating electronic word of mouth, in customer relationship management, in building the brand, in mining data about customer behavior, etc. (Alalwan et al., 2017, Kahar et al. 2012). On the other hand, there are also business risks arising from the use of social media (Williams & Hausman, 2017).

Social media facilitates communication among organizations and customers. Focusing on using electronic word of mouth is considered the most effective strategy in the interactive nature of communication. Electronic word of mouth is considered a reach influencer on customers. Some studies have reported that social media platforms increase the impact and prevalence of word of mouth relative to traditional tools (Alalwan et al., 2017; Hudson et al., 2016; Vendemia, 2017).

doc. PaedDr. Ludvík Eger, CSc., University of West Bohemia, Faculty of Economics, Univerzitní 8, Plzen 301 00, e-mail: leger@kmo.zcu.cz

doc. PaedDr. Dana Egerová, Ph.D., University of West Bohemia, Faculty of Economics, Univerzitní 8, Plzen 301 00, e-mail: egerova@kpm.zcu.cz

Social media enables open communication, which helps organizations to understand customer needs and motivates them to respond proactively and efficiently to those needs (Tajudeen, Jaafar, & Ainin, 2018). Companies wish to transmit marketing messages through social media by engaging customers in online conversations. These online conversations between company and customers are visible to a large audience and influence not only relationships but also company performance.

Several studies have consistently found a significant positive relationship between perceived interactivity and outcome variables, such as attitude and behavior (Alalwan et al., 2017; Vendemia, 2017). The relationship between product reviews and customer trust is one of the required research topics (Choi & Lee, 2017). Reaching current and prospective clients through social media is considered to be the most promising field of marketing these days (Alalwan et al., 2017; Rutter, Roper & Lettice, 2016; Smith, 2011). As mentioned above, trust is an important determinant of performance in the business area and can facilitate successful online communication (Cheng, Fu, & de Vreede, 2017; Häkansson & Witmer, 2015; Sherkan, Nepal, & Paris, 2013).

Social media usage in an organization requires a communication strategy, continuous monitoring, responsible and skilled experts or a team to update the information on the site, and suitable content that offers relevant information for the public and a quality that users feel as acceptable.

Previous research studies have analyzed various sectors, e.g., food / beverage brands, automotive companies, beauty, fashion design, etc. (Vaiciukynaite, Massara, & Gatautis, 2017). However, the hospitality industry is different from goods, therefore, it encompasses characteristics of service: intangibility, heterogeneity, inseparability, and perishability (Benoit (née Moeller), 2010). For instance, it was found that higher internet usage increased the impact on organizations in terms of increased revenue, enhanced relationships, and reductions in cost and time (Alalwan et al., 2017; Tajudeen, Jaafar, & Ainin, 2018). Thus, when companies use social media effectively for marketing purposes, it will likely have a positive impact on them. Therefore, this study investigates the impact of communication on Facebook on customer engagement, specifically in the hotel industry, and the following research question is proposed:

RQ1: How do selected four-star hotels in Pilsen use Facebook to communicate with customers?

The characteristics of company messages result in consumer behavior regarding likes, comments, shares and overall engagement on Facebook. It is possible to divide consumer responses to company and brand messages on Facebook into two main parts. The first group of consumers represents active users of this social network while second group are passive users or people that do not use social media. From this point of view, the conducted research focused only on communication between active consumers and the company.

Consumer sociability behavior on Facebook may include various kinds of actions such as linking, commenting, sharing and emoji reactions. A company may engage consumers in different ways, such as linking, commenting or sharing. Emoji reactions also include several types such as Like, Love, Wow, Haha, Sad, Angry and Thankful. Linking behavior allows consumers to indicate their linking in one click for the messages. Commenting behavior enables consumers to express their opinions and feelings on a company's page and requires more consumer effort. Sharing behavior allows consumers to share a company message with their social networks on their Facebook page. Linking is a shorter reaction and is recognized as an affective consumer response (Vaiciukynaite, Massara, & Gatautis, 2017). Different consumer actions may present diverse levels of consumer involvement. The following research question is proposed:

RQ2: What type of consumer reaction produces communication of selected hotels on Facebook?

Generally, in digital marketing experts use the expression "content is king" (Evans, 2017). Content attracts people rather than disturbing them. Social media without useful content for users (customers) would be dead. Recent findings have shown that useful information related to the company generates customer engagement according to the types of messages. In this area, the pilot study follows research by Vaiciukynaite, Massara, and Gatautis (2017) focused also on the type of content of company messages. The following research question is proposed:

RQ3: What key words are used by selected hotels to attract consumers on Facebook?

3 Research methodology

An explanatory sequential mixed methods design is used. It involves a two-phase project in which quantitative data are collected in the first phase, the results analyzed, and then these data are used for the qualitative phase (Creswell, 2014). The quantitative phase used Facebook API to gather data and then followed a qualitative analysis of selected messages with the aim to explain communication with customers on Facebook in detail.

This study analyzed the company messages of six four-star hotels located in Pilsen, the Czech Republic (Nosková, 2016; Tlučhoř, Janeček, & Rymusová, 2016) in September 2018. The pilot study combines data mining using two tools. First,

Microsoft Power BI was used to analyze how selected hotels communicated on Facebook over the period 2008 - 2018 and to gather the content of company messages for further analysis using Atlas.ti. Second, the Netvizz tool was used to analyze different sections of the Facebook platform - mainly pages (links to messages, types of messages, data about user engagement).

In the next step, Atlas.ti software was applied to create world clouds and to assess the content of messages with the most commonly used words. Qualitative evaluation of the messages with the higher engagement used data from the Netvizz report to gain information on which messages generated higher customer engagement according to the types of messages. Subsequently, the experts commented on selected messages from a marketing perspective. A total of 526 (Netvizz) records of messages from 6 hotels with Facebook profiles for the year 2017 were selected for investigation (Links, Photos, Status, Videos).

3.1 Sample

12 four-star hotels located in Pilsen were identified in September 2018 using tools such as Hotel.cz and Booking.com. 3 hotels do not use Facebook and 1 has an invalid Facebook page. 2 hotels are members of an international chain of hotels (Vienna Hotels and Courtyard Marriott Hotels) and thus were not comparable for the purposes of this study. Finally, six hotels were included in the subsequent detailed analysis. Basic information about these hotels is presented in Table 1.

Table 1 Selected four-star hotels, main services, number of rooms

Gondola		Panorama		Parkhotel		Primavera		Purkmistr		U Pramenu	
Accommodation		Accommodation		Accommodation		Accommodation		Accommodation		Accommodation	
Restaurant		Restaurant		Restaurant		Restaurant		Restaurant		Restaurant	
Wellness		Wellness		Wellness		-		Wellness		Conferences	
Catering and events		Catering and events		Catering and events		Catering and events		Catering and events		Catering and events	
Rooms	20	Rooms	27	Rooms	150	Rooms	92	Rooms	26	Rooms	20
EBT	16074	EBT	141	EBT	239	EBT	2506	EBT	X	EBT	X

Source: Own processing

Note. EBT (in thousands CZK) is for year 2016 or 2017, EBT for Purkmistr was not available, a foundation is the owner of hotel U Pramenu. Financial results only show that hotels are in positive numbers but cannot be used for comparison because there is data incompatibility.

4 Results

Table 2 provides descriptive statistics of different measures from the first quantitative phase of the conducted pilot study. Evaluation using services such as Hotel.cz, Booking.com and TripAdvisor is the result of customers' assessment of hotels services, see Table 2.

Table 2 Evaluation of selected hotels by Hotel.cz, Booking.com and TripAdvisor

Service	Hotel.cz			Booking.com			TripAdvisor		
Hotel	Number of evaluations	Evaluation in %	Order	Number of evaluations	Evaluation	Order	Number of evaluations	Evaluation	Order
Gondola	98	87	5	11	7.6	6	45	4	4
Panorama	40	90	3	267	8.5	2	18	4	4
Parkhotel	50	88	4	932	8.4	3	155	4	4
Primavera	19	91	2	399	8.3	4	86	4	4
Purkmistr	14	92	1	544	8.7	1	113	4,5	1
U Pramenu	8	75	6	347	8.1	5	25	4	4

Source: Own processing

Note. Hotel.cz, the best evaluation = 100 %, Booking.com, the best evaluation = 10. TripAdvisor, the best evaluation = 5. The number of guests who evaluated hotels varied greatly.

The findings indicate the overall best evaluation was received by hotel Purkmistr. On the other hand, the worst evaluation was received by the hotels Gondola and U Pramenu.

Findings gained via Power BI present how selected hotels used Facebook for communication. Figure 1 shows the use of Facebook / years and distribution of messages on Facebook by months. These data bring an interesting example of how Facebook is used in the hotel industry in the Czech Republic.

Figure 1 Selected hotels and their activity on Facebook (by years and by months)

Gondola
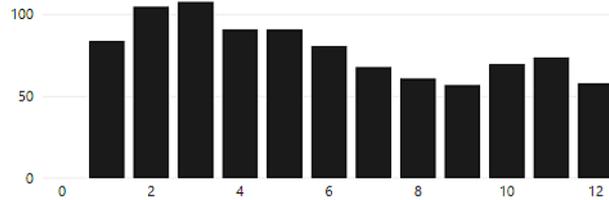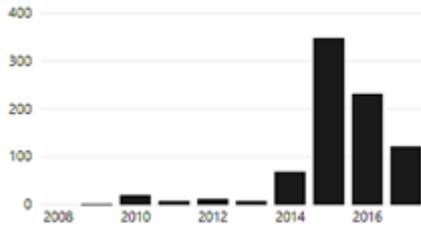
Panorama
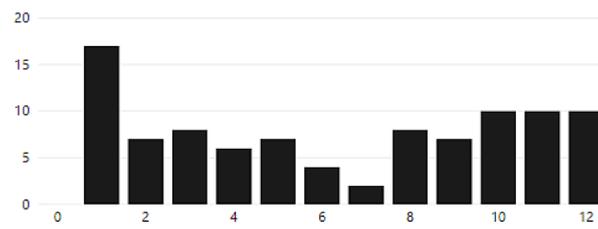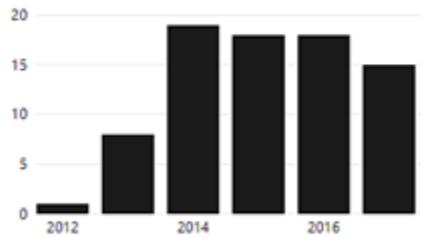
Parkhotel
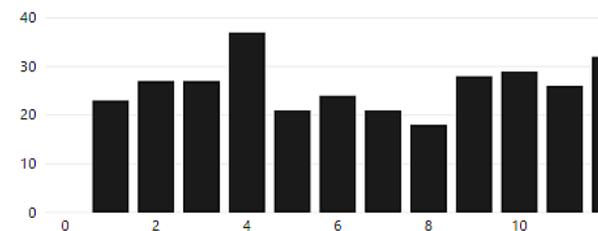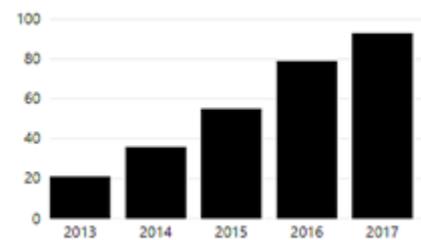
Primavera
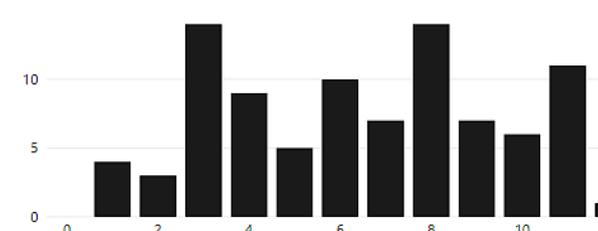
Purkmistr
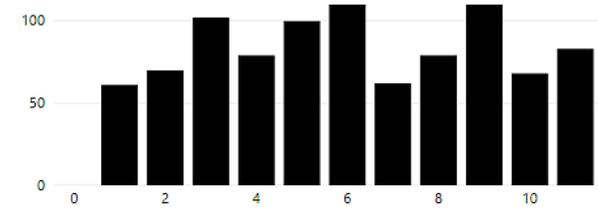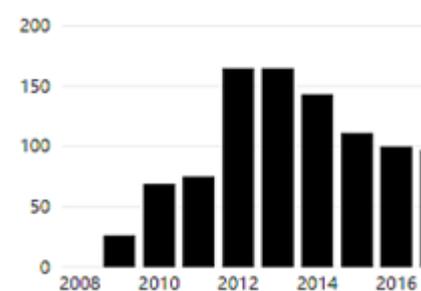
U Pramenu
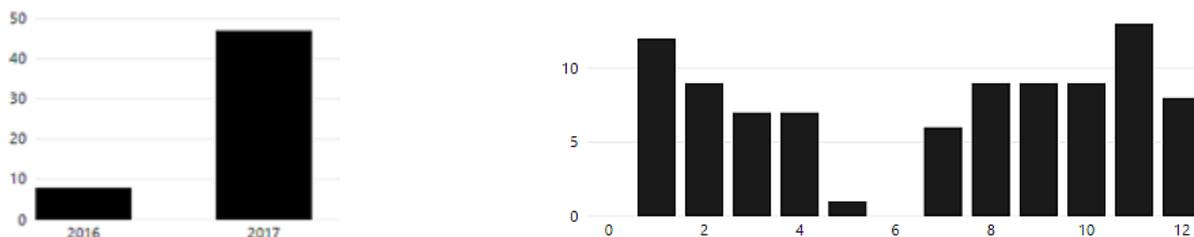
Note. Bar graphs show the tendency of how hotels used Facebook during years and months. Graphs do not have the same scale. Detailed information for the year 2017 is presented in Table 3.

To answer RQ2, the engagement was calculated for the selected six hotels. Engagement rate is a metric that measures the level (degree) of engagement received from the audience by a specific part of the published content. Engagement rate is a (old) metric that measures the level of engagement that a piece of created content (message) receives from an audience. It shows how much people interact with the content. Engagement rate is a metric that is used greatly in analyzing social media. This metric is continually refined by other parameters that enter into the calculation. On the one hand, because the engagement rate is calculated relative to the number of followers a company has on social media, the rate for both small and large companies can be compared equally, but on the other hand a metric that calculates engagement rate with PTAT (people talking about this) indicators is more accurate.

The calculated engagement rate for selected hotels and their communication on Facebook for the year 2017 is presented in Table 3.

$$\text{Engagement rate} = \frac{\text{Comments} + \text{Reactions} + \text{Shares}}{\text{Followers}}$$

Because the study is carried out in the hotel industry, a modified engagement rate is used and the indicator Followers is replaced by the indicator Number of rooms.

$$\text{Modified engagement rate} = \frac{\text{Comments} + \text{Reactions} + \text{Shares}}{\text{Number of rooms}}$$

The number of rooms is an indicator that takes into account one of the most important hotel size indicators. It also means that the number of possible accommodated customers influences the number of subjects for communication on the company page on Facebook. It must be noted that the number of selected hotels in this study is a significant limitation for the results presented in Table 3.

Table 3 Engagement rate and modified engagement rate for selected hotels

Hotel	Facebook/2017				Number of followers	Number of rooms	Engagement rate	Order	Modified E. rate	Order
	Comments	Reactions	Shares	Engagement						
Gondola	23	538	23	584	1105	20	0.53	4	29.20	2
Panorama	14	49	0	63	278	27	0.23	6	2.33	5
Parkhotel	25	881	130	1036	845	150	1.23	1	6.91	3
Primavera	1	130	35	166	302	92	0.55	3	1.80	6
Purkmistr	188	3127	305	3620	3889	26	0.93	2	139.23	1
U Pramenu	14	64	29	107	238	20	0.45	5	5.35	4

Source: Own processing

The results in Table 3 allow us to compare engagement rate with modified engagement rate for the hotel industry.

To answer the second research question, an overview of types of messages and of engagement was also produced. The ratio of messages / engagement gives us basic information on how effective partial types of messages are from this point of view. A qualitative analysis follows and represents a detailed view of this topic.

Table 4 Ratio, type of messages / engagement

Indicators / Hotels	Links	Engagement links	Link ratio	Photos	Engagement photos	Photo ratio	Status	Status ratio	Videos	Video ratio
Gondola	11	50	4.5	123	534	4.3	0		0	
Panorama	9	13	1.4	6	45	7.5	2	2.5	0	
Parkhotel	2	8	4.0	89	990	11.1	2	5.5	5	5.4
Primavera	1	5	5.0	105	161	1.5	0		0	
Purkmistr	3	35	11.7	101	3230	32.0	11	34.3	4	79.5
U Pramenu	15	10	0.7	30	97	3.2	7		0	
		Average 4.6			Average 10.0					
		Minimum 0.7			Minimum 1.5					
		Maximum 11.7			Maximum 32		Maximum 34.2		Maximum 79.5	

Source: Own processing

Note. Status and Videos had fewer records because some of the selected hotels did not use these types of messages on Facebook in 2017.

As can be seen from Table 4, the best engagement was types of messages created by hotel Purkmistr. Overall, the highest engagement was photos followed by links. The best engagement was Videos by Purkmistr. In the following qualitative phase, the best messages with a high engagement score were evaluated.

Although the calculated total engagement value is not a perfect indicator it gives us a basic quantitative review of the number of messages and number of reactions. It is important to note that Facebook gives different weight to different behaviors to determine what to show on the user´s screen. A share weighs approximately as much as 2 comments, each of which has roughly equal weight to 7 (10?) likes (Kim & Yang, 201). This means each of these signs of user behavior differs from others and does not represent the same customer involvement.

To gain key words that the selected hotels used to attract consumers on Facebook, an analysis using Atlas.ti was conducted. To explore the content of messages, a word cloud and word list for each selected hotel Facebook page were created. The content of messages for the year 2017 was extracted via Power BI and then analyzed using Atlas.ti. Figure 2 is an example of a word cloud and Table 5 shows selected results.

Figure 2 World cloud, hotel Purkmistr (Czech language)

Table 5 Top words from word clouds and number of words / Facebook page

	Hotels					
	Gondola	Panorama	Parkhotel	Primavera	Purkmistr	U Pramenu
Top 5 words	Menu, you, last, week, us	Room, Panorama, hotel, you, wellness	Parkhotel, Plzeň, you, come, us	Primavera, hotel, steak, menu, sauce	Purkmistr, you, beer, look forward, can	Restaurant, menu, dear, guests, visit
Number of words	744	156	327	80	801	152

Source: Own processing

Note. The Facebook pages of three hotels did not have a sufficient number of words for content analysis.

Table 5 shows the most frequent words used by hotels to attract consumers on Facebook. It is evident that the most used words were: names of hotels, menu, room, hotel, restaurant, name of the city, steak and beer.

Concerning the messages with the highest engagement (top messages), we identified the following. All top messages were created by hotel Purkmistr. Three top messages are photos with positive information about an employee (different persons) of the hotel. In fourth place is a message about a product (Purkmistr has its own brewery). Messages with a higher score from the Gondola, Panorama and Parkhotel hotels are also photos with information about a wedding, Christmas team greetings, and a high school dance party. Messages by Hotel Primavera did not reach 10 in engagement.

5 Discussion and conclusion

The preliminary pilot study was conducted in order to evaluate the feasibility of the key steps of the planned research focused on the same research topic.

Social media performance metrics must capture the richness of user activity online in relation to marketing targets. Detailed information about a company page and about customer traffic on, e.g., Facebook, are received by page owners via a sophisticated dashboard offered by the service provider. These data are usually part of a trade secret and were not available for researchers. To compare company communication with customers and their engagement metrics which Facebook offers using Netvizz as a tool that helps researchers to analyze different sections of the Facebook platform for research purposes.

Successful company-consumer interactions using social media support brand awareness, increase customer satisfaction and loyalty and boost sales (Vendemia, 2017; Wnag & Kim, 2017). The conducted pilot study brings information from this area for the hotel industry in the context of the Czech Republic and presents knowledge important for researchers and practitioners alike, because little is known about communication with customers in this area.

Some limitations of the research survey must be considered. First, we conducted only a pilot study and further research by increasing the size of the sample pool is needed. Second, the data were obtained through convenience sampling, which is acceptable for an explanatory study. Third, data were obtained from Facebook using Power BI and Netvizz in September 2018. These tools are relevant to the research purpose but possible small differences in data cannot be controlled by the researchers. The gained data about hotel business performance do not allow us to assess the dependency between the customer engagement level on social media and business performance.

Future research can be improved not only by increasing the size of the sample pool but also by focusing on social media marketing and PPC advertising of accommodation companies (Strauss & Frost, 2012).

References

Alalwan, A. A., Rana, N., Dwivedi, K., Y. & Algharabat, R. (2017) Social media in marketing: A review and analysis of the existing literature. *Telematics and Informatics*. 34, 1177-1190. https://doi.org/10.1016/j.tele.2017.05.008

Benoit (née Moeller), S. (2010). Characteristics of services – a new approach uncovers their value. *Journal of Services Marketing*, 24(5), 359-368. https://doi.org/10.1108/08876041011060468

Bhattacharya, C. B. & Sen, S. (2003). Consumer-Company Identification: A Framework for Understanding Consumers' Relationships with Companies. *Journal of Marketing*, 67(2), 76-88.

Cheng, X., Fu, S. & de Vreede, G-J. (2017). Understanding trust influencing factors in social media communication: A qualitative study. *International Journal of Information Management*, 32, 25-35. https://doi.org/10.1016/j.ijinfomgt.2016.11.009

Creswell, W. J. (2014). *Research design*. Thousand Oaks: SAGE.

Evans, H. (2017). *"Content is King"—Essay by Bill Gates 1996*. Available at: https://medium.com/@HeathEvans/content-is-king-essay-by-bill-gates-1996-df74552f80d9

Häkansson, P. & Witmer, H. (2015). Social Media and Trust – A Systematic Literature Review. *Journal of Business and Economics*, 6(3), 517-524. https://doi.org/10.15341/jbe(2155-7950)/03.06.2015/010

Hudson, S., Huang, L., Roth, M.S. & Madden, T.J. (2016). The influence of social media interactions on consumer–brand relationships: a three-country study of brand perceptions and marketing behaviors. *International Journal of Research in Marketing*, 33(1), 27-41. https://doi.org/10.1016/j.ijresmar.2015.06.004

Kahar, R., Yamimi, F., Bunari, M. & Habil, H. (2012). Trusting the Social Media in Small Business. *Procedia - Social and Behavioral Sciences,* 66 (2012) 564 – 570. https://doi.org/10.1016/j.sbspro.2012.11.301

Kim, Ch. & Yang, S-U. (2017). Like, comment, and share on Facebook: How each behaviour differs from other. Public Relations Review. 43, 441-449. https://doi.org/10.1016/j.pubrev.2017.02.006

Mičík, M. & Mičudová, K. (2018). Employer Brand Building: Using Social Media and Career Websites to Attract Generation Y. *Economics and Sociology*, 11(3), 171-189. https://doi:10.14254/2071-789X.2018/11-3/11

Rutter, R. Roper, S. & Lettice, F. (2016). Social media interaction, the university brand and recruitment performance. *Journal of Business Research*, 69, 3096-3104. https://doi.org/10.1016/j.jbusres.2016.01.025

Sabate, F., Berbegal-Mirabent, J., Carmona, A. C. & Lebherz, P.R. (2014). Factors influencing popularity of branded content in Facebook fan pages. *European Management Journal*. 32(6):1001–1011. https://doi.org /10.1016/j.emj.2014.05.001

Sherchan, W., Nepal, S., & Paris, C. (2013). A Survey of Trust in Social Networks. *ACM Computing Surveys*, 45(4), 47-47:33. https://doi.org /10.1145/2501654.2501661

Smith, T. K. (2011). Digital marketing strategies that Millenials find appealing, motivating, or just annoying. *Journal of Strategic Marketing*, 19(6), 489-499.

Statista, (2018). Number of social media users worldwide from 2010 to 2021 (in billions). Retrieved May 2018 from: https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/

Strauss, J., & Frost, R. (2012). *E-marketing*. New Jersey: Pearson Education.

Tajudeen, P. F., Jaafar, N. I. & Ainin, S. (2018). Understanding the impact of social media usage among organizations. *Information & Management,* 55, 308-321. https://doi.org/10.1016/j.im.2017.08.004

Tlučhoř, J. Janeček, P. & Rymusová, M. (2016). Qualitative evaluation of chosen online and offline communication means towards visitors of a selected city. In *International Scientific Days 2016. The Agri-Food Value Chain: Challenges for Natural Resources Management and Society.* Nitra: Slovak University of Agriculture in Nitra, 885-892. https://doi.org/10.15414/isd2016.s11.04

Vaiciukynaite, E., Massara, F. & Gatautis, R. (2017). An Investigation on Consumer Sociability Behaviour on Facebook. *Engineering Economics,* 28(4), 467-474. https://doi.org/10.5755/j01.ee.28.4.15078

Vendemia, M. A. (2017). When do consumers buy the company? Perceptions of interactivity in company-consumer interactions on social networking sites. *Computers in Human Behavior*, 71, 99-109. https://doi.org/10.1016/j.chb.2017.01.046

Williams, P. S. & Hausman, V. (2017). Categorizing the Business Risks of Social Media. *Procedia. Computer Science*. 121, 266-273. https://doi.org/10.1016/j.procs.2017.11.037

Cross-Border Purchasing Behavior – Studies in the Czech-German Border Region

Dita Hommerová, Jan Tlučhoř, Petr Janeček, David Kouba

Abstract: *European integration is increasingly becoming the current subject of a number of research studies. Much attention is devoted to the socio-economic aspects of integration. Even after a lengthy integration process, we can still find differences between the two sides of the border. The focus of this research paper is on the current state of knowledge of research into the cross-border region and cross-border activities, particularly in the Bohemia-Bavaria border region. Several research studies dealing with cross-border purchasing behavior have been conducted in recent years. This article attempts to summarize these research activities and studies. In terms of methodology, it is based on the desk research of secondary data sources. For example, this paper examines the methodology used, the methods in which the data were acquired (if relevant), the number of respondents, regional focus, the primary purpose and the focus of the study. Most research studies dealt with shoppers' motives for traveling across the border to do their shopping; some of them attempted to estimate the average length of travel, and several studies also took into consideration the expenses. Also worth mentioning is the fact that the majority of the research studies came into existence with the involvement of various chambers of commerce. This paper also contains selected research results.*

Key words: The Czech Republic · Purchasing behavior · Germany · Border region · Cross-border · Region

JEL Classification: D12 · F15 · M39

1 Introduction

One of the subjects which the Department of Marketing, Trade and Services at the Faculty of Economics of the University of West Bohemia in Pilsen deals with over the long-term is research into the Czech-German cross-border region with a focus on various aspects of the economy. Longitudinal research is used mainly in issues related to cross-border tourism. In 2017, the rich experience gained in these research studies was applied in research dealing with the labor market and education possibilities in a representative study prepared for the government of the Upper Palatinate (Regierung Oberpfalz).

The objective of this paper is to gain an overview of past studies into cross-border purchasing behavior (with a focus on the Czech-German border), the research methods they use, and the examined aspects of purchasing behavior. The specific aim of this article is to evaluate the motives for going shopping across the border.

2 Definitions

This research article deals with the Czech-German border region, so it is necessary to get the geographical terminology straight, as this cross-border region consisting of two neighboring countries is often referred to differently. Jeřábek et al. (2004) deals with the terminology associated with the area around the border. According to Jeřábek, the Czech terms "pohraniční region" (border region) or "příhraniční region" (region near the border) can be replaced with their single-word equivalents "pohraničí" and "příhraničí". Heffner (1998) adds the adjectives "hraniční" (borderline) and "přeshraniční" (cross-border). These terms were partly the result of examining foreign terminology, for example, the German expressions Grenzregion, Grenzgebiet, and Grenzräume (in Jeřábek et al., 2004). Dokoupil et al. (2012) refers to the territory along the border also as "the border region". This area on either side of the border forms a sort of zone, a specific region noticeably influenced by the border. The border is the most important factor that affects this economic area. Mauntz

Ing. Dita Hommerová, Ph.D., MBA, University of West Bohemia, Faculty of Economics, Univerzitní 8, Plzen 301 00, e-mail: hommer@kmo.zcu.cz

Ing. Petr Janeček, Ph.D., University of West Bohemia, Faculty of Economics, Univerzitní 8, Plzen 301 00, e-mail: janecp00@kmo.zcu.cz

Ing. Jan Tlučhoř, Ph.D., University of West Bohemia, Faculty of Economics, Univerzitní 8, Plzen 301 00, e-mail: jtluchor@kmo.zcu.cz

et al. (2009) talks about a border in general. He describes it as a physical, tangible and material line on a map used to distinguish between two different entities. Heger (2012) more accurately expands the political and administrative understanding of borders by cultural and communication (e.g., language) aspects. Heger (2012) also claims that the existence of a border has social implications and it cannot be understood as a mere line. It is more of a zone or a wider area with specific characteristics. In any case, it is an area of peripheral nature, where the central government plays a lesser role.

A state is traditionally understood as a tool to maintain sovereignty over a certain territory and society of people. However, in the modern world and especially on the territory of the European Union, this approach is outdated. Nowadays, we commonly see cross-border flows of capital, merchandise, people as well as ideas. For that reason, we need to think about the strict territorial arrangement differently (Popescu, 2008). Border regions are characterized by a number of economic barriers and inequalities which can be identified within one of the countries, or at the internal or external border of a bloc of countries. Regions vary from one another in various factors, such as (Greta & Lewandovsky, 2010):

- differences in the economic potential of the regions and how this affects their development;
- processes associated with employment in an industrialized society;
- increasing short-term innovations within industry development cycles;
- globalization and its impacts;
- new standards in the application of qualifications and skills.

The Bohemia-Bavaria border region is characterized by its large diversity of various types of economic activity, which goes hand in hand with the varied natural conditions. This region includes large rare and protected natural areas as well as areas that are intensely used by economic entities. There are a number of interested parties striving to develop this region. Some of these entities act in the public interest, others in their own, private interest. The impact of their activity on the region's development varies.

The Bohemia-Bavaria border region is part of the European Single Market, where the free movement of people, goods, services and capital is guaranteed. The European Union has long been trying to eliminate barriers (borders) within domestic trade and joint cross-border activities in general. One of the tools for achieving that is, for example, cross-border operational programs. The border in terms of the physical barrier between the Czech Republic and Germany currently does not exist; however, there are still noticeable differences between the two regions. Czechs and Germans speak a different language, have a different lifestyle, different traditions, education systems as well as a different mentality. There are also marked differences in important economic parameters (e.g., the GDP, nominal wages) between the two territories. These different factors are taken advantage of by consumers and are noticeable, for example, in their purchasing behavior.

According to Zelenka and Pásková (2012), cross-border tourism (visits) is a kind of tourism that takes place in areas close to borders with neighboring countries. These authors claim that international tourism may include various forms of "pseudo-tourism", for example, hiking, retail tourism, trips to the gas station, traveling abroad to have an abortion, sexual tourism or gambling tourism. *"Shopping tourism is a form of pseudo-tourism motivated by the possibility of purchasing goods more cheaply or purchasing goods that are otherwise unavailable in their own country"* (Zelenka and Pásková, 2012; p. 188). Palatková and Zichová (2011) note that this type of tourism concerns mainly two neighboring countries. Authors Palatková and Zichová point out that retail tourism takes advantage particularly of the price differences between the two countries. Sváta (2006) combines the two previous terms and speaks of cross-border shopping within the European Union. Cross-border shopping is a purchase made either in person or electronically by the residents of one country from retailers or service providers in another state.

Kuncharin and Mohamed (2013) mention several different approaches to the issue of cross-border shopping and its motivation. One of the explanations is based on the assumption that motivation is connected with a marketing mix. This concerns the product and its characteristics: the price of the product, its perceived quality, the services provided by the seller, the storage facility, the choice of various products in the target region, etc. The approach mentioned by these authors includes these types of motivation:

- there is either a lack of goods or a small selection in the shoppers' homeland;
- some goods are in limited quantity and can only be purchased far away from home;
- there is a significant difference in price levels between the two countries;
- the shoppers have a desire to purchase high-quality goods or products;
- the need to do one's shopping somewhere else other than in one's own home environment.

For example, Kratena and Wüger (1997) state the following typical (economic) reasons for shopping on the other side of the border: a relative difference in price (taking into consideration the costs of making the purchase and its volume); the quality of the products; the availability and existence of special/specific products; the range of selection; the store

business hours; the standard of living or the degree of regional integration. The following text contains an analysis of some of these factors. Macroeconomically, doing the shopping across the border represents non-participation in the macroeconomic cycle of one's own country.

One of the principal factors in shopping across the border that is mentioned in the literature on this topic is the price of products. This factor is affected by other factors, primarily finance. In his book, Timothy (2005) describes the first price push and pull factor – the exchange rate. People's motivation for cross-border shopping is highly elastic, therefore, even a small change in the exchange rate may result in a major difference in the demand for goods from across the border. Connected with the price and exchange rate, but also as a separate factor, is the form of payment for goods by visitors abroad. The price itself is also influenced by the state's tax policy. Timothy (2005) states that low taxes in the state across the border have a positive effect on the motivation for cross-border shopping. The following Table 1 shows the comparison between taxes in the Czech Republic and Germany. It clearly shows that Germany has a lower reduced VAT rate, which applies, for example, to groceries, but also a lower standard VAT rate. In the Czech Republic, there are lower taxes on gasoline and diesel fuel, while the tax imposed on beer is lower in Germany.

Other factors may include the cost-benefit ratio or the issue with dual quality goods. According to Timothy (2005), it has been verified that a higher-quality customer service on the part of retailers increases the motivation of shoppers from abroad to come and do their shopping in their stores. Timothy (2005) also states that the opening hours of retail stores can play a role in cross-border purchasing behavior. If stores are closed on Sundays or public holidays in one of the countries, or their opening hours are limited, this increases the motivation for cross-border shopping. Fassot (2007) adds that Germans are motivated by the stores' business hours, as there are restrictions imposed by law in this respect in Germany. According to Fassot (2007), the aforementioned factor does not apply if there isn't sufficient infrastructure available, or if the distance required to travel to do one's shopping is too large.

Table 1 Comparison of selected differences in tax rates between the Czech Rep. and Germany

	Czech Republic	**Germany**
Reduced VAT rate (%)	10 or 15	7
Standard VAT rate (%)	21	19
Excise tax on gasoline in EUR (per 1,000 liters)	475	655
Excise tax on diesel fuel in EUR (per 1,000 liters)	405	470
Excise tax on beer in EUR (per hectoliter)	14.21	9.44

Source: Kouba (2018)

Timothy (2005) further expands the reasons for cross-border shopping by "mere entertainment". As an example, he mentions Canadian customers who travelled across the border into the United States just because they wanted to enjoy shopping in a different environment. These customers, particularly families, took day-long trips in search of a new experience. Apart from shopping, their trips included sightseeing, and using various services – eating out, going to the movies, attending events, etc.

3 Methodology

In terms of methodology, the key approach is the analysis of secondary data sources using desk research. The objective was to find and compare available research studies dealing with cross-border purchasing behavior in the geographical areas on either side of the Czech-German border. The following factors were used to make the comparison: author/client; locations and ways of survey data acquisition; data processing; the focus of the study; respondents' demographic structure and the number of respondents.

A total of nine research studies dealing with the issue of cross-border purchasing behavior were found. These studies are briefly characterized and sorted using a clearly-arranged table. For certain factors, the authors attempted to conduct a meta-analysis of the research studies' findings and aggregated selected output.

4 Results

Table 2 contains a comparison of the nine studies of cross-border purchasing behavior, or shopping tourism, which were conducted in areas near the Czech-German border before the end of 2017. The following text contains brief descriptions of these studies in the context in which they were carried out.

As far as the organizations that commissioned these studies, it needs to be said that these were often German chambers of commerce and industry. The main objective of these studies was to determine the potential of Czech customers for

German retailers. Other studies were then conducted by students as qualification papers, and the rest were realized with the support of EU subsidies.

Förster (2007)

The 2007 study conducted by Corinna Förster of the University of Bayreuth paints a comprehensive picture of the Bohemia-Bavaria border region. Apart from the territorially political, geographic, demographic and historical aspects, it also deals with the economic aspects. The study contains information on cross-border consumer behavior: the shopping situation in Bohemia.

IHK Regensburg (2009)

The study entitled "Grenzüberschreitender Einzelhandel zwischen Bayern und Tschechien", that is, "Cross-border Retail Trade between Bavaria and Bohemia" was published in 2009 by the Regensburg IHK (Chamber of Commerce and Industry). This study describes Czech customers and their potential and expectations in the area of retail. This survey was carried out in towns close to the border, in the Bavarian district of Cham, and also in the Czech districts of Domažlice and Klatovy. 237 respondents took part in this research.

Mizuňová (2011)

This bachelor thesis by a student at the University of Economics, Prague examined the phenomenon of cross-border shopping from the point of view of tourism. This study was conducted in 2001 and involved 230 respondents. The respondents were recruited from the sister cities of Litvínov and Olbernau in Saxony, Germany.

IHK Chemnitz (2012)

In collaboration between the Chemnitz University of Technology and the University of West Bohemia in Pilsen, a research study of cross-border tourism was conducted in 2012 for the benefit of the IHK Chemnitz. A total of 1,400 respondents on both sides of the border took part in this research. On the German side, the research was carried out in eleven towns of Southwest Saxony. On the Czech side, the respondents came from ten towns on the opposite side of the border (IHK Chemnitz (2012)). Results are presented in the following publications: Cimler, Hommerová, Potměšil (2012), "Grenzüberschreitender Besucherverkehr: (Tschechen in Sachsen - Erzgebirge und Vogtland)", and Cimler et al. (2012), "Profil des tschechischen Handels und Kunden".

Table 2 Overview of cross-border studies focused on purchasing behavior conducted before the end of 2017

Author/ Client	Area	Location and manner of data collection	Data processing	Focus	Respondents	Number of respondents
Förster (2007)	CZ-BY (Cheb, Marktredwitz)	Analysis of car makes (outside the stores)	Descriptive statistics, cartographic representation	Motivation for shopping across the border, partially the distance	CZ, DE	
IHK Regensburg (2009)	CZ-BY (Cham, Domažlice, Klatovy)	At the point of sale, expert interviews	Descriptive statistics, cartographic representation, qualitative analysis	Motivation for shopping across the border, partially the distance	CZ	237
Mizuňová (VŠE, 2011)	CZ-SX (Litvínov, Olbernau)	At the point of sale	Descriptive statistics		CZ, DE	230
IHK Chemnitz (2012)	CZ-SX (Vogtland, Krušné hory)	At the point of sale	Descriptive statistics	Motivation, distance	CZ, DE	1,400
IHK Dresden (2012)	CZ-SX (Zittau)	At the point of sale				
Köttl (2014)	CZ-BY (Northeast Bavaria)	In households	Descriptive statistics	Motivation, estimated shopping volume		
Riedl et al. (2014)	CZ-BY (the northern part of the border region)	At the point of sale	Descriptive statistics	Motivation, distance	CZ, DE	1,009/958
IHK Regensburg (2015)	CZ-BY (The Pilsen Region, Upper Palatinate)	At the point of sale	Descriptive statistics	Motivation for shopping across the border, partially the distance	CZ	501

UWB (2017) for the Government of the Upper Palatinate	CZ-BY (The Pilsen Region, Upper Palatinate)	At the point of sale, CAWI	Descriptive statistics	Motivation for shopping across the border, partially the distance	CZ, DE	326/411

Source: Authors' own elaboration, 2018 according to Kouba (2018), Segerer, Hommerová (2018)

IHK Dresden (2012)

This research, conducted on November 17 and 18, 2011 in Zittau, focused on customers arriving from Bohemia. The objective of this survey, realized in the form of interviews on the premises of shopping centers and the surrounding areas, was to describe the purchasing behavior and motivation of 262 Czech respondents. The results are publicly accessible and compared against a similar research conducted by IHK Dresden in 2009.

Köttl (2014)

This successful dissertation from the Marketing Department at the Technical University of Munich aims to describe the consumer behavior in the Bavarian border region from the point of view of Czech visitors. Its output lies in a recommendation for the cross-border protection of consumers.

Riedl et al. (2014)

This publication presents a survey conducted in 2014. The guarantors of this research were the University of West Bohemia in Pilsen and the Hochschule Hof University of Applied Sciences, and it was carried out with the support of other partners: the University of South Bohemia in České Budějovice, the Cheb District Chamber of Commerce (NB now replaced by the Chamber of Commerce of the Region of Karlovy Vary), the town of Hof and the international association Access Marketing Management e.V. The researchers received answers from 1,009 Czech and 958 German respondents who came from the border areas of the Karlovy Vary and Pilsen Regions, Lower Bavaria, Upper Palatinate and Upper Franconia. 90% of the respondents come from areas within 100 km of the border.

IHK Regensburg (2015)

In 2015, the IHK Regensburg published "Tschechische Kunden – Chancen für Handel und Tourismus" (Czech Customers – a Chance for Trade and Tourism). This research study was a follow-up to the aforementioned study from 2009. This new survey was carried out among 501 Czech respondents, specifically from West Bohemia, who travel to Upper Palatinate to do their shopping.

UWB (2017)

In June 2017, a bilateral Czech-German research study was conducted. It was commissioned by the government of Upper Palatinate and carried out by the University of West Bohemia. The study has not yet been published; however, the authors of this research article were involved in this study. Apart from cross-border shopping, this research also dealt with studying and working on the other side of the border. In terms of its geographical focus, this research targeted mostly residents of the border areas within the Pilsen Region and Upper Palatinate. The objective of the study was to determine the expectations of various segments of the population in terms of information on Upper Palatinate (mainly among residents of the Pilsen Region) or the Pilsen Region (mainly among residents of Upper Palatinate). Using both personal interviews as well as computer assisted web interviewing, the following three target groups were examined: (prospective) employees; (prospective) students and pupils or their parents; (prospective) visitors/tourists.

The questioning was designed to adopt a wider approach to reveal the reasons for people's need for information and to provide a more comprehensive context. At the same time, the websites of towns (districts, regions) in the Pilsen Region and Upper Palatinate was analyzed (desk research) in order to describe the status quo in terms of the availability of information for residents on the other side of the border. The websites were evaluated separately for each target group from the point of view of Czech and German respondents. The data itself were supplemented with other relevant secondary sources. A total of 1,074 questionnaires were collected and processed within this study (subdivided according to the following areas: "labor market" – 99 in the Czech Republic and 61 in Bavaria; "studies" – 105 in the Czech Republic and 72 in Bavaria; "visitors" – 326 in the Czech Republic and 411 in Bavaria).

Figure 1 Motives for visiting the border region of Germany
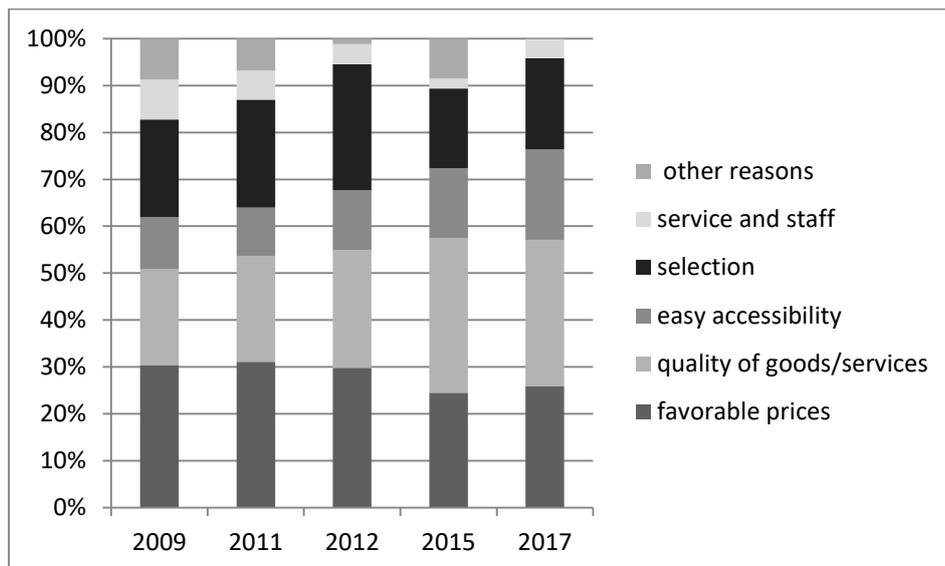
Source: Authors' own elaboration, 2018

Figure 2 Motives for visiting the border region of the Czech Republic
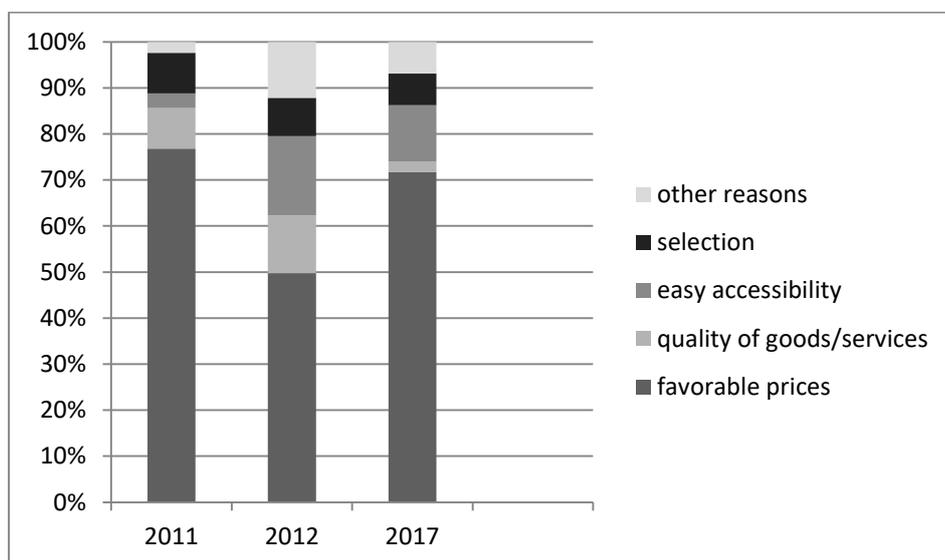
Source: Authors' own elaboration, 2018

One specific objective of this paper is to evaluate the motives for going shopping across the border. Based on the results of the presented research studies, the authors attempted a meta-analysis of the motives for shopping in the Czech Republic and Germany. The results of the research studies indicate that the key reasons for visiting the border regions of Germany are shopping, going on holiday or engaging in free-time activities. Other reasons are of minor significance. Figure 1 shows that there are two main motives for Czechs to do their shopping in Germany – favorable prices and the quality of products. Another important motive is the wide selection of products.

The reasons for visits to the Czech Republic are the same as the reasons for visiting Germany. These include mainly shopping and refueling and secondly free-time activities and recreation. Figure 2 shows the motives for shopping in the Czech Republic, where it is clear that German customers have one main reason – favorable prices.

5 Conclusion

The Czech-German border region is a specific type of economic area. There is the effect of the proximity of the border and in a way it can be referred to as a periphery, where the cross-border activity (mainly tourism) presents a major opportunity for economic growth. What is interesting is that this potential is studied more intensively by German entities, even though a larger economic potential, given the standard of living in Germany, is probably on the part of German consumers doing their shopping in the Czech Republic.

The majority of the studies were conducted at the point of sale by way of personal interviews. The key results of the studies examined can be summarized as follows: Cross-border shopping takes place on both sides of the border. Both Czechs and Germans find goods they are interested in. It is interesting that there is often an overlap in the type of merchandise that is frequently sought by consumers from the two countries (groceries, household products). The different tax rates also play a role (excise tax on fuel, alcohol, cigarettes, but also the different VAT rates). The relevant commute distance is up to 100 km (likely with a higher frequency of shopping trips from a smaller distance).

Future research may conduct a meta-analysis of other factors examined by the aforementioned studies. However, existing limitations will have to be dealt with. The various studies are not compatible for easy comparison. They often use different methods and cover different geographic areas. Also, the studies have varying degrees of representativeness. However, it is still possible to find common features and thus reveal other aspects of cross-border purchasing behavior, or tourism, in the Czech-German border region.

References

Cimler, P. et al. (2012). *Profil des tschechischen Handels und Kunden.* Chemnitz: GUC, Verl. der Ges. für Unternehmensrechnung und Controlling.

Cimler, P., Hommerová, D., & Potměšil, J. (2012). *Grenzüberschreitender Besucherverkehr: (Tschechen in Sachsen - Erzgebirge und Vogtland).* Chemnitz: GUC, Verl. der Ges. für Unternehmensrechnung und Controlling.

Dokoupil, J. et al. (2012*). Euroregion Šumava/Bayerischer Wald-Unterer Inn/Mühlviertel.* Plzeň: Vydavatelství a nakladatelství Aleš Čeněk.

Fassott, G. (2007). *Internationaler E-Commerce: Chancen und Barrieren aus Konsumentensicht.* Wiesbaden: Dt. Univ.-Verl.

Förster, C. (2007). *Cross-Border-Shopping im bayerisch-tschechischen Grenzraum : untersucht am Beispiel der Städte Marktredwitz und Cheb/Eger.* Bayreuth: Univ., Lehrstuhl Wirtschaftsgeographie und Regionalplanung.

Greta, M., & Lewandowski, K. (2010). Euroregion's "mission" and the success of the Lisbon strategy. *Business and Economic Horizons.* 1(1), s.14-20.

Heger, V. (2012). *Komunikace ve veřejné správě*. Praha: Grada.

Segerer, M., & Hommerová, D. (2018) Shopping in Bavaria: Why do Czech customers come to Upper Palatinate? Motives, sales volume, and the importance of distance. *Geografie. 123 (4).*

IHK Dresden (2012). *Chancen für den Einzelhandel: Ergebnisse einer Befragung zum Einkaufsverhalten tschechischer Kunden in Zittau im November 2011.* Industrie- und Handelskammer Dresden. Dostupné z: https://www.dresden.ihk.de/servlet/link_file?link_id=28810&publ_id=1055

IHK Regensburg (2009). *Grenzüberschreitender Einzelhandel zwischen Bayern und Tschechien: Studie zum Einkaufs- und Freizeitverhalten tschechischer Besucher im Landkreis Cham.* Industrie- und Handelskammer Regensburg. Dostupné z: https://d-nb.info/992978467/34

IHK Regensburg (2015). *Ostbayern Westböhmen: Tschechische Kunden – Chancen für Handel und Tourismus [online]. Regensburg: IHK Regensburg für Oberpfalz / Kelheim.* Dostupné z: https://www.ihk-regensburg.de/downloads2/Tschechische-Kunden---Chancen-fuer-Handel-und-Tourismus--Studie-/3573054

Jeřábek, M., Dokoupil, J., & Havlíček, T. (2004). *České pohraničí - bariéra nebo prostor zprostředkování?* Praha: Academia.

Köttl, B. (2014). *Grenzüberschreitenden Konsum in der bayerischen Grenzregion zu Tschechien.* München: Nomos.

Kouba, D. (2018). *Vývoj hospodářského prostoru v česko-německém příhraničí z pohledu návštěvního ruchu.* Plzeň: Západočeská univerzita v Plzni. Diplomová práce.

Kratena, K., & Wüger, M., (1997).*Volkswirtschaftliche Effekte von Kaufkraftabflüssen in Österreich.*WIFO. Dostupné z https://EconPapers.repec.org/RePEc:wfo:wstudy:2823

Kuncharin, W., & Mohamed, B. (2013). Cross-Border Shopping Motivation, Behaviours and Ethnocentrism of Malaysian in Hatyai, Thailand. *World Academy of Science, Engineering and Technology.* Dostupné z: http://waset.org/publications/9996943/cross-border-shopping-motivation-behaviours-and-ethnocentrism-of-malaysian-in-hatyai-thailand

Mauntz, A. et al. (2009). *Key concepts in political geography*. London: SAGE.

Mizuňová, M. (2011). *Přeshraniční aktivity v oblasti obchodu a služeb.* Praha: Vysoká škola ekonomická v Praze, Fakulta mezinárodních vztahů. Bakalářská práce.

Palatková, M., & Zichová, J. (2011). *Ekonomika turismu: turismus České republiky: vymezení a fungování trhu turismu, přístupy k hodnocení významu a vlivu turismu, charakteristika turismu České republiky*. Praha: Grada.

Popescu, G. (2008). The conflicting logics of cross-border reterritorialization: Geopolitics of Euroregions in Eastern Europe. *Political Geography*. 27 (4) s. 418-438. DOI: 10.1016/j.polgeo.2008.03.002.

Riedl, J. et al. (2014). *Empirische Daten für das Destinationsmarketing: Studie in Westböhmen und Nordostbayern = Marketing destinací severovýchodní Bavorsko – západní Čechy.* Weidenberg: Access Marketing Management.

Sváta, Z. (2006*). Evropské spotřebitelské centrum pro ČR.* Síť Evropských spotřebitelských center – elektronický obchod. Euroskop. Dostupné z: http://www.euroskop.cz/gallery/40/12137-prednaska_el_obchod.pdf

Timothy, D. J. (2005). *Shopping tourism, retailing and leisure*. Clevedon: Channel View Publications.

Zelenka, J., & Pásková, M. (2012). *Výkladový slovník cestovního ruchu*. Praha: Linde Praha.

Consumer preferences for local products

Kamil Pícha, Martina Vališová

Abstract*: Consumption of local sources by local population is widely discussed in last two decades. The aim of the paper is to assess some elements of the consumers' attitudes to inland ("national") and local products and the relations within preferences of certain origin of food products.*

A questionnaire survey has been done to collect data for this paper. The survey was realised in front of selected food stores in České Budějovice. This survey confirmed relation between consumers' preference to inland products and their decision on purchase according to the price. It confirmed also a relation with attitudes to the quality labels and labels confirming the product originated from the region where it is sold. A smaller but still significant difference was revealed when comparing the importance of the taste of the product between the group without any preference to the country of origin and the groups seeking for inland or local products.

Key words: Local product · Inland product · Food · Consumer · Attitude · Preference

JEL Classification: D10 · D91 · M31

1 Introduction

Consumption of local sources by local population is widely discussed in last two decades. Among the raised questions are the role of local consumption in the general health and well-being of consumers (they should eat what they are used to) – for instance, allergologists are increasingly confronted with allergic reactions to exotic fruits (Raap, Schaefer, Kapp, & Wedi, 2007) – or a support to local economy (consumption of local products => maintaining and increase of local production => local GDP and employment…) – e.g. Winter (2003), Lin (2009) or Verbeke, Pieniak, Guerrero, & Hersleth, (2012). The discussion is strengthened also by the protection of environment issues.

Local products

The definition of the localness of a product and then of the notion local product is not unanimous. "Local" carries the multiple connotations of common interest, of the construction of community through the development of links within everyday life, of the incorporation of a moral economy of interaction between neighbors or allies mutually engaged in production and consumption (Allen et al., 2003). How we determine "local" in this context will have to be contingent on the place: the social, ecological, and political circumstances which circumscribe it (Feagan, 2007). To put it simply, "local" is not the same everywhere. The local food movement is arguably the most dynamic segment of the food system, contributing to the challenge to define it (Thilmany McFadden, 2015).There are even opinions the local scale is socially produced, so it has no particular characteristics (Born, & Purcell, 2006). Local and regional food represents recently a frequently discussed topic from many point of view (e.g. Hinrichs, 2000; Feenstra, 2002; Kremer and DeLiberty, 2011; McIntyre and Rondeau 2011; Mundler and Rumpus, 2012; Knight, 2013).

Consumers'attitudes

Consumers' usually consider several aspects of purchased food products. Taste, quality and price are among the most important aspects (Kapsdorferova, & Nagyova, 2005). They could be also influenced by country of origin or quality labels (Kapsdorferova, & Nagyova, 2005). Consumers are also concerned by health safety of the food (Golian, Nagyová, Andocsová, Zajác, & Palkovič, 2018). Perceived quality is often linked with perceived health safety of the food products (Nagyová, 2018; Nagyová, Rovný, & Stávková, 2014). The consumers' attitude are influenced their demographic and socio-economic characteristics (Kadekova, Recky, Nagyová, Košičiarová, & Holienčinová, 2017).

Consumers increasingly demand local food and foods with a traditional character or image, which are often perceived as higher quality (Pieniak, Verbeke, Vanhonacker, Guerrero, & Hersleth, 2009).

doc. Ing. Kamil Pícha, Ph.D., University of South Bohemia, Faculty of Economics Studentská 13, 370 05 České Budějovice, e-mail: kpicha@ef.jcu.cz

Ing. Martina Vališová, University of South Bohemia, Faculty of Economics Studentská 13, 370 05 České Budějovice, e-mail: valisova.martina@gmail.com

The aim of the paper is to assess some elements of the consumers' attitudes to inland ("national") and local products and the relations within preferences of certain origin of food products.

2 Methods

Data collection

A questionnaire survey has been done to collect data for this paper. The survey was realised in front of selected food stores in České Budějovice. Every tenth consumer leaving the store has been asked to answer questions. Once he had refused, the following consumer has been asked. We have gathered 400 questionnaires. 73.3% out of the consumers who answered our questions were women. 26.8% of the surveyed sample were men.

Figure 1 Age structure of the surveyed sample (n=400)
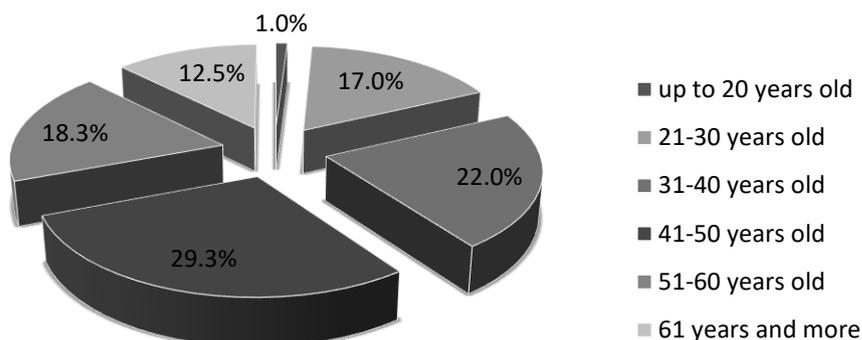
Source: Primary survey

Data analysis

Relations between particular consumers' attitudes were assessed by means of the chi-square goodness-of-fit test. All computations were performed using STATISTICA 12.0 software package (StatSoft, 2013).

3 Research results

Hypothesis on independence of two variables could be denied with more than 95% probability in case of consumers' preferences to inland products and their decision-making according to the price. Consumers preferring inland products consider the price of the food product as a deciding factor less often than the other consumers (table 1). The price is definitely a decisive criterion for 43.1% respondents without a preference to the country of origin, whereas only 23.5% of respondents preferring inland food consider the price in first place. Yet, a relative high price-sensitivity is still notice-able in case of all three studied groups of consumers (defined according to their attitude to inland products).

Table 1 Relation between consumers' preference to inland products and their decision on purchase according to the price (n=400)

Preference for inland products	Decision-making according to the price				
	Certainly yes	*Rather yes*	*Rather not*	*Certainly not*	*n*
Always	23.5%	52.9%	16.2%	7.4%	136
In case of some products	25.1%	54.8%	16.6%	3.5%	199
Never	43.1%	41.5%	13.9%	1.5%	65

Source: Primary survey

Likewise, we can deny the hypothesis on independence of two variables in the case of preference to inland products and the purchasers' decision-making according to a quality label. Again, this hypothesis is denied with more than 95% probability. Consumers who give preference to inland products over foreign products significantly more often consider their labeling by a quality label (table 2).

Table 2 Relation between consumers' preferences for inland products and their decision making on purchase according to a quality label (n=400)

Preference for inland products	Decision-making according to the quality label				
	Certainly yes	*Rather yes*	*Rather not*	*Certainly not*	*n*
Always	23.5%	51.5%	19.9%	5.2%	136
In case of some products	12.1%	56.3%	28.6%	3.0%	199
Never	7.7%	32.3%	46.2%	13.9%	65

Source: Primary survey

Hypothesis on independence of two variables could be denied with more than 95% probability also in case of consumers' preferences to inland products and their decision-making according to the label confirming that the products originated from the region where it is sold. Thus, we can confirm the relation between consumers' preference to inland products and their positive reaction on the label of regional origin of the product. Table 3 brings the evidence, the less is consumers' preference to inland products, the less is a potential the consumers will buy a product because of the label confirming the product originated from the region where it is sold.

To sum up – consumers with positive attitude to inland products are more probably influenced by a quality label whatever the qualitative aspect is (table 2 and 3).

Table 3 Relation between consumers' preference to inland products and their decision-making based on label confirming the product originated from the region where it is sold (n=400)

Preference for inland products	Decision making according to store's labelling of local/regionl products				
	Certainly yes	*Rather yes*	*Rather not*	*Certainly not*	*n*
Always	10.3%	44.1%	15.4%	30.2%	136
In case of some products	1.5%	33.3%	33.3%	31.8%	199
Never	0.0%	9.2%	26.2%	64.6%	65

Source: Primary survey

Although it is obvious, the taste plays an important role in the consumers' decision making (which is supported among others by the fact that no respondent denied the influence of a product's taste on his choice of the food products), we have find out the criteria of taste is still a more important for consumers with higher preference to inland products (table 4). The hypothesis on independence of two variables could be denied with more than 95% probability also in this case.

Table 4 Relation between consumers' preference for inland products and their decision-making according to the taste of the purchased product (n=400)

Preference for inland products	Decision-making according to the taste of the product			
	Certainly yes	*Rather yes*	*Rather not*	*n*
Always	77.2%	22.1%	0.7%	136
In case of some products	75.9%	24.1%	0.0%	199
Never	60.0%	36.9%	3.1%	65

Source: Primary survey

4 Discussion and conclusion

Geographically indexed consumer packaged goods data contain rich information about long-term marketing outcomes (Bronnenberg, Dhar, & Dubé, 2007). The origin of the food products and consumers' attitude interests many scholars in last decades.

Even if "national" or "inland" products and "local" products are perceived differently by consumers (Pícha, Navrátil, & Švec, 2018), we have revealed some closer relations between consumers preferring inland food products and those seeking for local products (products that originate in the region when they are sold) in comparison to the attitudes of consumers that are not interested in the origin of the purchased product.

Consumers may seek out local food because of the superior taste of products (Halweil, 2002). The criteria of taste could be more important for consumers with higher preference to inland products.

Origin of the food product is still an important factor for many consumers at least in part of their purchases. Consumers could be willing to pay a higher price for an inland or local product. They are still, however, quite price sensitive, even if the sensitivity is not as strong as in case of consumers who do not care of the origin of food products they buy.

Inland and local food products should always be a part of supply of food retailers. Their marketing strategy should comprise analysis of consumers' expectations in case of local products as well as the communication and promotion of the local products in their shelves. Orientation on providing consumers with inland and local products (Pícha, Skořepa, & Navrátil, 2013) has been confirmed to be a good strategy or at least a partial strategy of food stores.

Development of consumers' attitudes towards the product origin and especially local food should be further studied with regards to general changes in consumer behavior as well as the development of the importance of local economies in developed countries.

Acknowledgement

References

Allen, P., FitzSimmons, M., Goodman, M., & Warner, K. (2003). Shifting plates in the agrifood landscape: the tectonics of alternative agrifood initiatives in California. *Journal of rural studies*, 19(1), 61-75.

Bronnenberg, B. J., Dhar, S. K., & Dubé, J. P. (2007). Consumer packaged goods in the United States: National brands, local branding. *Journal of Marketing Research*, 44(1), 4-13.

Feagan, R. (2007). The place of food: mapping out the 'local' in local food systems. *Progress in human geography*, 31(1), 23-42.

Feenstra, G. (2002). Creating space for sustainable food systems: Lessons from the field. *Agriculture and human values*, 19(2), 99-106.

Golian, J., Nagyová, Ľ., Andocsová, A., Zajác, P., & Palkovič, J. (2018). Food safety from consumer perspective: health safety. *Potravinarstvo. Slovak Journal of Food Sciences*, 12(1), 313-322.

Halweil, B. (2002). Home grown: the case for local food in a global market. (Vol. 163). Worldwatch Institute.

Hinrichs, C. C. (2000). Embeddedness and local food systems: notes on two types of direct agricultural market. *Journal of rural studies*, 16(3), 295-303.

Kadekova, Z., Recky, R., Nagyová, Ľ., Košičiarová, I., & Holienčinová, M. (2017). Consumers purchasing preferences towards organic food in Slovakia. *Potravinarstvo. Slovak Journal of Food Sciences*, 11(1), 731-738.

Kapsdorferova, Z., & Nagyova, L. (2005). Consumer behavior at the Slovak dairy market. *Agricultural Economics*, 51(8), 362-368.

Knight, A. J. (2013). Evaluating local food programs: The case of Select Nova Scotia. *Evaluation and program planning*, 36(1), 29-39.

Kremer, P., & DeLiberty, T. L. (2011). Local food practices and growing potential: Mapping the case of Philadelphia. *Applied Geography*, 31(4), 1252-1261.

Lin, Y. C. (2009). Chapter 8 Linking Local and Culinary Cuisines with Destination Branding. In *Tourism Branding: Communities in Action* (pp. 105-118). Emerald Group Publishing Limited.

Mundler, P., & Rumpus, L. (2012). The energy efficiency of local food systems: A comparison between different modes of distribution. *Food policy*, 37(6), 609-615

McIntyre, L., & Rondeau, K. (2011). Individual consumer food localism: A review anchored in Canadian farmwomen's reflections. *Journal of rural studies*, 27(2), 116-124.

Nagyová, Ľ., Golian, J., Géci, A., Palkovič, J., Čapla, J., & Kádeková, Z. (2018). Food safety from a consumers´ point of view: food quality. *Potravinarstvo. Slovak Journal of Food Sciences*, 12(1), 355-363.

Nagyová, Ľ., Rovný, P., & Stávková, J. (2014). Consumer perception of eatable oils quality in SR. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 58(6), 329-334.

Pícha, K., Navrátil, J., & Švec, R. (2018). Preference to local food vs. Preference to "national" and regional food. *Journal of Food Products Marketing*, 24(2), 125-145.

Pícha, K., Skořepa, L., & Navrátil, J. (2013). Assessment of the results of the strategic orientation on regional and local products in food retail. *Acta universitatis agriculturae et silviculturae Mendelianae Brunensis*, 61(4), 1061-1068.

Pieniak, Z., Verbeke, W., Vanhonacker, F., Guerrero, L., & Hersleth, M. (2009). Association between traditional food consumption and motives for food choice in six European countries. *Appetite*, 53(1), 101-108.

Raap, U., Schaefer, T., Kapp, A., & Wedi, B. (2007). Exotic food allergy: anaphylactic reaction to lychee. *Journal of Investigational Allergology and Clinical Immunology*, 17(3), 199.

StatSoft, Inc. (2013). *Electronic Statistics Textbook*. Tulsa, OK: StatSoft. Retrieved from: http://www.statsoft.com/textbook/

ThilmanyMcFadden, D. (2015). What Do WeMean by "LocalFoods"? *Choices: The Magazine of Food, Farm*. 30(1), 1-6.

Verbeke, W., Pieniak, Z., Guerrero, L., & Hersleth, M. (2012). Consumers' awareness and attitudinal determinants of European Union quality label use on traditional foods. *Bio-based and Applied Economics*, 1(2), 213-229.

Winter, M. (2003). Embeddedness, the new food economy and defensive localism. *Journal of rural studies*, 19(1), 23-32.

SESSION

MICROECONOMIC AND MACROECONOMIC ASPECTS OF SOCIAL
AND ECONOMIC DEVELOPMENT

Impact of R&D Expenditures on Labour Productivity Growth

Tomáš Volek, Martina Novotná, Martina Kaňková

Abstract: *The expenditures of research and development is nowadays key determinant of economic growth and productivity. The aim of the paper is to assess impact of research and development expenditures on labour productivity growth. The article is focused on the EU countries and the observed data are from the period 2004-2016. The results of the analysis show that the highest expenditure of R&D (% GDP) have the old member states EU. The new member states EU have the highest growth rate of expenditures on R&D. The share of R&D expenditures is different across the EU Member States, ranging from 3.25% of GDP to 0.44% of GDP in 2016. The convergence (σ –convergence, β-convergence) of R&D expenditures in the EU countries has not been confirmed in period 2004 and 2017. A significant relationship was found between R&D and labour productivity only in some countries. Many factors influence this relationship as a time lag or R&D orientation.*

Key words: R&D · Labour Productivity · European Union · Convergence

JEL Classification: O30 · J24 · E24

1 Introduction

The expenditures on research and development (R&D) have a significant impact on economic growth and development of countries' economies. At the same time, science, research and innovation play a key role in increasing the competitiveness of the economies. Innovation, often based on research, is an important condition for maintaining the competitive advantage of businesses and countries. The results of research and development spending often lead to innovations that drive growth in business performance and productivity. The aim of the paper is to assess impact of research and development (R&D) expenditures on labour productivity growth. To investigate in detail if countries with lower work productivity have a higher growth pace than countries with a higher level of this indicator, the absolute converge (β-convergence) and σ-convergence were applied.

The basis for measuring economics growth and productivity production function. The Neoclassical production function takes the form Y(t) = F [K (t), L(t), T(t)] where Y(t) is the flow of output produced at time t. Capital, (t) represents the durable physical inputs, such as machines, buildings, pencils and so on. The second input to the production function is labour, L (t) and it represents the inputs associated with the human body – human capital (Šetek & Petrách, 2016) . The third input is the level of knowledge or technology, T (t) (Barro & Sala-i-Martin 2004). This neoclassical production function is based on the Solow's fundamental work. Technological progress is generally considered to be a very important growth factor. This also illustrates economic growth models. According to Solow's model, technological progress is the only factor that constantly increases the product to a real worker.

Models of endogenous growth say that economics growth is an endogenous process, coming from within each particular economy, with each having a different production function reflecting different quantities and qualities of its inputs and their ability to adapt, develop and use knowledge about how to produce within that economy (Cypher, 2014). The production function takes the form Y = F (R, K, H), Where Y is total output, R is Research and development (R&D) done by all firms in the economy, K is the accumulated physical capital stock and H is the accumulated stock of human capital (Romer, 1994). Research and development (R&D) is key determinant of economic growth. In models with the theory of endogenous growth, trying to explain the causes of technological progress and what policies could be beneficial to it. In the neoclassical model, the causes of technological progress cannot be explained; we can explain the endogenous growth model. They are investments in knowledge, research and development (Holman, 2004). Hájek and Stejskal (2018) say

Ing. Tomáš Volek, Ph.D., University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, České Budějovice, Czech Republic, e-mail: volek@ef.jcu.cz

Ing. Martina Novotná, Ph.D. University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, České Budějovice, Czech Republic, e-mail: novotna@ef.jcu.cz

that it is an important factor influencing the efficient use of research and development (R&D) is cooperation on the creation effects.

Productivity shows us the efficiency with which production factors are used. Productivity is the ratio of outputs and inputs. The basic indicator of productivity is labour productivity that tells us how effectively is labour force used. Labour productivity is measured as gross value added per labour input. Some of studies showed that labour productivity is a key factor in regional growth (Cuadrado-Roura et al. 2000, Dušek 2013). Labour productivity is influence by many factors as brach (sector), innovations (Mura & Rozsa, 2013, Vrchota & Řehoř, 2017), size of firm or economy (Chmelikova &Redlichova, 2013) or technological intensity (Hall et al.,2009). Apergis et al. (2008) found that R&D have statistically quantitatively important effects on labour productivity.

2 Methods

The paper deals with analysis of the impact of research and development (R&D) expenditures on labour productivity growth. The article is focused on the EU countries. The analysis is based on the date of EUROSTAT. The observed data were from the period 2004-2016. Correlation analysis was used to measure the relationship between research and development expenditures on labour productivity growth. Next step was an assessment of the convergence in the member states of the EU using β-convergence and σ-convergence. The definition of convergence intuitively says the difference between two or among more variables diminishes in time. It becomes negligible and converges to zero. We understand convergence as a process of approaching to a certain level, diminishing the difference between two variables in time (Nevima & Melecký, 2011).

The concept of β-convergence is understood as a convergence of the economic level of different countries (the assessment of labour productivity convergence in the member states EU). β-convergence comes from the neoclassical conception of the economic growth, where the growth of labour productivity is, in this case, negatively dependent on a starting economic level. It means, in the concept of β-convergence, that countries with a lower labour productivity level increase faster in a starting point of observation in comparison with countries with a higher level of this indicator. β-convergence can be defined using the following regressive equation:

$$\frac{1}{T} ln \left(\frac{Y_{it}}{Y_{i0}} \right) = \alpha + \beta * lnY_{i0} + \mu_i \tag{1}$$

Where the left side of the equation expresses the average labour productivity growth in the period from starting point 0 to t, which is dependent on the initial labour productivity level ($Y_{i,0}$), i denotes an observation number (country), T is the total number of years of the observation period, α is a constant, β is a coefficient and μ_i is a random component. B-convergence occurs when the slope of line beta is negative Baumol (1986).

σ-convergence comes also from the neoclassical conception of the economic growth, where all states converge to the same level of economic development or to the same economic performance. As a relative variance rate is used the coefficient of variation c_x, which is a quotient of the standard deviation and the arithmetic mean of the given observed variable

$$c_x = \frac{s_x}{\bar{x}}, \qquad \text{where} \qquad S_x = \sqrt{\frac{\Sigma_{i=1}^{n}(x_i - \bar{x})^2}{n}} \, . \tag{2}$$

σ-convergence takes place if the coefficient of variance of the economic levels of particular countries decreases in time. When defined on absolute differences, for example (Slavík, 2007), the existence of β -convergence a necessary condition for σ -convergence. However, this relationship need not be true vice versa.

3 Research results

The basic result of this article is to quantify the relationship between R&D expenditure and labour productivity. The R&D spending in the EU is 2% of the gross domestic product (Figure 1). The high spending on research and development have primarily old Member States such as Sweden, Austria and Germany. Small spending on research and development (less than 1% of GDP) has new Member States such as Latvia, Romania and Bulgaria. On the other hand, the largest increase of R&D expenditures have mainly new Member States as Slovakia, Bulgaria and Poland (R&D expenditures on GDP - index (2016/2004) is more than 2.5) Low increase in R&D expenditures was found in Finland and Sweden.

Figure 1 Research and development expenditures (R&D) 2016 - (% GDP)
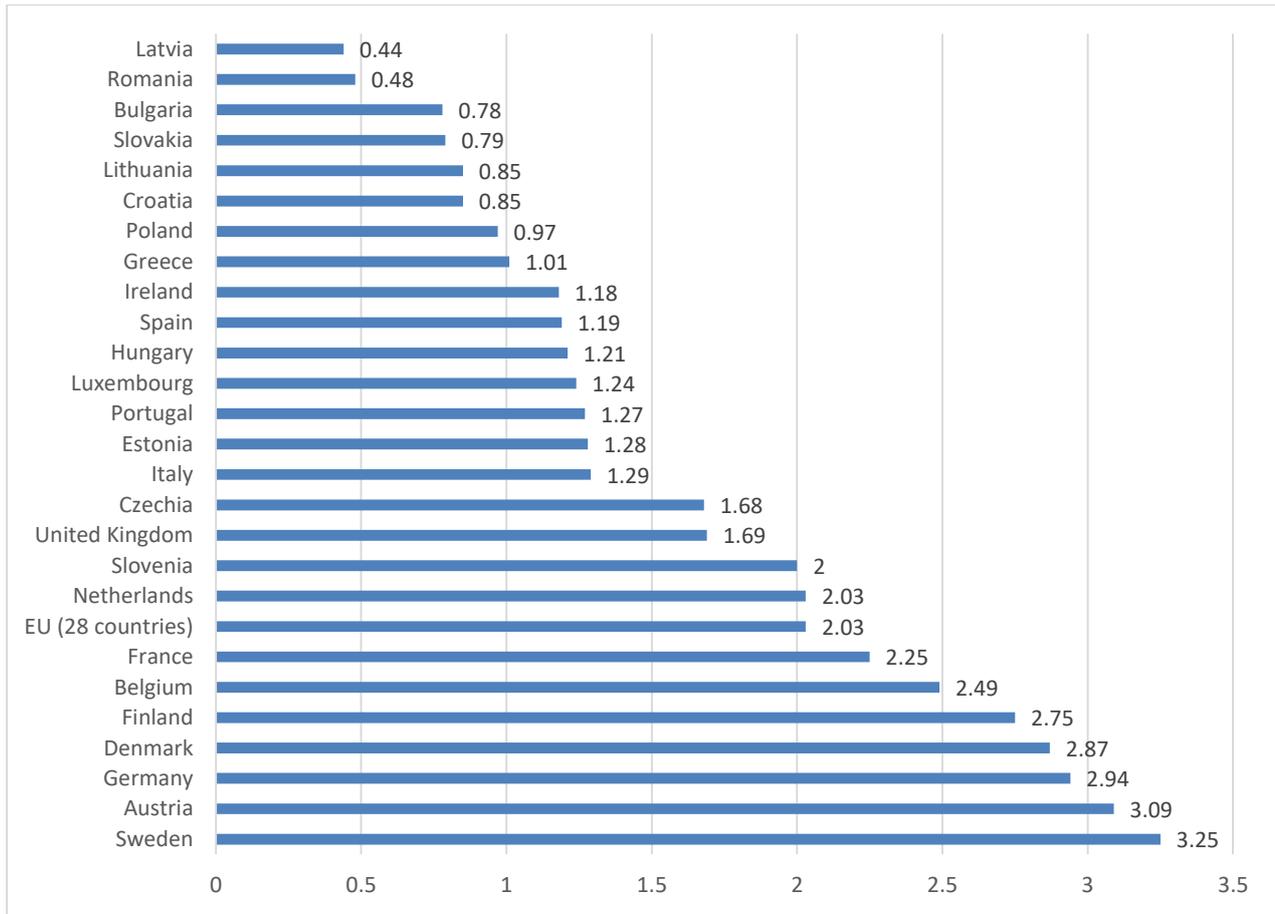
Source: Eurostat

Next step was explore the convergence R&D expenditures in the EU by using β-convergence and σ-convergence. The following Figure 2 shows us the β-convergence in the EU countries. It was found that the selective regressive coefficient (coefficient β) is negative (-0.51) and the determination index ($R^2 = 0.27$). There is no significant convergence in the EU countries.

Figure 2 Expenditure of R&D on GDP - β convergence of the EU countries
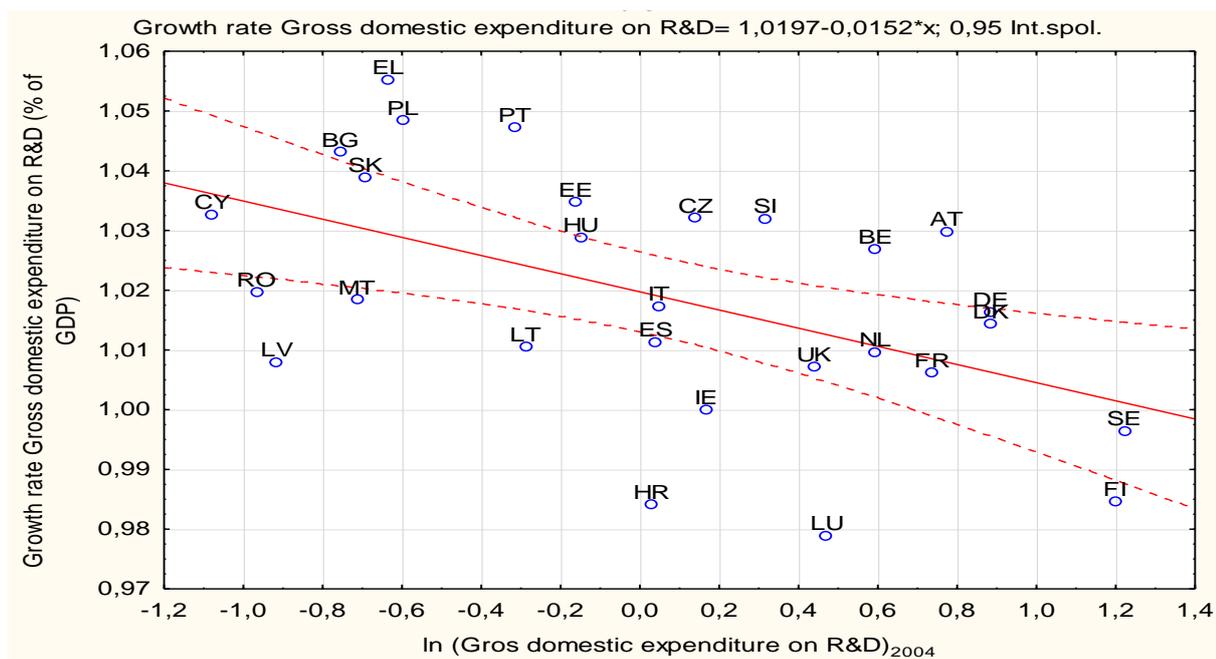
Source: Own calculations based on the data of Eurostat

The next section was determined σ- convergence, which is described as follows in Table 1. An important role is played by the coefficient of variation, which in 2015 falls. We can assume that σ-convergence as the variance values decrease to the year 2015.

Table 1 expenditures on R&D - σ convergence of the EU countries

|	average	median	min.	max.	SD	Var.coef.
2004	1.29	1.05	0.34	3.39	0.86	**66.42**
2005	1.31	1.08	0.37	3.39	0.86	**65.25**
2006	1.35	1.15	0.38	3.5	0.86	**63.42**
2007	1.35	1.18	0.4	3.35	0.84	**62.15**
2008	1.44	1.29	0.39	3.55	0.9	**62.44**
2009	1.5	1.38	0.44	3.75	0.94	**62.79**
2010	1.51	1.43	0.45	3.73	0.91	**60.01**
2011	1.58	1.46	0.46	3.64	0.92	**57.88**
2012	1.61	1.34	0.44	3.42	0.91	**56.54**
2013	1.61	1.36	0.39	3.31	0.9	**55.69**
2014	1.6	1.35	0.38	3.17	0.87	**54.16**
2015	1.61	1.31	0.48	3.27	0.84	**52.11**
2016	1.54	1.26	0.44	3.25	0.86	**56.14**

Source: Own calculations based on the data of Eurostat

The second part of the analytical part is the field of labour productivity. Figure 3 illustrates the growth rate of labour productivity of individual Member States in relation to the average EU labour productivity in 2004 (accession of the Czech Republic to the EU) and subsequently in 2017. The EU average exceeds the Member States (15) except Portugal, both in the two years compared. An exception is Greece, where labour productivity declined from 101% to 79% in 2017. The highest labour productivity has Ireland, Belgium and Austria. Later, the accession countries have a labour productivity level lower than the EU average (for example, Czechia in 2004 had about 74% of the EU average), but it is clear that these countries show higher labour productivity growth in 2017 (eg Czechia's percentage share in 2017 it increased to about 81%). On the contrary, the old EU Member States are stagnating and, in some cases, even reducing the percentage share. The highest labour productivity have Ireland, Belgium and Austria. The lowest labour productivity have Latvia, Romania and Bulgaria. The highest growth rate of labour productivity have except Ireland the new member states of EU as Romania, Lithuania and Latvia.

Figure 3 Current situation on labour productivity in EU (EU 100 %)
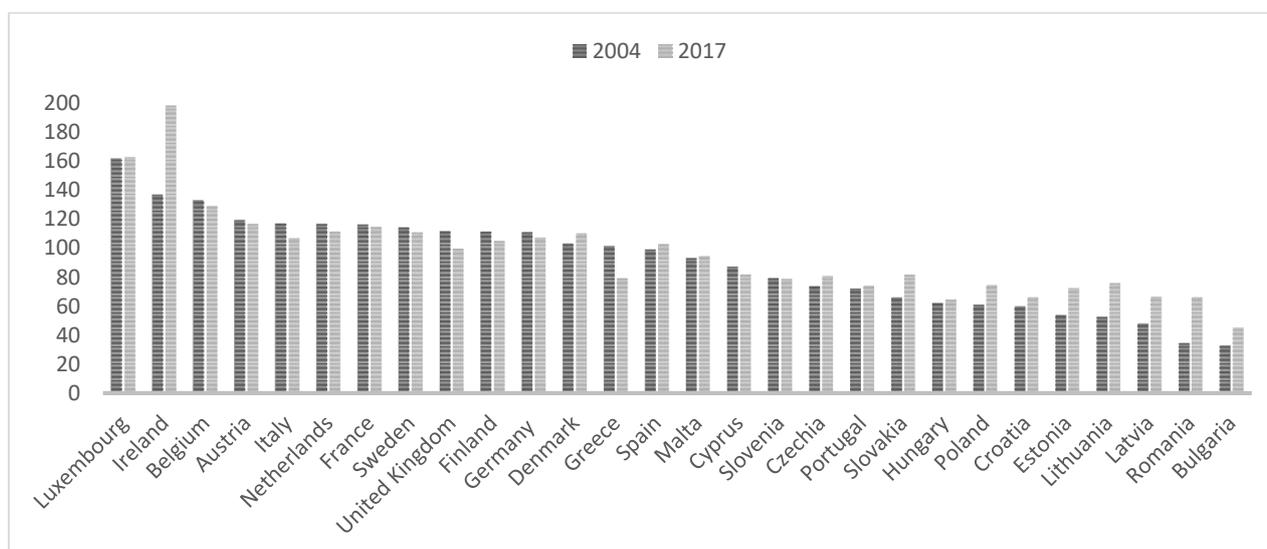
Source: Own calculations based on the data of Eurostat

The last part of the analysis deals with the relationship between the growth of expenditures on R & D expenditures and the growth of labour productivity. The aim was to find out whether the growth of R & D expenditures also affected

labour productivity growth. Regression and correlation analysis was used to determine the relationship. The results of the analysis are shown in Table 2. Countries are divided based on the leakage of the dependence between rising R & D expenditure and labour productivity growth. The largest statistically significant link was found in the first group countries, such as Belgium or Denmark. There are many factors that can influence this relationship as a time-lag, R&D orientation, structure of economy (sectors) or government subsidy R&D.

Table 2 Correlation between growth rate of R&D expenditures and labour productivity

Groups	Countries
Group 1 - significant dependence (R > 0,6)	BE*, DE*, ES*, FR*, LV*, LT*, LU*, NL*, AT*, PL*,RO*, SE*, UK*
Group 2 - medium dependence (R <0.4 ，0.59>)	IT*, CZ, IE, EL,CY, HU, MT, SK, FI
Group 3 - low dependence (R > 0.4)	BG, DK, EE, HR, PT*, SI,

Notes: * denotes statistical significance at the 5%; Country abbreviations: Belgium (BE); Greece(EL); Lithuania(LT); Portugal(PT); Bulgaria(BG); Spain(ES); Luxembourg(LU); Romania(RO); Czechia (CZ); France(FR), Hungary(HU); Slovenia (SI); Denmark(DK); Croatia(HR); Malta(MT); Slovakia(SK); Germany(DE); Italy(IT); Netherlands(NL);Finland (FI); Estonia(EE); Cyprus(CY); Austria(AT); Sweden(SE); Ireland(IE); Latvia(LV); Poland(PL); United Kingdom(UK).

4 Conclusions

The paper focuses on the link between R& D expenditure and labour productivity. The labour productivity is highest in the old member states EU. Labour productivity in these countries was found to stagnate or decrease slightly in 2017 compared to 2004. The new member states EU have the highest growth rates of LP. It was found convergence of level of LP in EU countries. The share of R & D expenditure is different across the EU Member States, ranging from 3.25% of GDP to 0.44% of GDP in 2016 The highest expenditure on R&D (% GDP) have the old member states EU. The new member states EU have the highest growth. Although there is an increase in these expenditures in the new Member States, this growth is not so significant as, on the basis of the σ -convergence and β-convergence assessment, the convergence of R & D expenditure between 2004 and 2017 has not been confirmed. It was found only low convergence of level expenditure on R&D in the EU. A significant relationship was found between R&D and labour productivity only in some countries (Group1). Many factors influence this relationship.

References

Apergis, N., Economidou, C., & Filippidis, I. (2008). Innovation, technology transfer and labour productivity linkages: evidence from a panel of manufacturing industries. *Review of World Economics*, 144(3), 491-508.

Baumol, W. J. (1986). Productivity growth, convergence, and welfare: what the long-run data show. *The American Economic Review*, 76 (5), 1072-1085.

Barro, R.J, & Sala-i-Martin, X.I. (2004). *Economic Growth*: McGraw-Hill.

Chmelikova, G., & Redlichova, R. (2013). Start-ups and their Role in the Economy. In *Region in the development of society 2013* (s. 129–136). Zemedelska 1, Brno, 613 00, Czech Republic: Mendel Univ Brno, pp. 129 -136.

Cuadrado-Roura, J. R., Mancha-Navarro, T., & Garrido-Yserte, R. (2000). Regional productivity patterns in Europe: An alternative approach. *Annals of Regional Science*, 34(3), 365-384. doi: 10.1007/s001680000019

Cypher, J. (2014). *The Process of Economic Development*: Taylor & Francis.

Dusek, J. (2013). European grouping of territorial cooperation as a way of cross-border regional cooperation within the European Union. *16th International Colloquium on Regional Sciences,* pp.329-336.

Hájek, P. & Stejskal, J. (2018). R&D Cooperation and Knowledge Spillover Effects for Sustainable Business Innovation in the Chemical Industry. *Sustainability*, 10(4), 1064.

Hall, B. H., Lotti, F., & Mairesse, J. (2009). Innovation and productivity in SMEs: empirical evidence for Italy. *Small Business Economics*, 33(1), 13–33. https://doi.org/10.1007/s11187-009-9184-8

Holman, R. (2004). *Macroeconomics 1*. vyd. Praha: CH Beck.

Mura, L., & Rozsa, Z. (2013). The impact of networking on the innovation performance of SMEs. In Loster, T and Pavelka, T (Ed.), *7th International days of statistics and economics* (s. 1036–1042). Fugnerova 691, Slany, 27401, Czech Republic: Melandrium.

Nevima, J., & Melecky, L. (2011). The β-convergence analysis of the visegrad four NUTS 2 regions. *Mathematical Models and Methods in Modern Science*, 48-53.

Romer, P. M. (1994). The Origins of Endogenous Growth. *The Journal of Economic Perspectives,* 8(1), 3-22.

Slavík, C. (2007). Reálná konvergence õeské republiky к evropské unii v porovnání s ostatními novymi ölenskymi zeměmi. *Politická ekonomie*, 1, 23.

Šetek, J., & Petrách, F. (2016). Human capital in the context of the economic dimension of crime in the transformation of the economy. *10th International Days of Statistics and Economics.* Praha. Czech republic. pp. 1777-1786.

Vrchota, J., & Rehor, P. (2017). Influence of strategies to determine the significance of the crisis by the managers of small and medium-sized enterprises. *Serbian Journal of Management,* 12(1), 53-63. doi: 10.5937/sjm12-11138.

The Ageing Challenges for Agriculture

Gintarė Vaznonienė, Vilma Atkočiūnienė

Abstract: *This article is intended to analyse the ageing issue in agricultural sector as a significant factor influencing the future of development of rural areas and agricultural activity. The main focus is placed on the fact that farmers' rotation involves a certain age conflict. Current situation in agriculture shows that young generation is not willing to be workers in agricultural sector, while elderly farmers, due to their age, are retiring or quitting this activity. Slow change of generations in agriculture, difficult engagement and maintenance of youth in agriculture as well as increasing number of elderly farmers reveal that this age conflict between different generations determines intergenerational tension which has emerged in agricultural sector of the European Union in the recent decade. Analysis of the secondary data in the selected countries highlights the deepening and developing issue of farmers' ageing. The authors consider that the local and national authorities are responsible for the society welfare issues and should further encourage socially innovative solutions by finding unconventional ideas for obtaining multidimensional support, including assistance provided by policy-makers and involving local agents to enhance inclusion of the aged and young population in the labour market and creation of local food systems.*

Key words: Ageing · Farmers · Agriculture · Policy Making

JEL Classification: I3 · J18 · Q18

1 Introduction

Ageing of European societies has already developed into an issue of contemporary society characteristic not only by majority of the European countries, but also of their rural areas, where this issue is becoming even more evident. The downgrading rural life due to the issue of ageing causes various inconveniences and challenges not only to local people, local government, but national government as well. It is not only the ageing of population that is viewed as an issue in rural areas, but also various negative effects created by it and related to changes in people's lifestyle, health, with respective effect on the transformations of rural economic activities. Practice of a number of countries shows that ageing population of rural areas is becoming a challenge, even a burden, to the country, as it requires additional expenses to maintain this part of the population. A fairly large share of rural population is occupied in the agricultural sector, and, consequently, these issues are becoming even more evident: the lowest income reported in rural areas (EUROSTAT, 2017), slow change of generations in agriculture, difficult engagement and maintenance of youth in agriculture as well as increasing number of elderly farmers (Mitchell, 2008; Population ageing in Europe: Facts, implications and policies, 2014; Guo et al., 2015) imply that this age conflict between different generations determines intergenerational tension which appears in agricultural sector of the European Union.

It has been claimed that, in Europe, there are 5.6 farmers older than 65 for each farmer younger than 35 (Young farmers in the EU – structural and economic characteristics, 2017). The ratio of young to elderly farmers (Rovny, 2016; Young farmers in the EU – structural and economic characteristics, 2017) shows negative aspects in renewal of farmers' population. Usually, ageing could be understood as physical, social, psychological process or transition from working age to retirement age, meaning that generations are changing as a normal process of society. Nonetheless, population ageing cannot be considered just as a process concerning only the elderly farmers, because it affects the entire social structures of rural areas and causes significant imbalance on the intergenerational perspective (Population ageing in Europe: Facts, implications and policies, 2014; White, 2015). This issue is the most evident in small-scale agriculture which usually is

Assoc. prof. dr. Gintarė Vaznonienė, Aleksandras Stulginskis University, Faculty of Economics and Management, Business and Rural Development Management Institute, Universiteto str. 10 - 408, LT-53361 Akademija, Kaunas distr., e-mail: gintarej@gmail.com

Prof. dr. Vilma Atkočiūnienė, Aleksandras Stulginskis University, Faculty of Economics and Management, Business and Rural Development Management Institute, Universiteto str. 10 - 408, LT-53361 Akademija, Kaunas distr., e-mail: vilma.atkociuniene@gmail.com

the major source of employment in rural areas. Various studies (White, 2012; Susilowati, 2014; Rovny, 2016) have revealed that young people are not interested in farming or future of rural areas, while older generation, to the contrary, tends to retain agricultural activity as the driving activity of rural people. Moreover, it should be pointed out that each new generation of rural young men and women now grows up with an opportunity to have better education than their parents, which increases their options for a future work place. B. White (2012, p. 15) has raised the challenging question related to engagement in agricultural activity: who wants to wait until he/she is 40 or 50 years old to become a farmer while the life never stops running?

There are a lot of factors which make agriculture an unattractive activity to young workforce. The factors include push and pull factors. The *push factors* are, for example, the increasing scarcity of agricultural land, and *pull factors* – more promising and higher income from working in the non-agricultural sectors. Furthermore, in terms of the cultural value system, the biggest part of youth considers working in non-agricultural sectors to be more prestigious. They prefer going to the cities to work as specialists of different areas, having more prestigious jobs (Mitchell et al., 2008; Susilowati et al., 2012; White, 2012). On the other hand, young generation has the potential to create innovations in agricultural sector, they are well educated, possess energy and are capable of demonstrating environmentally responsible and productive farming practices.

This age conflict between different generations, or intergenerational tension, has become particularly evident in the recent decade in agriculture of majority of the EU countries. Accordingly, researchers and agricultural specialists have recognized that slow renewal of human resources in agriculture, shift in the structure of agricultural labour are becoming a significant problem which requires specific implements (Carbone, Subioli, 2008; The ageing of rural populations: evidence on older farmers in lowand middle-income countries, 2014; Susilowati, 2014; Guo et al., 2015). Agriculture creates a huge impact not only on rural areas but on the entire society as well, and influence future economy of all generations. Here, certain phenomenon of alienation of young people from agricultural activity, knowledge and whole rural life has developed. The ageing farmers' society is the evidence that, not only for the elderly farmers, who are the driving force in primary agriculture, the declining interest among young farmers to work in the agricultural sector can have negative consequences on future sustainability not only of this agricultural sector, but also on rural areas and the entire society (Jurkėnaitė, 2013).

In view of the above, the formulated *research problem*: how does ageing affect changes in farmers structure and perspectives of agricultural activity. *Research object*: the issue of ageing in agriculture. *Research aim*: to analyse ageing as an issue in agriculture. In view of the research aim, several *research objectives* have been identified: 1) to identify the specifics of the issue of ageing in rural areas and agricultural activity; 2) to describe the research methodology; 3) to analyse the research results. This article refrains from comprehensive analysis of the issue of ageing and focuses more on challenges of farmers' ageing and the consequences on agricultural activity.

2 Methods

Though this article analyses differences in the issue of ageing in agriculture in the selected countries, it is clear that the issue of ageing is also a challenge in other economic activities or different types of living area. This article is focused on the issue of ageing in four selected EU countries: the Czech Republic, Lithuania, Hungary and Slovakia. These countries resemble each other to a certain extent in terms of development of the issue of ageing in agriculture, and share similarities in terms of their respective situation in small scale farming. This has enabled the authors to perform comparison based on young and elderly farmers changes in the agricultural sector.

Data from several databases related to situation of farms may be used for this kind of research:

- EUROSTAT Farm structure survey (FSS) – survey on the structure of agricultural holdings;
- The Farm Accountancy Data Network (FADN) – an instrument for evaluating the income of agricultural holdings and the impacts of the Common Agricultural Policy;
- Agricultural census of individual countries;
- United Nations' Food and Agriculture Organisation (FAO) – an instrument for evaluating the income of agricultural holdings and the impacts of the Common Agricultural Policy;
- Various scientific researches results and publications.

Nonetheless, this research is based mostly on the data taken from the EUROSTAT Farm Structure Survey (FSS). Given that the available data are not actually up to date, the analysis is focused mainly on the information related to the period of 2005-2013. The limitations of the research have emerged in the attempts to evaluate the latest data, because not all data are accessible for the same years in the selected countries. It should be mentioned that, according to the EUROSTAT Glossary (2018) of concepts, agricultural holding, or holding or farm, are the concepts which carry the mostly

same meaning – natural person, group of natural persons or legal person. Definition of young farmers is used Regulation (EU) No. 1305/2013 of the European Parliament and of the Council. This document defines young farmer as a person who is no more than 40 years of age at the moment of submitting the application, possesses adequate occupational skills and competence and is setting up for the first time in an agricultural holding as head of that holding. Accordingly, in this case, we shall consider young farmers to be the persons under 40 years and the future-oriented human capital which can contribute to supporting agricultural sector.

Several social economic indicators enabling to characterise the issue of ageing and its depth in agriculture have been selected for the research. The indicators have been compared, and structural and relative changes of age have been assessed, followed by generation of the insights about ageing in the future of farming, as the latter have also been assessed not only on the EU scale, but also at national level in individual countries. Various criteria have been used for identification of the scope of the issue of renewal of farmers' generation: e.g., average farmers' age (Scott, 2005; Jurkėnaitė, 2013), where high value of the indicator could be linked to the issue of renewal of generations. Nonetheless, this indicator would not provide any information on the farmers' structure by age (Scott, 2005) and potential farm viability. The selected countries have therefore been compared using the following indicators: the share of people occupied in agriculture in the total number of occupied population; distribution of occupied population in agriculture by age groups; change and structure of agricultural holdings by holder's age; ratio of young to old farmers.

3 Research results

Agriculture is usually recognized as one of the sectors engaging the highest employment rate of rural people (Carbone, Subioli, 2008; White, 2012; Rovny, 2015). Nonetheless, the extent to which agricultural activity is important for the rural area is also conditionally revealed by the differences in the proportions of population living in a rural area, because these areas are where the most farmers live and perform their activity. In the selected countries, Slovakia had the largest rural population in 2016 – 46.5 % of total population, accordingly, in Lithuania – 33.5 %, Hungary – 28.3 %, the Czech Republic – 27.02 %.

This could mean that this kind of activity would be expected to provide the main material resources for people living in rural areas. Analysis of the statistical data based on people occupied in agriculture in total occupied population has shown that the situation differs from country to country in the EU (Fig. 1).

Figure 1 Share of population occupied in agriculture in the total occupied population in 2015, percent
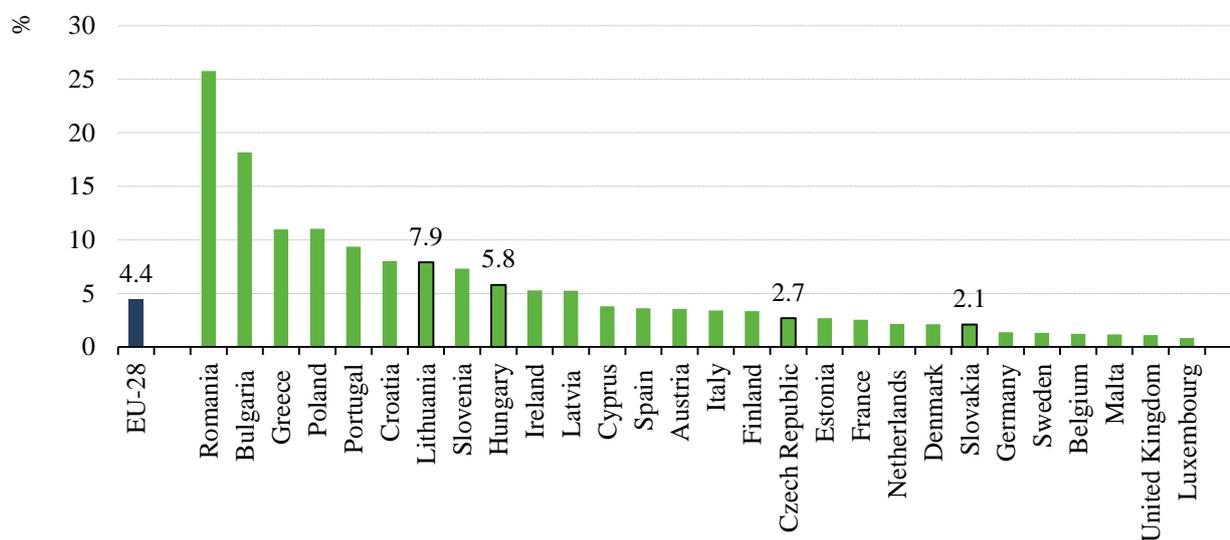
Source: made by the authors using Eurostat data, 2017

In the case of selected countries (the Czech Republic, Lithuania, Hungary and Slovakia), their comparison has suggested that, in Lithuania (+3.5 %) and Hungary (+1.4 %), the analysed indicator was higher than the EU's average, while the situation observed in the Czech Republic and Slovakia was opposite – the indicator was lower by 1.7 % and 2.3 % respectively. The figure shows that the larger the share of population occupied in agriculture, the greater role is played by this sector in the country.

Carbone, A. and Subioli, G. (2008) have emphasized that comparative description of the process of ageing in the primary sector enables researchers to reveal the depth of this issue in various countries. This means that availability of the information on the age group prevailing in agriculture enables assessing the situation and exploring the means for its

improvement. One of the indicators disclosing the analysed problem is distribution of the population occupied in agriculture by age groups (Fig. 2). This indicator helps understand how workers in agriculture have distributed according to their age in different countries, as well as identify where the concentration of the largest share of agricultural workers is the highest.

Figure 2 Distribution of the population occupied in agriculture by age groups in 2016

Czeck Republic ➡️
15-39 age group – 32,7%
40-64 age group – 63,8%
65+ - 3,5%

Hungary ➡️
15-39 age group – 35,0%
40-64 age group – 62,9%
65+ - *no data*

Lithuania ➡️
15-39 age group – 25,7%
40-64 age group – 66,5
65+ - *no data*

Slovakia ➡️
15-39 age group – 36,0%
40-64 age group – 62,1%
65+ - *no data*
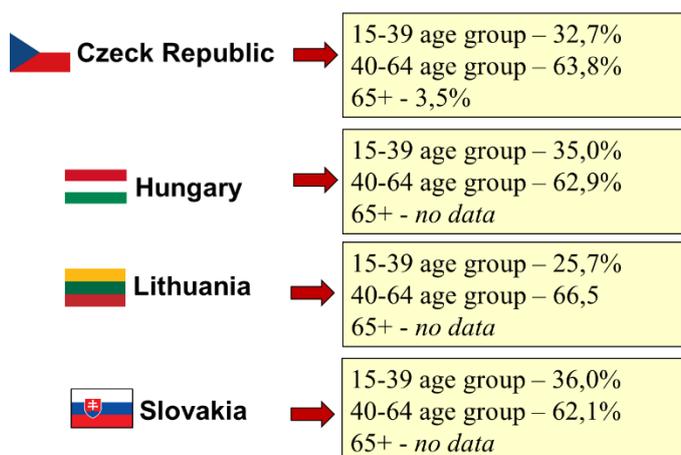
Source: made by the authors using WBO data, 2018

This figure has revealed an important issue related to availability of statistical indicators – the analysis can become limited, if there are no specific facts about the situation. In particular, this becomes evident in the attempts to compare different countries. In this case, when comparing the selected countries, it is clear that the age group 40-64 accounted for the largest share of the population occupied in agriculture in all selected countries, while the youngest group accounted for more or less one third (depending on country) of the population occupied in agriculture. The oldest group according to the given figure were not identified by the WBO at that moment, but it can be calculated. Moreover, although it has been emphasized that, in most European countries, retirement age is 65 or above, in Lithuania, for example (Demographic yearbook, 2017), the retirement age of 65 years is expected to be established only in 2026, while in 2016, the retirement age was 63 (and 4 months) for men and 61 (and 8 months) for women. This also shows distortions in calculation of the elderly population in agriculture and its comparison to the other countries, because there is a 2- or 4-year difference for male and female farmers when comparing to the other countries. Furthermore, it has been emphasized that, for example, in Lithuania, the number of elderly has increased because the retirement age is lower than in most European countries.

The change in the numbers of younger agricultural holding holders (below the age of 35) in 2013 compared to the year 2005 and 2010, was the most significant in the Czech Republic (Table 1), while comparison of the same years in other countries has shown changes older groups of agricultural holding holders.

Table 1 Changes of agricultural holding holders by age group (percent points)

Age group	Czech Republic		Lithuania		Hungary		Slovakia	
	2013/2005	2013/2010	2013/2005	2013/2010	2013/2005	2013/2010	2013/2005	2013/2010
Less than 35 years	-5,7	-7,9	0,4	-0,2	-1,6	-0,9	3,6	1
From 35 to 44 years	-3	-6,8	-5,1	-2	0	0,3	1	0,2
From 45 to 54 years	-4,7	-2,4	3,6	1,7	-6,5	-1,7	-2,5	-2
From 55 to 64 years	6,5	6,3	-1,7	2,4	5	1,3	4,2	1,8
65 years or over	7	10,9	2,8	-2	3,1	0,9	-6,1	-0,9

Remark: white cells show negative change, colored – positive change.

In Slovakia, to the contrary, the major decrease was observed in the age group of 65 years or above. Taking into account the situation of all the selected countries in all age groups, comparing years 2013 and 2005, the number of agricultural holding holders decreased in terms of absolute numbers. This allows making certain conclusions on the attitude towards agricultural activity and reveals that each analysed country was subject to specific conditions which influenced the decrease in the number of people occupied in agricultural activity. Nonetheless, in Lithuania and Slovakia, comparing years 2013 and 2005, the youngest group increased respectively by 0.4 and 3.6 percent points in terms of the structure. Comparing the situation in 2013 and 2010 in the selected countries, the situation different in the youngest group, and only in Slovakia, the number of agricultural holdings holders aged below 35 increased.

It is obvious from the given table that the most significant increase in the number of agricultural holding holders in three countries was observed in the age group from 55 to 64, comparing 2013 to 2005 and 2010. These tendencies confirm the insights expressed in the introduction part of the article that the generational turnover in farming mostly has negative tendencies and the renewal of farmers' population is very slow.

Deeper analysis or structural analysis of agricultural holders by age groups (Table 2) in 2013 (in the year, for which the latest data was available in the process of conduction of the research) reveals very similar tendencies in the situations of the selected countries, which have been noticed doing comparison by years.

Table 2 The structure of agricultural holders by age groups in 2013 (percent)

Age group	Czech Republic	Lithuania	Hungary	Slovakia
Less than 35 years	4,4	5,6	6,1	7,7
From 35 to 44 years	14,2	13,7	14,7	14,5
From 45 to 54 years	23,1	25,3	19,3	24
From 55 to 64 years	33,5	20,6	29,2	30
65 years or over	24,8	34,8	30,7	23,9
The youngest group Less than 35 years PLUS From 35 to 44 years	*18,6*	*19,3*	*20,8*	*22,2*
The oldest group From 55 to 64 years PLUS 65 years or over	*58,3*	*55,4*	*59,9*	*53,9*

In this case, it can also be observed that, in the structure of agricultural holders in 2013, the youngest group was 3 times smaller than the oldest group in the Czech Republic, Lithuania and Hungary, and almost 2.5 times smaller in Slovakia. Young farmers in Slovakia accounted for the largest share of young farmers (22.2 %) compared to other selected countries, while in the oldest group, Hungary had as many as 60 % of older farmers.

Another indicator which is important in analysis of ageing in agriculture is the ratio of young to old farmers (Table 3). This indicator also emphasizes the depth of the issue of ageing and can be closely related to the older farmers' concerns that there would not be sufficient number of people occupied in the agricultural sector in the near future. In particular, this issue can be observed in small or family farms (Garner, Campos, 2014; Rovny, 2016), where family members face the issue of keeping young people at the farm, as young people prefer other activities or off-farm employment.

Table 3 Ratio of young to old farmers

Countries	Number of farmers younger than 35 years for every farmer older than 55 years		Number of farmers younger than 35 years for every farmer older than 65 years
	2007	**2010**	**2013**
Czech Republic	0,25	0,29	0,18
Lithuania	0,08	0,11	0,16
Hungary	0,14	0,12	0,2
Slovakia	0,06	0,14	0,32

Source: made by the authors following Rovny, 2016; Young…, 2017

The table above presents comparison of the ratio of young to old farmers in different years and emphasizes how changes in the numbers of young farmers influence the changes in the oldest farmers group. This indicator is quite low in the selected countries and varies from year to year, depending on certain factors, and supports that the turnover of generations is very small, as suggested already by the analysed data. In analysis of this indicator, the authors have calculated that, for every young farmer in 2013, there were 13 older farmers in the Czech Republic, 10 older farmers in Lithuania and Hungary, 7 older farmers in Slovakia.

Summarizing the situation suggested by all the analysed indicators, it can be concluded that this is a deep issue, which not only on the specifics of agricultural activity. It should taken into account that farmers' families also play a significant role, as they are capable of demonstrating positive sides of agricultural activity integrating young people into the daily agricultural routine. Agricultural policy priorities and implements (for example policy related to access to capital, developing skills, access to land etc.), which vary across the selected countries, also have considerable influence. Moreover, from scientific point of view, future situation and relations among young and elderly farmers should be discussed and monitored in order to verify the need to establish positive forces which can help form agriculture as a more attractive activity.

4 Conclusions

Ageing in agriculture has a huge impact on the outcomes for future rural areas economy and its social structure as well to all society. The generational renewal problem in agriculture is challenged by low change of generations in agriculture, difficult engagement and maintenance of youth in agriculture, increasing number of older farmers and potential decrease of agricultural production due to previous problems.

Analysis of statistical indicators based on farmers ageing revealed the depth of the problem. Ageing indicators in agriculture in the selected countries highlighted that all four countries face similar situation – lack of rotation of young people comparing to older farmers; comparison and structural indicators of farmers ageing disclosed also mostly negative tendencies in renewal of elderly farmers' population. Some older farmers retire, some make their activity specialized or even sell their farm, while not everybody can dispose it to their younger family members. This challenges that the present demographic reality demands attention from national and local policy-makers and other interested actors which should rethink implements solving this problem.

Some methodological remarks should be kept in mind while evaluating ageing phenomenon in agriculture. Existing data are not always up to date, the retirement age is not the same not only in the selected countries of this article, but also in another European Union countries – this makes inconveniences searching for the useful data.

References

Ageing in the Twenty-First Century: A Celebration and A Challenge. (2012). [Online]. United Nations Population Fund. Available at (accessed online 26 10 2018): https://www.unfpa.org/sites/default/files/pub-pdf/Ageing%20report.pdf

Carbone, A., & Subioli, G. (2008). The generational turnover in agriculture: the ageing dynamics and the eu support policies to young farmers. *Paper prepared for the 109th eaae seminar "The cap after the Fischler Reform: national implementations, impact assessment and the Agenda for future reforms*". Università della Tuscia, Viterbo – Italy.

Demographic yearbook 2016. (2017). Statistics Lithuania. Vilnius.

EUROSTAT. (2017). Farmers in the EU – statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php/Farmers_in_the_EU_-_statistics#Rural_areas_-_place_where_most_farmers_live

EUROSTAT. (2018). Agricultural holding. Glossary: Statistics explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary: Agricultural_holding

Garner, E., & Campos, A .P. (2014). *Identifying the "family farm". An informal discussion of the concepts and definitions*. Food and Agriculture Organization of the United Nations, Rome. Available at: http://www.fao.org/3/a-i4306e.pdf

Guo G., Wen Q., & Jingjuan Zhu, J. (2015). The Impact of Aging Agricultural Labor Population on Farmland Output: From the Perspective of Farmer Preferences. *Mathematical Problems in Engineering*. Volume 2015, 7 pages. http://dx.doi.org/10.1155/2015/730618

Jurkėnaitė, N. (2013). Lietuvos ūkių demografinis gyvybingumas (Demographic viability of Lithuanian farms). *Management Theory and Studies for Rural Business and Infrastructure Development*. Vol. 35. No. 4. Scientific Journal, 544-553.

Mitchell, J., Bradley, D., Wilson, J., & Goins, R.T. (2008). The aging farm population and rural aging research. *J Agromedicine*; 13(2):95-109. doi: 10.1080/10599240802125383

Population ageing in Europe: Facts, implications and policies. (2014). *Directorate-General for Research and Innovation Socioeconomic sciences and humanities*. Available at (accessed online 20 09 2018): https://ec.europa.eu/research/social-sciences/pdf/policy_reviews/kina26426enc.pdf

Rovny, P. (2016). The analysis of farm population with respect to young farmers in the European Union. *Procedia – Social and Behavioral Sciences* 220, 391-398.

Susilowati, S.H, T.B. Purwantini, D.Hidayat, M. Maulana, A.M. Makkay Ar-Rozi, R.D. Yofa, Supriyati & W.K. Sejati. (2012). Panel Petani Nasional (Patanas): Dinamika Indikator Pembangunan Pertanian dan Perdesaan (National Farmer Panel: The Agricultural and Rural Development Indicator). *Research Report*. Indonesian Center for Agricultural Socio Economic and Policy Studies. Ministry of Agriculture.

Susilowati, S. H. (2014). Attracting the Young Generation to Engage in Agriculture. *Submitted as a country paper for the FFTC-RDA International Seminar on Enhanced Entry of Young Generation into Farming,* Oct. 20-24, Jeonju, Korea. Access online: http://ap.fftc.agnet.org/ap_db.php?id=323

Scott, J. (2005). *Farm and Community Viability: report on interview results*. Available at [2018 10 25]: http://www.gpiatlantic.org/pdf/agriculture/farmviab.pdf

The ageing of rural populations: evidence on older farmers in lowand middle-income countries. (2014). HelpAge International. German Federal Ministry of Economic Cooperation and Development.

WBO. Rural population (% of total population). Retrieved 2018-04-23, from https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS

White, B. (2015). Generational dynamics in agriculture: reflections on rural youth and farming futures. *Cah Agric* 24, 330-334. doi : 10.1684/agr.2015.0787

White, B. (2012_. Agriculture and the Generation Problem: Rural Youth, Employment and the Future of Farming. *IDS Bulletin* Volume 43 Number 6, 9-19.

Young farmers in the EU – structural and economic characteristics. (2017). *EU Agricultural and Farm Economics Briefs*. No 15. Available at: http://ec.europa.eu/agriculture/rural-area-economics/briefs/index_en.htm

The Impact of Population Ageing on National Economy

Ilona Kiausiene

Abstract: *XXI century has fiercely entered our lives, setting new requirements. Europe has been undergoing demographic changes of an unprecedented scope, bringing the respective challenges with it. The increasingly longer life expectancy is a great achievement for humanity, nonetheless, if viewed from social and economic perspectives, population ageing is construed as negative changes in demographic factors. Reducing population and ageing population structure influence various areas of life of the society, even reduce the possibilities for economic growth. The aim of the research – having summarized demographic trends to determine the impact of population ageing on the national economy. To reach the research aim such research tasks were formulated: 1) to identify factors influencing ageing of population; 2) to identify the interdependence between ageing population and economic indicators. The implemented research revealed that in recent decades, the structure and profile of the EU's population has changed considerably. The EU's population grows progressively older: the proportion of older persons is growing at a faster rate than the general population. In many countries, including Lithuania, the population is getting older, the median residents' age is increasing quickly. According to economic and social approaches ageing of society and decrease of population become significant problems and influence various spheres of society life, warn about possible challenges and concerns to the state. The results of the research showed that demographic changes and economic indicators are related on strong, statistically significant relationships. Implementing the research there were used analysis and synthesis of scientific literature, comparison, summary, statistical data analysis.*

1 Introduction

As the quick economic globalisation processes are ongoing and the countries' demographic structures are changing, the problems caused by the demographic changes, which have a significant impact on the country's economy, social environment, development of society, are becoming more relevant. The falling birth rate, increasing emigration, ageing population decreases the number of economically active persons and increases the number of survivors. There as well appears a threat for the country's competitiveness: as the labour force recourses are decreasing and the labour force is ageing, the countries are obliged to look for new ways to improve demographic indicators and deal with the current economic situation. Thus, the problem of the ageing population that is encountered by many EU Member States has become relevant in the last decades.

According to the United Nations (UN) recommendations, the retirement threshold is considered 60 years, and according to World Health Organisation (WHO), it is 65 years. When discussing the ageing of Lithuanian population, it is based on WHO recommendation, because 15–64 years persons fall under the group of working people in Lithuania (Garlauskaitė, Zabarauskaitė, 2015). The concept of ageing is very broad and can be considered in various aspects: physiological (medical), psychological, demographic, economic, social, etc. When analysing the demographic changes from social and economic perspectives, the ageing of population, according to Garlauskaitė, Zabarauskaitė (2015), is perceived as the change in population age structure that appears due to the increasing number or senior population, in comparison to the other age groups.

The factors determining population ageing are divided into two main groups: demographic factors and non-demographic factors (Garlauskaitė, Zabarauskaitė, 2015). Demographic factors includes: age, decrease of birth rate, migration, mortality, increase of average life expectancy. Non-demographic factors includes: financial security, physical activity, leisure activities, medical achievements, scientific and technological achievements. The influence of non-demographic factors on ageing is undeniable, but it is difficult or even impossible to measure.

Assoc. prof. dr. Ilona Kiausiene, Vilnius University, Kaunas Faculty, Institute of Social Sciences and Applied Informatics, Muitinės street. 8, LT-44280 Kaunas, Lithuania, e-mail: ilona.kiausiene@knf.vu.lt

Some scientists (Gustainienė, Banevičienė, 2014; Bloom *et al.*, 2015) agree that increased longevity is a great achievement for humanity, it is one of the most remarkable success stories in human history. According to Gustainienė, Banevičienė (2014) elderly population continues growing and its role is becoming more important both to the economy and to people communities. Growing numbers of elderly people changes not only an individual's life, but also relations between people. Elderly people are becoming a progressively influential group of society as a result of the increasing elderly population. Bloom *et al.* (2015) notice that in addition to older people potential capacity to work, older people embody a large reserve of human capital, especially in education and work experience.

Other scientists (Bosworth *et al.*, 2004; Bloom *et al.*, 2010; Berk, Weill, 2015; Choi, Shin, 2015) emphasize, that the population ageing have large economic consequences, effect on government budgets, asset markets, translates into the ageing of the workforce, decreases the growth rate of the labour supply remarkably. A growing number of elderly persons (aged 65 and over) is likely to have a considerable impact on a wide range of policy areas: most directly with respect to the different health and care requirements of the elderly, but also with respect to labour markets, social security and pension systems, economic fortunes, as well as government finances (Eurostat, 2015). According to Corsi, Lodovici (2012), negative demographic changes raised significant budgetary, economic and social issues. The phenomenon increases pressure on pension systems, public finances, social and care services for older people, heightening the risks of exclusion from the labour market and family and community life, and inter-generational conflicts.

Bloom *et al.* (2015) note, that those, who contend that an increase in the population share at older ages will drive many undesirable macroeconomic phenomena typically base their arguments on five points: 1) older people do not work as much as young and middle-aged adults, which means that an economy populated mainly by such people will tend to create less output (on a per-person basis) than an economy with a higher proportion of individuals at prime working age; 2) consumption accounts for a higher proportion of income in older adults than for those at the prime working ages; 3) an increasing proportion of older people tends to raise the demands on pension schemes; 4) disease and disability in older adults represent a substantial loss to national production; 5) older people place a large burden on health and long-term care systems.

Thus, permanent changes of demographic processes make an impact on economic system and residents' material wellbeing. Ageing society, the changes in population distribution by age groups have significant social and economic consequences.

The aim of the research – having summarized demographic trends to determine the impact of population ageing on the national economy. To reach the research aim such research tasks were formulated: 1) to identify factors influencing ageing of population; 2) to identify the interdependence between ageing population and economic indicators. Implementing the research there were used analysis and synthesis of scientific literature, comparison, summary, statistical data analysis.

2 Methods

The assessment model of the impact of population ageing on the country's economy involves three stages (Figure 1).

Figure 1 Assessment stages of the impact of population ageing on the country's economy
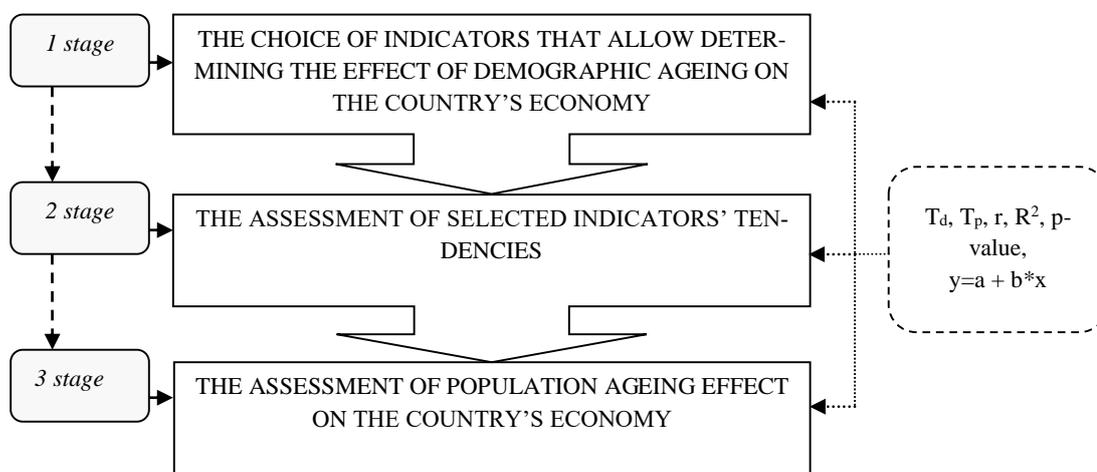
Source: Own processing

Ageing may be measured through an analysis of various demographic indicators, including (Eurostat, 2015): 1) the median age; 2) the proportion of the population in each of the main demographic age groups – namely, children (defined here as those aged 0–14 years), the working-age population (15–64 years) and the elderly population (65 years or over); and, 3) age-dependency ratios – such as the young-age dependency ratio, the old-age dependency ratio. In this case, the final set includes the following indicators: elderly people (aged 65 and older), life expectancy at birth, age dependency ratio, median age of the population. There have been chosen the following indicators that reflect the country's economic situation: gross domestic product (GDP per capita), employment rate, health care costs, expenditure on social security. Firstly, the tendencies of the selected indicators are assessed.

In order to verify the strength of the interdependence between the economic indicators of ageing population, the correlation-regression analysis has been used. Bartosevičienė (2011) claims that correlation coefficient r indicates the strength of the interrelation, and it is calculated according to the obtained regression equation. Correlation reveals whether there is a link between the analysed variables, what is its direction, strength, and regression determines the form of the link. The calculated correlation coefficient can change from -1 to +1. If this coefficient is negative, it means that the analysed indicators are indirectly or inversely related, and if it is positive, it means that there is a direct dependence between values. The closer is the value of the coefficient to 1, the stronger is the link between the analysed values. The link is perceived as statistically important if $p<0.05$. In order to evaluate the links of interval variables, the Pearson coefficient is calculated.

The regression line is a line that best describes the scatter chart points and according to which the strength of the link could be indicated: if line is slopping, the link is weak, or there is no link, if it is steep, the link is strong (Kasnauskienė, 2010). The regression line equation is represented by the following formula (Martišius, 2014):

$$y = a + b \cdot x \tag{1}$$

where:

y – average value of consequence feature

x – cause feature value

a ir b – coefficients of regression equation.

Coefficient b reveals how the average value of consequence feature changes when the cause feature value changes by one unit (Martišius, 2014). In order to determine the link strength of the regression equation variables, the following link closeness indicators are calculated: 1) correlation coefficient r; 2) determination coefficient R^2 (Čekanavičius, Murauskas, 2014).
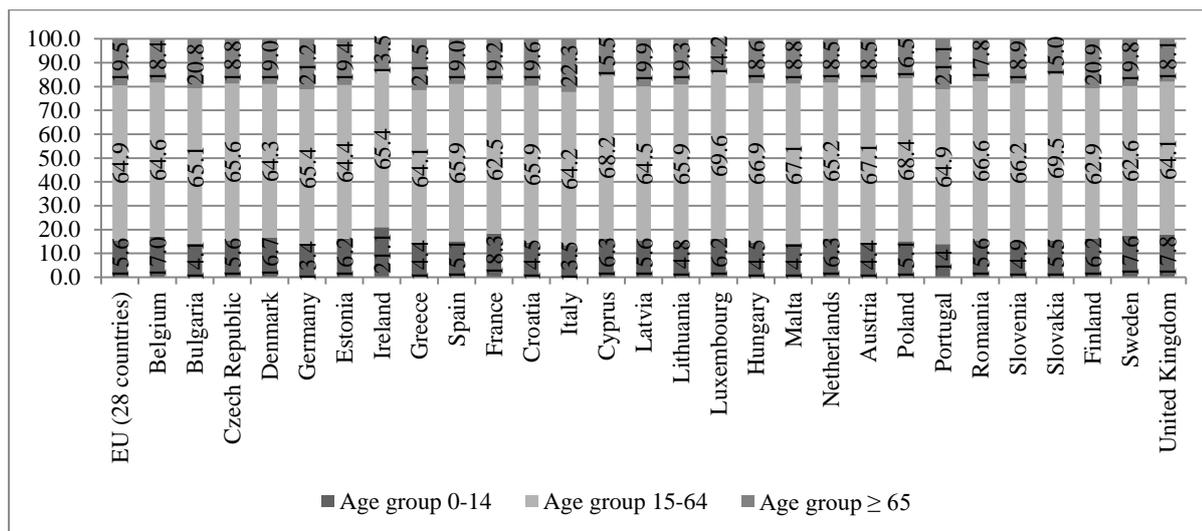
3 Research results

On 1 January 2018, the population of the EU was estimated at 512.6 million inhabitants, which was 1.1 million (+ 2.1 per 1000 residents) more than a year before (Eurostat, 2018a). Thus the EU-28's population increased, however birth rates fell progressively and life expectancy increased gradually. The natural change of the EU population was negative (0.2 million more deaths than births were recorded in the EU). The positive population change was therefore due to net migration (Eurostat, 2018a).

Lithuania has a negative trend in the number of population. During 2017 the largest decrease was recorded in Lithuania (-13.8 per 1 000 residents). According to Lithuanian Statistics (2018) at the beginning of 2018, the estimated resident population of Lithuania amounted to 2 million 808.9 thousand, i.e. by 39 thousand (1.4%) less than at the beginning of 2017. In 2005–2017, the resident population declined 16.3%. The decline in the resident population in 2017 was caused by negative net international migration and the natural decrease. The impact of negative net international migration accounted for 71% of the total decline. In 2005–2017, due to negative net international migration, the population declined 71.9% of the total decline, due to the natural decrease – 28.1% of the total decline.

Main demographic indicator defining ageing trends is the share of elderly population in the society. The data of Eurostat (2017) prove that in 2017 young people (0 to 14 years old) made up 15.6% of the EU-28's population. Older persons (aged 65 or over) had a 19.5% share (an increase of 0.3% compared with the previous year and an increase of 2.4% compared with 10 years earlier) (Figure 2).

Figure 2 Population by age group (% of total population) in EU (28 countries) in the year 2017

Country	Age group 0-14	Age group 15-64	Age group ≥ 65
EU (28 countries)	15.6	64.9	19.5
Belgium	17.0	64.6	18.4
Bulgaria	14.1	65.1	20.8
Czech Republic	15.6	65.6	18.8
Denmark	16.7	64.3	19.0
Germany	13.4	65.4	21.2
Estonia	16.2	64.4	19.4
Ireland	21.1	65.4	13.5
Greece	14.4	64.1	21.5
Spain	15.1	65.9	19.0
France	18.3	62.5	19.2
Croatia	14.5	65.9	19.6
Italy	13.5	64.2	22.3
Cyprus	16.3	68.2	15.5
Latvia	15.6	64.5	19.9
Lithuania	14.8	65.9	19.3
Luxembourg	16.2	69.6	14.2
Hungary	14.5	66.9	18.6
Malta	14.1	67.1	18.8
Netherlands	16.3	65.2	18.5
Austria	14.4	67.1	18.5
Poland	15.1	68.4	16.5
Portugal	14.0	64.9	21.1
Romania	15.6	66.6	17.8
Slovenia	14.9	66.2	18.9
Slovakia	15.5	69.5	15.0
Finland	16.2	62.9	20.9
Sweden	17.6	62.6	19.8
United Kingdom	17.8	64.1	18.1

Source: Own processing based on Eurostat. (2018b).

In Lithuania the number of elderly persons, compared to the total resident population, increased from 15.8% at the beginning of 2005 to 19.3% at the beginning of 2017 (Figure 2). At the beginning of 2018, there were 551.8 thousand elderly people (aged 65 and older), or 19.6% of the total resident population. Each seventh man and each fourth woman was aged 65 and older. Compared to the beginning of 2017, the number of elderly people increased by 1.6 thousand, or 0.3%. At the beginning of 2018, the number of children under 15 was 1.3 times lower than that of elderly people. There were 131 elderly persons per 100 children (Statistics Lithuania, 2018).

Life expectancy at birth rose rapidly during the last century due to a number of factors, including reductions in infant mortality, rising living standards, improved lifestyles and better education, as well as advances in healthcare and medicine (Eurostat, 2018b). The data of Eurostat (2018b) prove that in the year 2016, in comparison with 2010, life expectancy in EU Members States increased by 1.1 years (Table 1).

Table 1 Main demografic indicators in EU 28 and Lithuania

Situation	Life expectancy at birth		Old-age dependency ratio		Median age of the population, years	
	2010	2016	2010	2017	2010	2017
Lithuania	73.3	74.9	25.6	29.3	40.3	43.4
EU 28	79.9	81.0	26.1	29.9	41.0	42.8
Best	82.4 (Spain)	83.5 (Spain)	16.5 (Ireland)	20.5 (Luxembourg)	44.2 (Germany)	45.9 (Germany, Italy)
Worst	73.1 (Latvia)	74.9 (Latvia, Lithuania, Bulgaria)	31.4 (Germany)	34.8 (Italy)	34.0 (Ireland)	36.9 (Ireland)

Source: Own processing based on Eurostat. (2018b).

Nevertheless, there are considerable differences in life expectancy between Member States. In 2016 life expectancy was in Spain (83.5 years) while in Latvia, Lithuania and Bulgaria 74.9 years (the difference between life expectancy at birth was 8.6 years (in 2010, 9.3 years) (Table 1). In 2017, first time life expectancy at birth for men in Lithuania was exceed 70 years (i.e. 70.7 years). In 2017, the difference between life expectancy at birth for men and for women was 9.7 years (in 2016, 10.5 years) (Statistics Lithuania, 2018). At the beginning of 2017, the median age of the population of Lithuania was 43.4, i.e. by 3.1 years longer than at the beginning of 2010.

The demographic projections over the long term reveal that the EU is 'turning increasingly grey' in the coming decades (European Commission, 2018). The total population in the EU is projected to increase from 511 million in 2016 to 520 million in 2070 (will increase by 9.3 million), but the working-age population (15-64) will decrease significantly (Table 2).

Table 2 Main demographic and macroeconomic assumptions

Indicators	European Union			Lithuania		
	2016	2040	2070	2016	2040	2070
Total population, in million	510.9	528.5	520.3	2.9	2.1	1.7
Working age population (15-64) as % of total population	65.2	58.2	56.2	66.1	55.6	55.8
Elderly population (65 and over) as % of total population	19.3	27.1	28.8	19.2	31.8	29.6
Very elderly population (80 and over) as % of elderly population	28.1	33.9	43.6	28.0	33.1	46.9
Potential Real GDP (growth rate)	1.3	1.3	1.5	2.1	1.0	1.7
Potential real GDP per capita (growth rate)	1.0	1.3	1.5	3.3	2.1	2.2
Employment 15-74 (growth rate)	0.7	-0.2	-0.1	0.8	-1.1	0.2
Share of older (55-64) in employment (15-64), %	16.5	20.3	19.9	0.2	19.2	21.5
Old-age dependency ratio 15-64	29.6	46.6	51.2	29.0	57.2	53.1
Total dependency ratio	53.5	71.9	78.0	51.2	79.9	79.3

Source: Own processing based on European Commission. (2018).

The old-age dependency ratio (people aged 65 and above relative to those aged 15 to 64) in the EU is projected to increase by 21.6 pps. over the projection period, from 29.6% in 2016 to 51.2% in 2070 (Table 2). This implies that the EU would go from having 3.3 working-age people for every person aged over 65 years to only two working-age persons. The population projection trends have significant effects on labour market. Employment rates expected to rise while employment is projected to fall (European Commission, 2018). Over the whole period 2016-2070, the average annual Potential Real GDP growth rate in the EU is projected to be 1.4%. In per capita terms, developments are projected to be similar, with average potential GDP growth of 1.3% (European Commission, 2018).

In Lithuania statistical data indicate annual growth of the elderly population. Fairly large share of elderly population is a sign of potential additional challenges to the state. In the year 2017 in comparison with 2012, GDP/per capita in Lithuania grew annually and increased 32.6%. However, expenditure on social protection and health care grow slower than GDP.

In Lithuania there was identified strong direct (r = 0.900) and significant (p = 0.037) relation between independent variable elderly people and dependent variable expenditure on social protection. This model explains 90.2% of analysed cases because determination coefficient is 0.9019 (Table 3).

Table 3 The interdependence between ageing population and economic indicators

Indicators	GDP/per capita	Employment rate	Health care costs	Expenditure on social security
Elderly people (aged 65 and older)	0.829 (0.042)*	0.829 (0.042)*	-0.829 (0.042)*	0.700 (0.188)
Age-dependency ratio	-0.943 (0.005)**	-0.943 (0.005)**	0.943 (0.005)**	-1.000 (0.00)**
Average life expectancy	0.900 (0.037)*	0.900 (0.037)*	-0.900 (0.037)*	0.900 (0.037)*

Source: Own processing

* correlations are significant at p < 0,05
** correlations are significant at p < 0,01

The regression model shows very strong direct and significant relations between average life expectancy and three selected indicators: GDP/per capita, employment rate, health care costs. Regression model reveals that in Lithuania while increasing average life expectancy, GDP/per capita, employment rate, health care costs can increase.

In conclusion, it could be stated that the ageing of the population is one of the most significant demographic changes of the recent time. The statistical data confirm that the life expectancy is increasing, and there are more seniors in comparison to young persons. The ageing of the population creates new economic and social context. From the economic perspective, ageing means the decrease of country's competitiveness, lower productivity and level of savings and higher government expenditure. Moreover, the ageing of population designates the decrease of economically active persons, the increase of social, healthcare expenditure; thus, the economic burden will increase to the working population and cause a threat to the development of country's economy.

4 Conclusions

The implemented research revealed that in recent decades, the structure and profile of the EU's population has changed considerably. The EU's population grows progressively older: the proportion of older persons is growing at a faster rate than the general population. In many countries, including Lithuania, the population is getting older, the median residents' age is increasing quickly. Demographic changes are influenced mostly by these tendencies: decrease of birthrate, longer life expectancy at birth and ageing society.

According to economic and social approaches ageing of society and decrease of population become significant problems and influence various spheres of society life, warn about possible challenges and concerns to the state. The results of the research showed that demographic changes and economic indicators are related on strong, statistically significant relationships.

References

Bartosevičienė, V. (2011). *Ekonominės statistikos pagrindai*. Kaunas: Technologija.

Berk, J., & Weil, D. N. (2015). Old teachers, old ideas, and the effect of population aging on economic growth. *Research in Economics*, 69, 661-670.

Bloom, D. E., Chatterji, S., Kowal, P., Lloyd-Sherlock, P., McKee, M., Rechel, B., Rosenberg, L., & Smith, J. P. (2015). Macroeconomic implications of population ageing and selected policy responses. *The Lancet*, 385(9968), 649-657.

Bloom, D.E., Canning, D., & Fink, G. (2010). Implications of population ageing for economic growth. *Oxford Review of Economic Policy*, 26 (4), 583-612.

Bosworth, B., Bryant, R., & Burtless, G. (2004). The impact of aging on financial markets and the economy: a survey. The Brookings Institution.

Corsi, M., & Lodovici, M. S. (2012). Active Aging and Gender Equality Policies. Luxembourg: Publications Office of the European Union.

Čekanavičius, V., & Murauskas, G. (2014). *Taikomoji regresinė analizė socialiniuose tyrimuose*. Vilnius: Vilniaus universiteto leidykla. ISBN: 9786094593000.

European Commission. (2018). The 2018 Ageing Report. Economic & Budgetary Projections for the 28 EU Member States (2016-2070), *European Economy Institutional Papers* (pp. 383). Luxembourg: Publications Office of the European Union.

Eurostat. (2015). People in the EU: who are we and how do we live? *Statistical books*. Luxembourg: Publications Office of the European Union.

Eurostat. (2018a). EU population up to nearly 513 million on 1 January 2018. *Eurostat newsrelease*, 115/2018.

Eurostat. (2018b). *Population and social conditions*. [Online]. Available at: http://ec.europa.eu/eurostat.

Garlauskaitė, A., & Zabarauskaitė, R. (2015). Lietuvos gyventojų senėjimą lemiančių veiksnių analizė. *Science – future of Lithuania*, 7(2), 199-209.

Gustainienė, L., & Banevičienė, V. (2014). Vyresnio amžiaus žmonių psichologinių bei socialinių veiksnių, psichosocialinio prisitaikymo ypatumai socialinių ir demografinių duomenų atžvilgiu. *Socialinis darbas (Social work)*, 13(2), 248-262.

Choi, Ki-H., & Shin, S. (2015). Population aging, economic growth, and the social transmission of human capital: An analysis with an overlapping generations model. *Economic Modelling*, 50, 138-147.

Kasnauskienė, G. (2010). *Statistika verslo sprendimams*. Vilnius: Vilniaus universiteto leidykla. ISBN: 9789955336136.

Martišius, S. A. (2014). *Statistikos metodai socialiniuose ekonominiuose tyrimuose*. Vilnius: Vilniaus universiteto leidykla. ISBN: 9786094593574.

Statistics Lithuania. (2018). *Demographic Yearbook 2017*. Vilnius. ISSN 2029-3739.

Privatization in theoretical concepts and the reality of economic policy on the example of the Czech Republic

Jaroslav Šetek, Jiří Alina, Veronika Plachá

Abstract: *The paper focuses on the essence and genesis of a completely new form of structural change called privatization. It was started in the Czech Republic as part of the transformation process since the early 1990s. The Czech economy was accompanied, in particular, by the theoretical concepts and real economic policy practices of prominent personalities of the liberal current of the last third of the twentieth century. Emphasis is also placed on the potential risks that may arise from the turn of the 20th and 21st centuries in the privatization of major strategic societies in the context of geopolitical interests, the incidence of non-transparent economic entities in the world economy and the interconnectedness of Smart technologies in cities and regions.*

Key words: Privatization · Structural changes · Transformation of the economy

JEL Classification: A12 · B41 · E00 · H11

1 Introduction

Almost three decades since the start of transition from a centrally managed economy to a market economy in the Czech Republic, there is enough time to carry out a thorough analysis of privatization within the framework of the structural changes that have been made. Privatization means the suspension of public goods and property rights into the private sphere. The term is not old, it can be seen in reality in the Czech Republic for the first time since the beginning of the 1990s, ie in the context of structural changes within the framework of the transformation economic policy in the transition from the centrally managed economy to the market economy. At the same time, this was the case for other Central European countries, where the same transformation process of the economic system took place. In the theoretical concepts of economic policy, the term is roughly ten years old, first used publicly by US President Ronald Reagan for the first time in the early 1980s. By this time, the concept was publicly totally unknown and unused. This, in fact, corresponded to the real status of Western societies

In the then Czech society at the beginning of the 1990s, where the overwhelming majority of assets held in the hands of the state, the privatized economy was largely unknown. The makers of the transformation economic policy, who were well aware of the urgency of privatization, and who had promoted it from the beginning as an organic part of the Czech transformation strategy, knew about private management from its own experience that it worked better than the centrally planned economy. The privatization process was mainly informed by British and Latin American publications, whose applicability was limited in domestic conditions. Privatization was a step into the unknown at the beginning of the society, bringing many of the perceived risks, a decision for which broad political support was needed. Political representation has, from the outset, understood that privatization in the post-Communist country will be a much more complex task than that in Great Britain carried out by Prime Minister Margaret Thatcher at the beginning of the 1980s. The problem of limited portability was that there were other reasons in the UK for privatization and, on the other hand, other infrastructure for its implementation.

Ing. Jaroslav Šetek, Ph.D., University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, České Budějovice, Czech Republic, e-mail: jsetek@ef.jcu.cz

Ing. Jiří Alina, Ph.D., University of South Bohemia, Faculty of Economics, Department of Economics, Studentská 13, České Budějovice, Czech Republic, e-mail: jalina@ef.jcu.cz

Ing. Veronika Plachá, student, University of South Bohemia, Faculty of Economics, Studentská 13, České Budějovice, Czech Republic

2 Methods

The contribution is elaborated by application of interdisciplinary approach of economic theory, alternative current of economic thinking (especially theory of public choice), economic and regional policy to explain the phenomenon of privatization in theoretical concepts and real practice on the example of the Czech Republic.

In the process, the application of a mutual combination of analytical and comparative methods leading to synthesis as a selected thought process, which on the basis of established criteria creates a complete picture of the phenomenon, prevails. This option will provide an explanation of the above mentioned problems based on the concepts of economic theory and the implemented economic policy in practice. Since it is a concept of an economic policy whose application is still feasible in the context of structural changes in market economies, appropriate recommendations are also based on the up-to-date assessment of theory and practice.

3 Research results

Initial philosophy

The history of the twentieth century represents the rivalry of individualism with collectivism. Liberal democracies have been exposed to enormous pressure from outside the totalitarian states and from within the totalitarian political forces. Despite the undisputed successes of the economic system of "capitalism" in the 19th century, the growth of Communist, Nazi and other totalitarian regimes can be seen in the 20th century. The first one originated in 1917 in Russia, the next in 1933 in Germany and the largest in 1949 in China.

The major turnaround is only in the 1980s and is inseparably linked to the names and Ronald Reagan and Margaret Thatcher. The Conservative Revolution of the 1980s was prepared first in the sphere of social sciences and especially economics. The question of whether economic activity is to coordinate central authority through a plan or, on the contrary, the invisible hand of the market through freely created prices was the essence of a political struggle between individualists and collectivists. Friedrich August von Hayek has shown that central planning is ultimately incompatible with the freedom of the individual. Here is a break point, because in such a situation it has been meaningless to seek a compromise between the market and the plan. Classical liberalism, thanks to these new intellectual impulses, has restored its attractiveness and argumentative power. It was only a step towards practical politics. Before Hayek, there was some kind of compromise with the plan in economics (Mlčoch, 2005). It was best represented by the Austrian economist Joseph Schumpeter. Although he disagreed with socialism, he continued to argue that moving towards socialism was inevitable. Socialism then defined itself as a gradual shift of decision-making on economic matters from the private sphere to the public sphere. In terms of such a broad definition, the world's development has been very realistic until its death at the end of the 1940s. The world really "marched towards socialism," and the slogans accompanying this process were "nationalization" and "planning" (Mlčoch, 2006). Schumpeter, however, was wrong in considering the march to socialism as inevitable. This is evidenced by the political activities of Ronald Reagan and Margaret Thatcher in the 1980s. The theme of world politics has ceased to be "nationalization and planning" through their activities. The economic policy priority has become "privatization and the market" (Schwarz, 2003). Reagan and Thatcher stood in front of the same high-profile policy. The first task was to deal with collectivist dangers from outside and the other to deal with similar dangers within their countries. Both tasks have been extremely successful. It was remarkable that they had not grown from the very beginning, and that they went uncompromisingly for their goals. Yet more remarkable was the fact that they gained tremendous public support for such a policy. Until the 1970s, politics bringing voices was considered to be entirely different from what Thatcher and Reagan performed. It was more interesting to watch their election victory. Reagan and Thatcher defeated their political opponents by the difference of class. Ronald Reagan has exhausted two presidential terms with the US Constitution, and Margaret Thatcher has reached a record-breaking election hat-trick in a row behind. As a result, they have had a sufficient mandate to promote their policies both at home and abroad. Margaret Thatcher and Ronald Reagan influenced the end of the 20th century more than anyone else. Their long-standing effort was crowned in 1989 by the collapse of Communism in the countries of Central and Eastern Europe, and in 1991 by the collapse of the "realm of evil". In most of the former Communist countries, democracy, the rule of law, and the market economy have begun to be restored. This development in the East has sharply contradicted the prosperity of the West.

Privatization as an integral part of structural change

Even in the early 1970s, the West created a state-owned economic sector, particularly in the energy, mining and transport infrastructure sectors. In essence, it was a redemption, but it was, in fact, the process of reverse privatization. The transformation of the economic system through privatization in the 1970s was considered only by a small group of academic economists at several American universities. In the 1970s, in the West, the prosperity and the concept of a mixed economy

were in full strength. Market economy and privatization were not spoken. In real practice, Britain's Prime Minister Margaret Thatcher in the 1980s introduced the privatization process for the first time in the context of economic policy implementation. In the 1980s, privatization was more or less applied in more than 100 other countries (Mlčoch, 2005).

In 1989, the American economist John Williamson wrote the Washington Consensus as an Assistance to Developing States. The impetus for its creation was Latin America and the deep debt crisis in the region in the second half of the 1980s. Williamson, however, was convinced that a general consensus had been made about these recommendations in Washington (Mlčoch, 2005). In its essence, it was a standard, comprehensive program for institutional change in the economy, recognized by Washington institutions, such as the International Monetary Fund, the World Bank and the US Treasury Department. The Washington Consensus was not an official doctrine. It has never been formally codified by the institutions, nor was it intended for post-communist countries. The rules included requirements for macroeconomic stabilization, the opening of economies in trade and investment and the strengthening of market forces within the domestic economy. In Williamson, he made ten recommendations, among which was the privatization of state property (Mlčoch & Sojka, 2000).

Theory of property rights

The flow of economic thinking on property rights shows that the form of ownership and the structure of ownership is an important reality, co-deciding on the effectiveness of property management. This theory distinguishes between private and public goods, in a teleological way, which is based on the purpose for which the goods serve. In the words of Karel Engliš, a prominent first-eulogy economist, "private" is what follows "the purpose of a private yield" (Mlčoch, 2005); what, on the contrary, does not follow such a private revenue purpose is public. Private consumption is characterized by competitive consumption: the fact that someone consumes a certain private estate means that no one else can consume this particular property. Consumption of public goods, on the other hand, is uncompetitive: for example, ensuring a healthy environment for individuals generally means a healthy environment for others. Private property and its production usually best suit ownership forms, which are referred to as private or private forms. These ownership forms are characterized by a number of characteristics, of which the most significant are exclusivity, divisibility and transferability. Exclusivity of property rights means that some thing is the exclusive property of any subject; the divisibility of ownership rights means that the owner can divide his property rights to the matter into precisely defined (exclusive) parts (Wawrosz & Valenčík, 2014). Lastly, the transferability of ownership rights means that the owner may alienate, sell or free-of-charge to other entities.

Neoclassical economics, for long periods of development, did not focus its interest on the institutional aspects of the economic system. This also applies to one of the most important market economy institutions, which are property rights. This does not mean that neoclassical economists consider irrelevant, what form of ownership the market entities have. Private ownership was considered the ideal form and it was also assumed in the vast majority of neoclassical models. For this reason, ownership was merely an exogenous condition of a market economy. The primary role of private ownership was based on this approach in providing incentives for market actors to make private firms more efficient. According to the ideas of Adam Smith, the overall prosperity of the company should be ensured by "selfish" (Smith, 1958) pursuing individual interests that bring society's welfare in its entire society. However, if a large part of the market players were not in private hands, these profitable incentives would be blunted and society would get worse (Smith, 2005). Since the 1960s, trends have begun to advance in the economy, which have understood that institutional arrangements can take many forms, evolve, or undergo processes of fundamental change. From the point of view of economic analysis, therefore, it is not possible to assume institutions only as they are important factors influencing economic performance (Mlčoch, 2005). Institutions must become endogenous variables in economic models, and economics should focus on their exploration. This approach was promoted in the neoclassical economy under the name of the new institutional economy, in which the theory of property rights was also developed.

One of the first economists to deal with the theory of property rights was Harold Demsetz. To establish private ownership instead of public ownership, according to Demetz, internalization of externalities associated with public ownership is the case. If the benefits from internalization outweigh the costs associated with it, private ownership will be established. However, Demsetz did not devote himself to the creation of property rights in his analyzes (Mlčoch, 2005). James Buchanan, who was inspired by English philosophers, and explained the emergence of a natural distribution of property rights on a contractual principle, contributed significantly to the further development of the theory of property rights. Compliance with the social contract, which is based on economic calculation, is due to conflicts over precious goods (Mlčoch, 2000). The issue of their protection and enforceability automatically arises with the emergence of property rights. A large number of economic actors increase the transaction costs associated with guarding their property rights, and on the basis of cost-benefit analysis, the actors conclude that it is preferable to establish laws protecting their rights and power to be a guarantor of these laws. The laws are set up in a constitutional phase, but they also depend on the

subsequent post-constitutional stage in which they enforce these laws (Hayek, 1994). Democratic tradition and continuity, long-term order evolution, and moral quality of society are factors that contribute to lower transaction costs associated with proprietary rights enforceability (Hayek, 1995). These factors also positively influence the economic performance of the company. Buchanan points to a fact that is important for all changing societies, including the post-communist countries of Central and Eastern Europe: It does not only matter to the formal rules of the game but also to informal institutions encoded in society. The speed potential of their changes and developments is by their very nature considerably limited. If traditional neo-classics assumed that private ownership stimulated more effectively the efficient management of economic resources than public ownership, the theory of property rights did not reverse this claim, but in its conclusions it added several additional conditions, but it is still possible to treat it as true Hayek, 1978). Eventual fulfillment of these conditions depends on the institutional basis of the economic system. In the first place, it must guarantee property rights, both by legal standards and by informal institutions (Smith, 2005).

Privatization in Concepts and Reality of Economic Policy of the West

The first signals of the upcoming changes in the paradigm of economic policy began to come in the second half of the 1970s. The entire Western economy was then subjected to a serious test due to the oil crisis. Some smaller countries such as New Zealand, Israel and Chile have begun to experiment with their monetary policy with monetarist recommendations and have stopped listening to Keynesian economists (Hayek, 1995). The experience of these experiments was generally positive, and this was a basic prerequisite for extending the new economic policy to larger Western states as well. The First Great Economy of the West, which left Keynesian economic orthodoxy, was Great Britain. It happened shortly after Margaret Thatcher's appointment as prime minister. It was remarkable that the prime minister had decided very quickly. The word of change was surprising, especially because the Conservative Party did not speak about such big changes in its election program in 1979. But that's all the more he has begun to do. In the first phase, the changes have affected Britain's budgets, where public spending and public debt have declined rapidly.

An important step was the privatization of the state sector in the UK economy. This process has been tried in several minor cases already in the first election period of the government of Margaret Thatcher. The results were encouraging, and the resistance of the interest groups was less than the assumed by the Thatcher. On the basis of these facts, privatization became one of the pillars of the Conservative Party's electoral program in 1983. This year, Margaret Thatcher brought the second election victory and the possibility of implementing a privatization program. The prime minister took the opportunity very vigorously, and by the end of her mandate in 1990, she privatized dozens of large British businesses including, for example, British Steel, British Airways and British Telecom. The privatization program has brought Britain economic success. The government has been able to dispose of public debt through privatization receipts, and newly privatized companies have performed better in the markets than when they were state-owned.

Privatization in the Concepts of Czech Economic Thought

The Book of Human Behavior by Ludwig von Misese was impressed by the thinking of Czech economists at the end of the sixties. Chapter The impossibility of calculating under socialism brought arguments against the illusion that socialism can calculate costs and calculate at all (Mises, 2006). Another Austrian, who influenced the thinking of one of the coupon privatizers, was Frederick August von Hayek. In The Book of Slavery, he tries to warn the Free Western World of the socialist efforts to drive society and all economic activity (Hayek, 1990). The Law, Legislation and Freedom, in which it expresses the need and right of each individual to private ownership and the definition of rules to protect them (Hayek, 1994), had the greatest influence on the following introduction of privatization.

The group of economists used their knowledge in the work of Czechoslovakia in 1989, at the crossroads led by Józef Zielenec, where they dealt with the process of transformation. This work is really revolutionary, and perhaps the first privatization idea was officially pronounced here (Zieleniec & Mládek, 1990): "However, the most serious and difficult task facing our company will be to open the way for the gradual privatization of state-owned enterprises." To enforce the required changes leading to privatization was the need for strength and political support, which Václav Klaus was most likely to deserve at that time.

Privatization within the structural changes of the Czech economy

The rapid and irreversible privatization process played a key role in the transformation of the Czech economy from the conditions planned for market economy conditions. This was not only because the total volume of assets subject to privatization amounted to about 1 trillion Czech crowns. It was also necessary to restore the sector of small private entrepreneurs, which in the past period has been completely exterminated in the Czech economy, unlike many other Eastern European economies. Another reason was concern about the decomposition of enterprises during preparations for privatization and the resulting chaotic "spontaneous" appropriation.

Privatization took place at a very fast pace, with restitution, small privatization and large privatization. By the end of 1992, approximately 100,000 business units worth CZK 70-120 billion were restituted; only the question of restitution of ecclesiastical property has remained unresolved. With small privatization, the volume of small trades, trade and services was privatized by the end of the first half of 1992, and at the end of 1993, approximately 24,000 business units were privatized and worth CZK 30 billion. Large privatization took place in a wider variety of methods involving public auctions, public tenders and direct sales as well as the voucher method. The criterion used was whether the owner of an efficient enterprise could be effectively managed while paying the corresponding price. The coupon method used for the first time on a large scale in the Czech Republic has been recognized as a way to quickly and fairly equally distribute large assets under conditions of capital shortages, while at the same time involving the population in the political support of the privatization process. Major privatizations included the transformation of cooperatives (worth CZK 200-230 billion), the sale of private owners (worth CZK 480 billion), the transfer of assets to municipalities (worth CZK 350 billion) and coupon privatization (worth CZK 355 billion in Czech).

One of the highly discussed topics throughout the 1990s was the speed of privatization. Critics (Sojka and Mlčoch, 2000) believe that speed has been subordinated to the quality of the process being carried out. This view is not unique. However, other authors argue in the opposite sense. For example (Lavigne, 1999) states that even the fastest privatization methods in the 1990s lasted for 18 months, which is slow. Similarly (Kotrba, 1997), describes the sacrifice of the speed of privatization by greater competition between proposals and the search for the optimal variant of privatization. Another issue is the end of the whole process. Privatization was not apparently ended with the conclusion of the second wave of mass privatization. After 1995, however, the process was suspended and the methods used changed. The subsequent period was characterized by a very difficult doprivatization. Some authors directly find one of the biggest problems of the whole transformation in the slow process of privatization (Schwarz, 1998). Overall, however, it is clear that the basic steps of privatization were (as opposed to most post-socialist countries) made quick.

Analysis of the Czech privatization of the 1990s

Since the beginning of the 1990s, the political representation of the Czech Republic has been a privatization as part of the transformation of the economy and its structural changes as one of the key points. Since then, the concepts of small privatization and large privatization have come to light. Then coupon privatization took place in two waves. Over time, coupon privatization methods were successful only politically, and it was not entirely economic. This can be documented by the claim that coupon privatization has created a not very functional hierarchical ownership structure, which has become one of the main problems of the Czech economy. The state has remained the main or at least major owner of large financial institutions (especially banks) that have established the largest privatization funds and, in some cases, incorporated them into some industrial holdings. The portfolio of these funds generally included minority holdings of 200 to 500 largest corporations. The state and large state-owned banks were unable to ensure effective ownership control of the management or the strategic management of privatization funds and their owned corporations. The above-mentioned hierarchical structure government and parliament - the National Property Fund - large banks - investment privatization funds - corporations as part of the portfolio did not create direct state influence on formally private firms, however, under these conditions, the state still could not give up its, albeit indirect, responsibility for their prosperity . Real privatization in this sector of the economy did not take place until the second half of the 1990s, in particular the privatization of banks (Kotrba, 1997). The subcapitalisation of new owners of privatized corporations and government intervention forced state co-owned banks to provide loans to these companies in the hundreds of billions of Czech crowns, without always taking into account the likelihood of their return. Excessive indebtedness of domestic acquirers of privatized property, together with their only partial experience of managing large companies in market conditions, was the main cause of their managerial difficulties and the critical financial situation in which many of these corporations were now. At the same time, the linking of ownership interests and credit exposure of banks to commercial companies created an atmosphere in which the necessary restructuring was withdrawn and bankruptcies were not welcome. The importance of the legal and institutional framework of economic transformation and the legal regulation of a number of areas has not been underestimated (financial markets, conflicts of interest, minority shareholders' rights, incentives for investors...). This has led to a number of cases of unethical behavior, threats to the interests of minority shareholders and misuse of information of an asymmetric nature in business.

Remediation of the aforementioned shortcomings came too late and ultimately resulted in a loss of interest from foreign investors, a decline in the importance of the Czech capital market, a rapid depreciation of securities and an economic downturn, whose effects persisted for a long time. The lessons learned from the 1990s privatization were that it was necessary to look for serious strategic investors for the remaining companies. The main objective of the privatization was to find high-quality and perspective, especially foreign owners, and thereby ensure their significant position within the Czech economy and international markets.

Based on the analysis and comparison of the Czech privatization model and the whole post-communist world of the 1990s, the best form of privatization was the strategic form of sale to strategic investors. Additionally, employers' applications were also considered. For this reason, in order to find a strategic investor as the dominant methods of privatization, they used to consider the forms of public tender, public tenders, in case no more bidders would apply the direct selling method.

The history of Czech privatization is accompanied by many cases since the second half of the 1990s, when it was about the privatization of mining companies. In this context, there is talk of "wild privatization", which is being investigated until now, especially in connection with the alleged corrupt activities of the privatization participants and the failure of the state administration. It is estimated that the consequence of these activities was considerably underestimated state property (in the amount of billions of crowns) to privatization sale with appropriate lower state revenues from privatization.

Reasons for retaining majority ownership by some companies

In the spirit of liberal theoretical concepts and economic policy makers of the 1980s, privatization has allowed stringent monitoring of the economic development of companies, increased efficiency, as well as finding and finding the necessary balance between investment and dividend. Privatization should allow for the necessary restructuring of companies that could not have happened before privatization and would lack the necessary incentives. Their slimming and the reduction of surplus employment have the macro-level to push the labor force market, whose rigidity is still a huge hindrance to economic growth. Last but not least, in privately-owned companies, it is necessary to cultivate so far not very satisfactory managerial ethics and to strengthen managers' responsibility for the entrusted property and the quality of services provided to consumers (Volek & Novotná, 2015).

At the turn of the 20th and 21st centuries, a variety of scattered risks such as organized crime and international terrorism are entering the global economy (Šetek, 2015). At the same time, in some economies, significant companies come under the monopoly of political representation of the state. In parallel, the energy security phenomenon is entering the forefront of the strategic interests of the macroeconomic economic policy of the West. Against this background, it is quite effective for the Czech economy and other European states not to privatize significant strategic companies to ensure the production and transmission of electricity, pipelines and gas pipelines with storage facilities, rail transport, as part of the economic policy concept. Therefore, to prevent access of capital with a non-transparent structure to the strategic sectors of the national economy (Šetek & Petrách, 2017). Any capital entry in the context of privatization tenders for these companies by those entities would be a potential risk within the country's significant macroeconomic interests.

In the Czech Republic, the local and regional level of public policy has become increasingly important since the 1990s, particularly in the context of privatization on the one hand and decentralization, liberalization, the application of the principle of subsidiarity on the other. Because the main objective of regional policy is the realization of local public interest. This can be characterized as a long-term increase in the living standards of the citizens of the given area by increasing the quality and quantity of public services and ensuring decent living conditions for all the population), the process of local development - or local public policy - should be based on the reflection of different needs of individual social groups children, employees, entrepreneurs, seniors ...). This reflection is currently supported through the implementation of the basic principles of strategic management - smart administration. In this context, the privatization of entities connected to smart technologies in regions and cities may mean that these territorial units are too dependent on private companies to obtain a massive supply of data on citizens, businesses and institutions with the help of the state. This may indicate a potential risk of using the information obtained on its own, without the possibility of public scrutiny. "*With the culmination of a smart city, the city is privatized*," warns Evgeny Morozov, a thinker dealing with technology and politics. "*Such a city where you will have to pay for services that were formerly free of charge*." (Morozov, 2011)

4 Conclusions

State ownership was extreme in Czechoslovakia for the period of central planning. The necessity of privatization is therefore not questioned. The disputes, however, have led to the extent, method and pace of privatization. The privatization methods used in Czechoslovakia and subsequently in the Czech Republic were not in connection with the Washington Consensus. From the start of privatization to the present, Czech state revenues amount to about 1 trillion Czech crowns. The resources thus obtained are for specialized funds (for example, transport infrastructure). According to European law, they can not be used to reduce the state budget deficit and consequently reduce government debt. However, the subsequent financing of activities from these funds for the public interest will avoid expenditure from the state budget. This will help to reduce the potential public budget deficit.

Despite some privatization plans (roughly in the period 2000-2005), they remained in the Czech economy entirely state-owned or majority-owned by the state, companies in the field of electricity generation and transmission, gas pipelines and pipelines and rail transport. These are important societies representing the vascular or nervous system from the point of view of the "anatomy" of the national economy. Their significance, especially with current changes in current geopolitical interests and the associated scattered risks, represents a strategic position within the economic interests of the state and the European Union . This reality leads to a number of questions. One of them is what opinion would be of interest to today's prominent advocates of privatization economic policies, such as R. Reagan and M. Thatcher. It can also be said that the conditions for privatization are always in a certain time and space, ie the 1980s and 1990s were the "golden" era for privatization.

Acknowledgement

References

Hayek, F. A. (1978). *The Constitution of Liberty, Chicago*, The University of Chicago Press.

Hayek, F. A.(1990). *The Road to Slavery*. Praha, Academia 1990.

Hayek, F. A. (1995). *Fateful conceit, the mistakes of socialism*. Praha, Slon 1995.

Hayek, F. A. (1994*). Law, Legislation and Freedom. New interpretation of liberal principles of justice and political economy*. Praha, Academia 1994.

Hayek, F. A. (1995). *The counter-revolution of science*, Praha, Liberální institut 1995.

Mlčoch, L. (2000). *Critical view of economic transformation in the Czech Republic*. In Reflections on Czech Economic Transformation**. Praha: Vyšehrad, pp. 85−89.

Kotrba, J. (1997): *Privatization process in the Czech Republic: Actors and winners. In: Švejnar, J.: The Czech Republic and the economic transformation in Central and Eastern Europe. Praha. Academia.*

Lavigne, M. (1999). *The Economics of Transition: From Socialist Economy to Market Economy*. Houndmills: Palgrave Macmillian,

Mises, L. (2006). *Human Negotiation: Treatise on Economics.*.Praha. Liberální institut.

Mlčoch, L. (2000). *Critical view of economic transformation in the Czech Republic. In Reflections on Czech Economic Transformation.* Praha: Vyšehrad, pp. 85−89.

Mlčoch, L., Machonin, P., & Sojka, M. (2000). *Economic and Social Changes in the Czech Society after 1989.* Alternative view. 1st ed. Praha. Karolinum.

Mlčoch, L. (2005). *Institutional Economics.* 2. ed. Praha. Univerzita Karlova.

Morozov, E. (2011). *The net delusion: the dark side of internet freedom*. 1st ed. New York. Public Affairs.

Schwarz, J., (2003). Transformation, Reform, and Third Way. *Political Economy*. 3/2003. Praha. Vysoká škola ekonomická. pp. 83-89.

Smith, A. (1958). *Discussing the nature and origin of the wealth of nations*. SNPL. Praha.

Smith, A.. (2005). *The theory of moral feelings.* Liberální institut. Praha

Šetek, J. (2015). *New Features in Respect of the Economy and Security in the early 21st Century.* The International Scientific Conference INPROFORUM. České Budějovice. Czech republic. pp. 14–19.

Šetek, J., & Petrách F. (2017). *National security in the context of global econonomy*. 17th International Scientific Conference. Rajecké Teplice, Slovak republic. pp. 2315-2323.

Volek, T., & Novotná, M. (2015). Gross Value Added and Total Factor Productivity In *Czech Sectors.Contemporary Economics*, 9(1), pp. 17-27.

Wawrosz, P., & Valenčik, R. (2014). *How to Describe Affinities in Redistribution Systems*. 18th International Conference Current Trends in Public Sector Research. Praha. Czech republic. pp. 212 – 220.

Zieleniec, J., & Mládek, J. (1990). *Czechoslovakia at the crossroads.* Lidové noviny, Praha 1990.

The Historical Comparison of Housing Affordability in Czech Republic

David Slavata

Abstract: The Czech Republic is a country with the highest growth of real estate's prices in Europe. The paper is focused on the analysis of this long-term growth of real estate's prices and its influences to the availability of housing. There will be presented Czech historical data describing housing affordability as well. The housing affordability in Czech Republic will be compared using the basic indicators of housing affordability such as P/I ratio and P/R ratio. The aim of the paper is to find out (with the help of mentioned ratios), if the present price level of the Czech real estate market is overvalued or undervalued. To evaluate the results the sum of P/I and P/R ratios will be used. For that purpose in the article there will be presented the results of my long term research which one of the outputs the average wages and awerage prices of one flat family houses are. There will be presented the collected data from the year 1861 to 1943. The data were from daily newspapers taken.

Key words: Housing price · P/I ratio · Housing Affordability · Overvaluation

JEL Classification: R30 · P50

1 Introduction

The paper focuses on analyse of housing affordability in Czech Republic from historical point of view. Besides of this the present situation of housing affordability in selected European countries will be presented. Many countries in the world have been experiencing with boom in house prices for a couple of years. The European countries are not an exception. The house price is one of the highly monitored indicator. The house price analysis has become very common in connection with crisis in 2008. From the time up to now the economists make many of researches to explore potential risk of house price increase. Now in 2018 again many of papers are analysing the potential real estate bubble. Under condition of rising prices of homes and rising amount of mortgages there are some worries of Czech National Bank, that there can be some real estate bubble expected.

The aim of the paper is: 1.to analyze housin affordability in selected European countries,

2. to compare and analyze historical real estete market data comming from Czech region (Czech part of Czechoslovakia, Czech part of Habsburk Empire)

3. to indicate present overvaluation or undervaluation of flats due the price level of European countries and due the historical price level of Czech.

To identify the overvaluation or undervaluation of house prices is not so easy. There are many of different view and factors how to identify the housing affordability. Under the condition of Czech Republic there are several authors who analyse the situation of house prices in Czech Republic. J Cadil (2009) tries to analyse the real estate bubble in Czech Republic using the R/I ratio and regression analysis. He states the price bubble is the expectation of price acceleration of particular asset, which results in higher demand and such increase in demand is pushing prices up. The self – reinforcing mechanism is working until bubble bursts.

There are some other authors who try to analyse the Czech real estate market from the point of real estate bubble. Hlavacek, Komarek (2010) define real estate bubble as residual of housing price growth that cannot be explained by the aforementioned "standard" factors. The main factors for increase of real estate prices in national economy they define as:

1. a process of catching-up with the usual level in developed economies combined with macroeconomic convergence,

2. a correction in relative prices,

3. the development of the Czech housing market and

Ing. David Slavata, VŠB-TU Ostrava, Faculty of Economics, Department of Public Economy, e-mail: david.slavata@vsb.cz

   4. the constantly expanding mortgage market in the Czech Republic.

They analyse the property prices using three alternative approaches – an approach based on simple indicators of housing price sustainability (price-to-income and rental returns) and two simple econometric models (a time series model and panel regression).

Zemcik and Mikhed (2009) in their paper investigate the situation of decreasing of U.S. real estate market after the beginning of the financial crisis. Thea use the regression analysis to explain the main fluctuations.

Many of sources use for identification of price real estate bubble the simple housing market indicators. There are mainly compared the historical levels of indicators with the current level of indicators. The most typical indicator using by accredited institutions (national and international financial institutions such as Goldman Sachs, Czech National Bank etc.) is P/I ratio. The comparison of P/I can indicate potential real estate bubble.

The main simple real estate indicators can be divided into the four separate groups:

   1. housing affordability measures

   2. housing debt measures

   3. housing ownership and rent indicators

   4. housing price indexes

The aim of the paper is to find out, if the prices are overvalued or undervalued using by selected simple real estate indicators.

2 Methods

The analysis of housing affordability will be made by using main real estate indicators, which is P/I ratio (average price of flat to year personal income ratio), P/R ratio (average price of flat to year rent ratio). As additional in some cases to get more precise results, the other indicators will be used. They are: P/GDP ratio (average price of flat to GDP per capita ratio), P/W ratio (average price of flat to average wage ratio) and M/I ratio (year mortgage payment to year personal income ratio).

To analyse the Czech real estate market with the price levels of other European countries the data from several sources was taken. It has been already found, that different data sources refer to different numbers for the same time. The reason consist in different methodology and likely in time delays as well. The annual net wages for the latest period 2018 were presented as different by the Eurostat and by www.numbeo.com for instance. Since the www.numbeo.cz determines the average monthly net salary after tax as an average of data contributed by the contributors, Eurostat presents the official data received from the national statistical agencies. To make it more objective, if necessary to count the comparative indicators there has been used the average of these numbers.

The GDP per capita was taken from the World Bank's statistical survey. Such variables were important to determine P/GDP ratio comparative indicator. In some cases it is more objective to use P/GDP ratio (even some sources presents only the P/GDP ratio in their housing statistics instead of maybe less informative P/I ratio) instead of P/I ratio. While net Income in P/I ratio indicator captures more of the employees' situation, the GDP per capita in P/GDP ratio may capture the economic situation of traders and other entities whose income does not depend on dependent activity (as in case of employee). To make it more objective, if necessary to count the comparative indicators there has been used the averages of P/GDP ratio and P/I ratio.

The levels of prices and rents were from www.numbeo.com taken. Other sources of prices were found but due to incompleteness or insufficient form (Eurostat presents only indexed prices) I decided for the www.numbeo.com source. The method used to determine housing prices and rents was derived from the average prices entered into the system by individual contributors.

To analyse the Czech real estate market in comparison with its historical level of basic indicatore values the data from historical peridical newspapers were taken. As the main source of information were Lidove Noviny and Narodni Listy used. There were picked up and recorded the prices presented in ads. The Lidove Noviny were published daily from year 1893 – 1945 and the ads information described mostly the situation in Moravian regions. The Narodni Listy newspapers were published during the years 1861 – 1941 and the ads information described mostly the situation in Bohemia regions. To get more homogenues output describing the situation in Czech regions as whole, from the recorded database, the average values were calculated.

There were especially inspected the bid wages to calculate averge level of emploee income in each year. As the second step tehre were analysed the ads describing the real estate market. Which is the bid price of family houses for sale and the bid price of rents. The rents were mostly in their month price presented, so it was necessary to calculate it on the year level.

To calculate undervaluation or overvation the next mathematical formula and steps will be use:

$$PI = \frac{P}{I}$$ (1)

where:

P…… average price of flat

I…….. average value of personal income

The price to income ratio (see the formula 1) represents the basic affordability measure of housing. It is generally the ratio of average house prices to average personal disposable income, expressed as a percentage or as years of income. This ratio, applied to individuals, is a basic component of mortgage lending decisions.

$$PR = \frac{P}{R}$$ (2)

where:

R……… average year rent

The price to rent ratio express the inverted value of capitalization. It says how many year rents will cover the current price of flat. As lower the P/R ratio is as more convenient to buy the flat. Trulia established the following thresholds for the P/R ratio: less than 15 indicates it is much better to buy than rent; from 15 to 20 indicates it is typically better to rent than buy; and 20 or more indicates it is much better to rent than buy.

The overvaluation or undervaluation will be calculated by the mathematical formula 3:

$$OUa = \frac{\frac{PIa+PRa}{1} - \frac{\sum(PIn+PRn)}{n}}{\frac{\sum(PIn+PRn)}{n}} \, x \, 100$$

(3)

where:

OU…. overvaluation or undervaluation

a……. the given European country (given year in case of historical comparison)

n…….. number of selected countries (number of years in case of historical comparison)

The separate values of above ratios (described in formula (1) and (2) with their different information values will be added up and implemented into the global indicator OU (see formula (3)).

3 Research results

The results valid for the particular countries are in percentage shown and valid for centrum areas and outside of centrum areas as well as average value of values for centrum and outside of centrum areas. The rank is assigned to the countries according to their average value. The results are in next Table 1 shown.

Table 1 Overvaluation and undervaluation of flat prices in %, July 2018

Country	Overvaluation, undervaluation in % city center areas	Overvaluation, undervaluation in % outside of center	Average	
			value	rank
Albania	22,75	3,23	12,99	6,00
Austria	13,06	18,96	16,01	5,00
Belgium	-21,53	-10,03	-15,78	26,00
Bulgaria	-16,28	-12,59	-14,44	24,00
Croatia	18,32	25,42	21,87	4,00
Cyprus	-35,57	-30,30	-32,94	30,00
Czech Republic	**31,75**	**32,55**	**32,15**	**2,00**

Denmark	-12,89	-10,13	-11,51	21,00
Estonia	-2,60	0,84	-0,88	15,00
Finland	2,66	-5,18	-1,26	16,00
France	39,99	33,01	36,50	1,00
Germany	11,88	13,04	12,46	7,00
Greece	-6,24	6,72	0,24	14,00
Hungary	10,75	0,56	5,66	12,00
Ireland	-29,34	-31,82	-30,58	29,00
Italy	12,50	2,88	7,69	11,00
Latvia	-6,87	-10,44	-8,65	20,00
Lithuania	7,60	10,73	9,16	9,00
Luxembourg	7,69	15,13	11,41	8,00
Malta	-16,87	-18,91	-17,89	28,00
Netherlands	-16,77	-17,18	-16,97	27,00
Poland	-9,24	-6,68	-7,96	19,00
Portugal	-6,62	-16,87	-11,75	22,00
Romania	-6,70	0,87	-2,91	17,00
Slovakia	-16,22	-7,92	-12,07	23,00
Slovenia	3,38	13,22	8,30	10,00
Spain	-12,04	-17,54	-14,79	25,00
Sweden	29,71	24,37	27,04	3,00
Ukraine	0,09	-9,68	-4,79	18,00
United Kingdom	3,61	3,74	3,68	13,00

Source: Own calculations, www.numbeo.com, Eurostat 2018, World Bank 2018, www.trzniceny.cz

The overvaluation and undervaluation is calculated due to the deviation of average values counted from the given parameters. The methodology of calculations is presented in previous chapter.

The results from Table 1 show the overvaluation of flats in Czech Republic. The price overvaluation of flats is 32.15% above the average value for the file of presented countries. The rank assigned to the country is 2. The Czech Republic is the country with one of the most overvalued flats in Europe.

The most overvalued flats in Europe you can find in France with the rank 1, where the level of overvaluation exceeds 36%. The rank number 3 belongs to the Sweden with its overvaluation of 27.04%. The data show undervaluation of flats in Poland. The average undervaluation of flats is 7.96%, which is the 19th position from inspected countries.

On the other hand the most undervalued prices of flats are Cyprus (-32.94%, rank 30), Ireland (-30.58%, rank 29) and Malta (-17.89, rank 28). It is assumed the increase of price flats in the future in these countries.

From the Table 1 it is seen even the difference between overvaluation/undervaluation of flat prices in city centrum areas and overvaluation/undervaluation of flat prices in outside city areas. The difference between overvaluation of city centrum areas and outside of centrum areas is -0,80% in case of Czech Republic. It imply there is nearly no difference between cities and rural areas. The demand covers all the areas equally.

The highest difference is indicated for Albania (+19.52%). While the overvaluation in cities there is indicated at the level of 22.75%, the situation in outside of central areas indicates the overvaluation only +3.23%. The next country with the high difference is Belgium (-11.49%). Undervaluation of central city areas is equal to -21.53% which is more than in outside of city areas (-10.03%). The third position belongs to the Portugal (10.25%). Its city centrum areas are undervalued by -6.62% while the outside city centrum areas are undervalued by -16.87%.

3.1 Historical data comparison

The partial results of collecting data from Lidove noviny and Narodni listy are in next three figures (figure 1, figure 2, figure 3) shown. All the prices are in their average nominal values shown. Each figure presents the basic variables which are necessary to constract the housing affordability indicators (P/I ratio and P/R ratio).

The first figure 1 presents the average levels of wages in Bohemia and Moravia within the years 1861 – 1943. In the figure 1 separately the averages of specialized wages, the averages of labour wages and averages of both specialized and labour wages are shown. The data show the stable level of nominal values within the most of Habsburg empire period. The increase of nominal wages starts during the First World War with its peaks in pre crisis (great depression) period in 1928 and 1929.
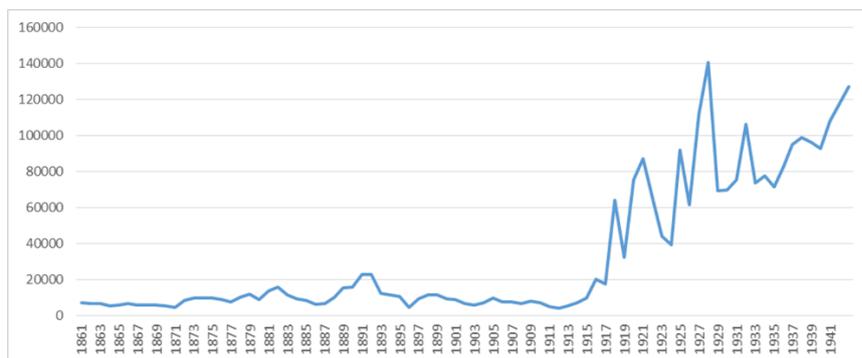
Figure 1 Average level of wages in Czech countries within the years 1861 - 1943
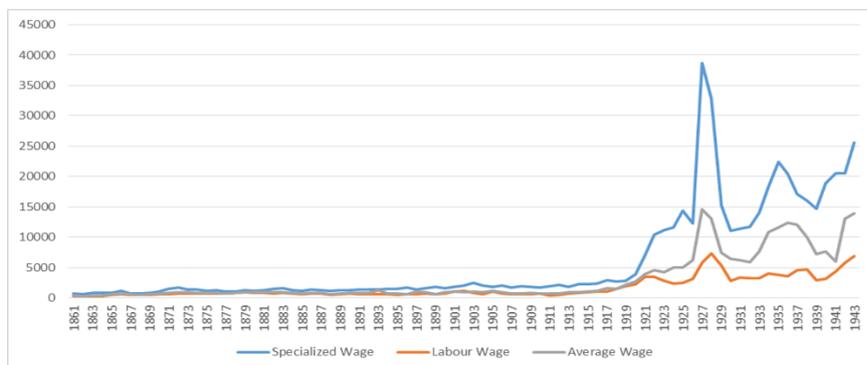
Source: Own processing, Lidove noviny, Narodni listy

The figure 2 presents the average asking price per one flat family house within the years 1861 – 1943. The data show the stable level of nominal values within the most of Habsburg empire period. The increase of average nominal values of houses starts during the First World War with its peak in pre crisis (great depression) period in 1929. The main reason of the drop of prices in the years 1924 and 1925 is likely the emigration wave of Czech population to the USA. From 1925 the strict immigration rules were implemented in USA. Because of the deadline for the liberal rules in 1925 ended, many of owners who decided to emmigrate tried to sell their houses as quicker as possible. It influenced the asking prices of course.

**Figure 2** Average asking price per one flat family house within the years 1861 - 1943

Source: Own processing, Lidove noviny, Narodni listy

The next figure 3 presents the average asking price per year rent for average flat. The data show the gradual increase of nominal values within the most of Habsburg empire period. The steep geometrical increase of average nominal values of rents   starts during the First World War with its peak in pre crisis (great depression) period in 1929. The period of years 1914 – 1927 is well known as period with the most strict rent regulation rules implemented in Czechoslovak legal system. The strict rules were gradualy released untill the year 1938.

Figure 3 Average asking price per year rent for average flat within the years 1861 - 1943
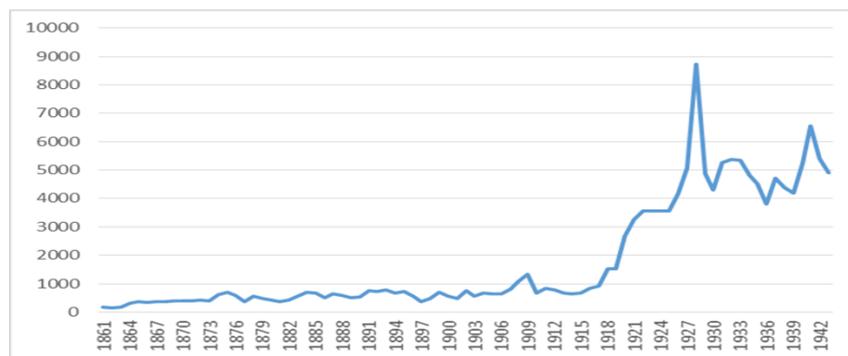
Source: Own processing, Lidove noviny, Narodni listy

The next figure 4 presents the comparison of housing affordability level in 2018 and within the period of 1861 – 1943. The data were calculated from previous values of wages, family houses and rents. The red line presents the current value of affordability indicator (P/I ratio + P/R ratio), while the blue line presents the value of housing affordability indicator in shown years.

Figure 4 Comparison of housing affordability level in 2018 and from 1861 – 1943 in Czech countries
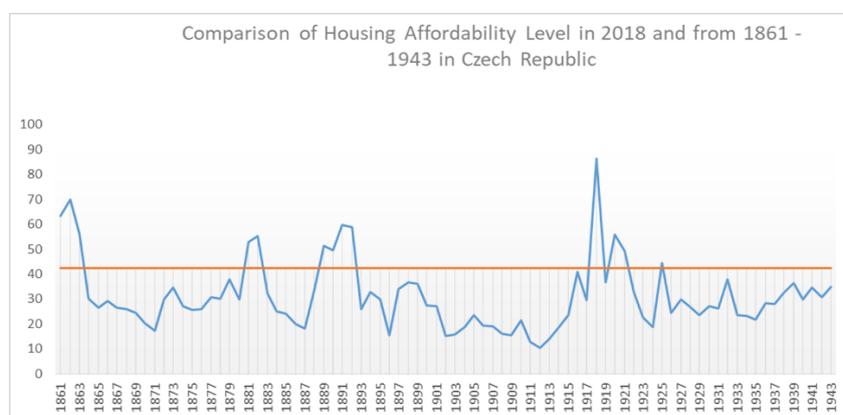
Source: Own processing, Lidove noviny, Narodni listy

The level of red line seems to be above the average value calculated from the values of the years 1861 – 1943. It is clear the calculations of housing affordability indicates worse acces in 2018 in comparison to the searched period. From the point of presented indicators (P/I ratio + P/R ratio) the housing affordability is comparable with First World War period (1914 – 1918). To calculate the overvaluation or undervaluation using the mathematical formulas 1, 2, 3 which are presented in chapter 2 the current price of flats indicates overvaluation +36,11%.

4 Conclusions

The analyzed data show very low level of housing affordability in Czech Republic. The prices of flats using the housing affordability indicators show overvaluation. The overvaluation is indicated by comparison with the average level of housing affordability indicators calculated from the values of indicators of 30 European countries. The level of overvaluation in Czech Republic is 32,15%.

The second - historical approach consist in comparison of historical levels of housing affordability indicators. Its average value is calculated from the values stated in daily press ads Lidove noviny and Narodni listy. Even by using this historical approach the overvaluation is indicated. The historical approach indicates overvaluation + 36,11%.

The main likely reasons of flat overvaluation are low mortgage interests in previous period. Due the actions of Czech central bank the interest rates have increased in recent months. The second likely reason seems to be increase of wages. The wages have increased since last year due the rapid increase of Czech GDP. High demand for labour increases the nominal wages and safty of those who are interested to buy a real estate. The third likely reason seems to be the impact of Czech central bank monetary policy. It held the advantageous exchange rate for foreign investors for a years. As the result of such step it probably influenced the increase of flat prices. The main effect of price rises was the massive use of shared housing. For incomming tourist that was the most convenient and economical way how to spend their money in Czech republic.

References

Baar, N. (1998). *The Economics of Welfare State*. Stanford: Stanford University Press

Brauner, R. *Specific factors of the contemporary development of the Czech real estate market.* In Proceedings of the 13TH international scientific conference "European Financial Systems 2016". Brno: Masaryk university, 2016. s. 44-51. ISBN: 978-80-210-8308- 0.

Cadil, J. (2009). *Housing price bubble analysis–case of the Czech Republic.* Prague: Prague Economic Papers 1.pp 38-47.

Bělušková, K., & Brychta, K. *CFC Rules as stated in the standards of the OECD and EU – a comparative study.* In Financial Management of Firms and Financial Institution: 11th International Scientific Conference: Proceedings. Ostrava: VŠB-Technická univerzita Ostrava, 2018. s. 46-53. ISBN: 978-80-248-4139-7.

Hakalová, J, Palochová, M., & Tušan, R (2016) *Problems with the Breach of the Obligation to Publish Financial Statements and Annual Reports of Business Entities in the Czech and Slovak Republic in the Context of Global Requirements for Reporting and Disclosing Information.* In: 16th International Scientific Conference Globalization and Its Socio-Economic Consequences. University of Zilina, The Faculty of Operation and Economics of Transport and Communication, Department of Economics, 2016, s. 603-610. ISBN 978-80-8154-191-9.

Halásková, M., & Halásková, R. (2014) *Assessment of Public Expenditures in Selected Areas of Public Services in EU Countries.* In: Stavárek, D., & Vodová, P. (ed.). Proceedings of the 14th International Conference on Finance and Banking. Karviná: Silesian University of Business Administration, pp.88-98. ISBN 978-80-7248-939-8.

Hlaváček, M., & Komárek, L. (2010) *Housing price bubbles and their determinants in the Czech Republic and its regions.*Prague: CNB WP 12

Mikhed, V., & Zemcik, P. (2009) *Do house prices reflect fundamentals?* Aggregate and panel data evidence. Journal of Housing Economics 18.2. pp 140-149.

Панова, Е.Д. , Андреева, В.Н. (2009) *Качество жизни как показатель развития нации: подходы и методы оценивания.* Бізнес Інформ Издательский дом "ИНЖЭК".

Slavata, D. *The Ownership Structure of Housing Market and Unemployment in CZ 2015* , Public Economics and Administration: proceedings of the 11th international scientific conference : Ostrava, Czech Republic, 8th-9th September 2015, VŠB – Technical University of Ostrava, pp 185-190, ISSN 1805-9104, ISBN 978-80-248-3839-7

www.trzniceny.cz [online 2018 -09 -05]

www.numbeo.com [online 2018 -09 -05]

The Quality of Life Trends in Area of Health in V4 Countries

Elena Hošková, Martin Richter, Iveta Zentková

Abstract: The quality of life is a multidimenzional problem. Objective and subjective evaluating indicators are used for measuring the quality of life. Among objective indicators belong indicators in area of material living conditions, in area of health of inhabitants, safety, education, living environment etc. The aim of this paper is to investigate the quality of life in area of health in V4 Countries. The focus is put on the objective indicators of quality of life such as the life expectancy and healthy life years at birth. The methodology is based on the tools of regression analysis. Inputs used for regression are from the database Eurostat in the periode of years 2005-2017. Analysis shows that females perform higher life expectancy and higher healthy life years compare to the males in all V4 Countries. The highest life expectancy and healthy life years at birth perform females in Czech Republic (2017 the life expectancy 82,1 years, healthy life years 64) and in Poland (2017 the life expectancy 82 years, healthy life years 64,6). According to estimated trend functions the life expectancy of females increased yearly by value 0,23 on average in both countries.

Key words: Quality of Life · Life Expectancy · Healthy Life · Years at Birth

JEL Classification: A13 · C20

1 Introduction

For the satisfaction of citizens of any state, the crucial precondition of the livelihood is not only economic aspect but also the quality of their life. This includes objective and subjective factors that are of interest for many scientists. They study the economic and social conditions of quality of life, Uher (2004). In the last two decades, quality of life is considered to be the concept that applies to the individuals and the research of the quality of life is related to the health condition (HRQOL - Health-Related-Quality of Life), Fuhrer (2000). Health trends over much of the past century have been generally, and notably, positive throughout the world. In several regions, however, life expectancy has declined over the past 1-2 decades, McMichael, McKee, Shkolnikov, Valkonen (2004). Phenomena such as the reduction of mortality, ageing, and the increase in life expectancy are extremely useful in the planning of public policies that seek to promote the economic and social development of countries, Diaz, Debón, Giner, Bosch (2018). In most Central European countries, life expectancy is now increasing mainly thanks to a decline in cardiovascular mortality, Meslé (2004). It has been noted that national life expectancies have diverged in Europe in recent decades, but it is unknown how these recent trends compare to longer term developments. During the first decades of the 20th century, variation in life expectancy in Europe increased to reach peak values around 1920, then decreased to reach its lowest values in 1960 (among men) and 1970 (among women), and finally increased strongly again, MacKenbach (2013). Driven by technological progress, human life expectancy has increased greatly since the nineteenth century. Demographic evidence has revealed an ongoing reduction in old-age mortality and a rise of the maximum age at death, which may gradually extend human longevity, Dong, Milholland, Vijg (2016). National populations can now be clearly grouped into those that have achieved rapid gains in life expectancy; those whose gains are slower or are perhaps plateauing; and those in which the trends have reversed. By eliminating deaths from cardiovascular diseases and diabetes mellitus, the life expectancy could be more prolonged, Gavurová, Vargašová (2018).

2 Methods

The aim of this paper is to investigate the quality of life in area of health in V4 Countries. The focus is put on the objective indicators of quality of life such as the healthy life years at birth (HLY) and the life expectancy (LEB). HLY measures the number of remaining years that a person of a certain age is expected to live without disability. It is actually a disability-

---

Ing. Elena Hošková, Ph.D., Slovak University of Agriculture in Nitra, Department of Economics (FEM), Tr. A. Hlinku č. 2, 949 76 Nitra

Ing. Martin Richter, Ph.D., Slovak University of Agriculture in Nitra, Department of Economics (FEM), Tr. A. Hlinku č. 2, 949 76 Nitra

doc. Ing. Iveta Zentková, CSc., Slovak University of Agriculture in Nitra, Department of Economics (FEM), Tr. A. Hlinku č. 2, 949 76 Nitra

free life expectancy[2].LEB is the mean length of life of a hypotethical cohort assumed to be exposed, from birth through death, to the mortality rates observed at a given year.[3]

The methodology is based on the tools of regression analysis. The database Eurostat from years 2005-2017 was used for regressions models of trends (t).

We assumed, than the linear model can be used for trend functions.

$$HLY_{ij} = a + b.t \qquad\qquad LEB_{ij} = a + b.t$$

Where

HLY_{ij} Healthy life years of i-country j-gender   i = (1,4), j = (1,2)

LEB_{ij} Life expectancy at birth of i-country j-gender   i = (1,4), j = (1,2)

3 Research results

3.1 Healthy years HLY

Healthy years is one of the most important life quality indicators in area of health. For maintaining the health of the population, many countries are already engaged in support activities aiming the prevention. The most anticipated healthy life years in the reference period were reported for female and male in Poland in 2005. The estimated life expectancy was 66.9 years for women and 61.2 years for men. Despite the fact that health expenditures in the Slovak Republic are the second highest among the V4 countries, and 2% of them are used for the prevention of diseases, it is the country with the lowest number of healthy life years for men and women, Table 1. Slovakia has the worst values of standardised mortality rates for ischemic heart diseases in EU countries. Mortality rates are significantly higher for males compared with females[4]. According to the Public Health Office of the Slovak Republic, it can be assumed that the number of non-infectious diseases will continue to rise[5]

Table 1 Descriptive statistics – healthy life years

Females				
	Minimum	**Maximum**	**Mean**	**Std. deviation**
CR	59,9	65,0	63,3	1,7
HU	54,3	60,8	58,6	1,9
PO	61,5	66,9	63,1	1,4
SK	52,0	56,6	54,0	1,6
Males				
	Minimum	**Maximum**	**Mean**	**Std. deviation**
CZ	57,9	63,4	61,5	1,8
HU	52,2	59,5	56,8	2,3
PL	57,6	61,3	59,3	1,1
SK	52,1	56,4	54,1	1,5

Source: Own processing

Comparing HLY trends among Countries

In 2006, in Poland, there was a steep decline in healthy life years, and in all other years the population of Czech Republic had the highest value. The trend in predictions of healthy life years for female in the Czech Republic was inceasing up to 0.34 on average, according to the estimated trend function. Similar pattern was seen in case of males, the healthy life years increased on averaged by 0.41 years per year.

---

2 Eurostat

3 Eurostat

[4] Gavurová, Vargašová, (2016)

[5] http://www.uvzsr.sk/index.php?option=com_content&view=article&id=1582%3Asprava-o-zdravotnom-stave-obyvatestva-sr-za-roky-2009-2011&catid=108%3Amaterialy-schvalene-vladou&Itemid=106

In Hungary, the number of healthy life years increased steadily from year to year. According to estimated trend function it increased on average annually by 0.45 years forr females and 0.61 for male.

The development in the Slovak Republic and in Poland was not statistically reliable to describe by trend function

Trend functions of Healthy life years:

$$HLY_{CZf} = 60,99 + 0,34t \quad R^2 = 0,57 \quad sigF = 0,01 \quad sig\ coeff \quad 0,01; 0,05$$

$$HLY_{HUf} = 55,83 + 0,45t \quad R^2 = 0,79 \quad sigF = 0,01 \quad sig\ coeff \quad 0,01; 0,01$$

$$HLY_{CZm} = 58,82 + 0,41t \quad R^2 = 0,83 \quad sigF = 0,01 \quad sig\ coeff \quad 0,01; 0,05$$

$$HLY_{HUm} = 52,82 + 0,61t \quad R^2 = 0,88 \quad sigF = 0,01 \quad sig\ coeff \quad 0,01; 0,01$$

Comparing HLY trends for males and females in the individual countries

In all V4 countries, healthy life years are higher for females than for males. The smallest difference in healthy life years for males and females is reported for the Slovak Republic. The trend for males copies the trend for females with only slight deviations. In the Czech Republic and in Hungary there is an average gender difference of 2 years. The most significant difference between the healthy life years of males and females, on average by 4 years, was reported in Poland. However, it should be noted that in this country, healthy life years trends of men and women tend to be slightly convergent.

3.2 Life expectancy at birth LEB

Descriptive statistics of life expectancy shows Table 2. The highest life expectancy was recorded in 2015 in the Czech Republic, 81.6 for females, 76.1 for males. The highest average life expectancy rates of both genders are also observed in the Czech Repbulic, which makes the Czech Republic ranked among the countries with high quality of life in the area of health.

Table 2 Descriptive statistics – life expectancy

Females				
	Minimum	Maximum	Mean	Std. Deviation
CR	79,2	82,6	80,9	1,4
HU	77,2	79,7	78,6	1,7
PO	79,3	82,0	80,7	2,0
SK	78,1	80,7	79,5	2,3
Males				
	Minimum	Maximum	Mean	Std. Deviation
CZ	72,9	76,1	74,6	1,0
HU	68,7	72,6	70,9	1,4
PL	70,8	73,9	72,3	1,1
SK	70,2	73,8	71,9	1,2

Source: Own processing

Comparison of LEB trends among countries

Life expectancy in the Czech Republic increased annualy on average by 0.23 years for females and 0.27 for males. Life expectancy of females in the Czech Republic increased from 79.2 years to 82.1 between years 2005 and 2016, and for males it increased from 72.9 years to 76.1 years between years 2005 and 2016.

While the trend of life expectancy for females in Poland essentially copied the development in the Czech Republic, the expected life expectancy of males in Poland was, on average, three years lower than in the Czech Republic. Life expectancy according to estimated trend function increased annualy on average by 0.23 years for females and by 0.31 years for males.

The lowest life expectancy was observed in Hungary over the reference period, on average 3 years lower than in the Czech Republic for females, and 4 years lower for males.

Trend functions of Life expectancy at brith:

$$LEB_{CZf} = 79,37 + 0,23t \qquad R^2 = 0,94 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{HUf} = 77,32 + 0,19t \qquad R^2 = 0,92 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{PLf} = 79,11 + 0,24t \qquad R^2 = 0,97 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{SKf} = 77,92 + 0,23t \qquad R^2 = 0,92 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{CZm} = 72,88 + 0,27t \qquad R^2 = 0,98 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{HUm} = 68,64 + 0,37t \qquad R^2 = 0,97 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{PLm} = 70,24 + 0,31t \qquad R^2 = 0,97 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

$$LEB_{SKm} = 69,74 + 0,34t \qquad R^2 = 0,98 \qquad sigF = 0,01 \qquad sig\ coeff\ \ 0,01;\ 0,01$$

Comparison of LEB trends for males and females in individual countries

The absolute value of life expectancy at birth for females is significantly higher than for males in all monitored countries. The biggest difference is in Poland, followed by Hungary and the Slovak Republic. The difference in life expectancy of female and male is on average 8.4 years (PL), 7.7 (HU) and 7.5 years (SR). The smallest difference is in the Czech Republic (in average 6.2 years). Estimated trend functions pointed out the faster life expectancy growth for males than for females. Due to this fact, the differences between the life expectancy of males and females gradually diminish.

3.3. Total health expenditures and expenditures on prevention

For a detailed understanding of the context, we examined how are the development trends of individual indicators of quality of life for males and females related.

We found that between the development trends:

- of healthy life years for females and males in each country is very tight relationship

- of life expectancy for females and males in each country have an extremely tight relationship

Considering these facts, it can be assumed that healthy life years and life expectancy in each country are significantly determined by exogenous factors. We identified the correlation between their development and the development of total health expenditures of governments (THCE) and expenditures of governments on prevention (EP).

Total health expenditures vary considerably from country to country. The highest amount is observed in the Czech Republic with an average value over the monitored period of 1161 EUR per capita and year. Lower average expenditures per person was in the Slovak Republic (992 EUR) in Hungary (789 EUR) and in Poland (697 EUR). Except of the Slovak Republic, total health expenditures increased in all countries over the monitored period.

To determine the correlation between total health expenditures and healthy life years the Pearson correlation coefficient was used. We found the following:

- between the total health expenditures and healthy life years there is a strong correlation in Poland (+) and Slovakia (-), and in Hungary and the Czech Republic there is a low correlation (-).

- between total health expenditures and life expectancy there is a strong correlation in Poland (+), Hungary (-), Slovakia (-).

Another important factor of the population health is expenditures on prevention. The highest expenditures of governments on prevention has the Slovak Republic. The average value over the observed period was 16.3 EUR per capita and year. Unlike other countries where the expenditures on prevention have a fluctuating trend, in the Slovak Republic there was a growing trend over the observed period. In the Czech Republic the average expenditures on prevention was 6.4 EUR, in Hungary 3.1 EUR and in Poland 0.9 EUR per capita and year.

Pearson's correlation coefficient confirmed that:

- there is a very strong correlation between expenditures on prevention and healthy life years in the Czech Republic (+), Poland (+) and in the Slovak Republic (+) same for females and for males.

- there is a strong correlation between expenditures on prevention and life expectancy in Poland (+) and the Slovak Republic (+) for females and males and in the Czech Republic (+) for females.

The results of available research show that over the past two centuries, outside times of war and famine, such reversals have been rare. Exploration of these varied population health trends elucidates better the close relation between population health and the processes of economic, social, and technological change, McMichael, McKee, Shkolnikov, Valkonen (2004). However, it is also found that cohort effects (the baby boom generation) as well as improvements in life expectancy have a substantial effect on future health care expenditure even when proximity to death is controlled for. When life expectancy increases, terminal costs are postponed but the increases in health expenditure that follow from longer life expectancy are not as large as the increase in the number of elderly persons would suggest (due to "healthy ageing"). Based on the empirical estimates, healthy ageing is expected to reduce the impact of increased life expectancy on real health expenditure by 50% compared to a situation without healthy ageing, Bjørner, T.B. - Arnberg, S. (2012).

4 Conclusions

The aim of this paper was to investigate the quality of life in area of health in V4 Countries. The Quality of Life was charactered by Healthy life years and Life expectancy at brith. Healthy life years were rising in all countries over the observed period. According to the estimated functions they increased on average more rapidly for males than for females in the Czech Republic and in Hungary. The difference between healthy life years of females and males was on average 2 years. On the basis of past developments, we expect that differences in males and female's healthy life years will gradually decrease in these two countries.

The development of life expectancy at birth has a distinctive upward trend in all V4 countries. According to the estimated trend functions, the value of this indicator increased on average by 0.22 per year for females and by 0.32 per year for males. Life is higher by 7 years on average for females than for males in each country. Despite the stronger growth in males' life expectancy in the next 5 years, we do not expect bringing the indicator closer to females' life expectancy.

The results of the analysis showed that the quality of life of the V4 population is increasing. Healthy life years grow faster than life expectancy for males and females. The results of the analysis also showed that the total health expenditures do not cause such a significant beneficial effect on healthy life years and life expectancy as expenditures on prevention. The finances used for prevention have their justification and affect the health of the population, thereby enhance the quality of life of the population.

References

Bjørner, T.B., & Arnberg, S. Terminal costs, improved life expectancy and future public health expenditure. In*: International Journal of Health Care Finance and Economics*, Volume 12, Issue 2, June 2012, Pages 129-143, ISSN 13896563, DOI 10.1007/s10754-012-9106-1.

Diaz, G., Debón, A., & Giner-Bosch, V.: Mortality forecasting in Colombia from abridged life tables by sex. In: *Genus*, Volume 74, Issue 1, 1 December 2018, Article number 15, ISSN: 00166987, DOI: 10.1186/s41118-018-0038-6.

Dong, X. - Milholland, B. - Vijg, J.: Evidence for a limit to human lifespan. In: *NatureVolume 538*, Issue 7624, 2016, Pages 257-259, ISSN: 00280836, DOI: 10.1038/nature19793.

Fuhrer, M. J.: Subjectifying quality of life as a medical rehabilitation outcome. In: *Disability and Rehabilitation*, 22, 481 – 489, 2000.

MacKenbach, J.P.: Convergence and divergence of life expectancy in Europe: A centennial view. In: *European Journal of Epidemiology*, Volume 28, Issue 3, March 2013, Pages 229-240, ISSN: 03932990, DOI: 10.1007/s10654-012-9747-x, PubMed ID: 23184355.

McMichael, A.J., McKee, M., Shkolnikov, V., & Valkonen, T.: Mortality trends and setbacks: Global convergence or divergence? In: *Lancet*, Volume 363, Issue 9415, 3 April 2004, Pages 1155-1159, ISSN: 01406736, DOI: 10.1016/S0140-6736(04)15902-3.

Meslé, F.: Mortality in central and eastern Europe: Long-term trends and recent upturns. In: *Demographic Research*, Volume 10, Issue SUPPL. 2, 16 April 2004, Pages 45-70, ISSN: 14359871.

Gavurová, B., & Vargašová, T.: Regional differences of standardised mortality rates for ischemic heart diseases in the Slovak Republic for the period 1996–2013 in the context of income inequality. In: *Health Economics Review*, Volume 6, Issue 1, 4 June 2016, Article number 21, ISSN: 21911991, DOI: 10.1186/s13561-016-0099-1.

Gavurová, B., & Vagašová, T.: Potential gains in life expectancy by eliminating deaths from cardiovascular diseases and diabetes mellitus in the working life ages among Slovak population. In*: Health Economics Review*, Volume 8, Issue 1, 1 December 2018, Article number 16, ISSN: 21911991, DOI: 10.1186/s13561-018-0202-x.

Llorca, J., Prieto Salceda, D., & Delgado-Rodríguez, M.: Gauging inequalities in age of death: Calculating the Gini index based on mortality tables, In: *Revista Espanola de Salud Publica*, Volume 74, Issue 1, January 2000, Pages 5-12, ISSN 11355727.

Seligman, B., Greenberg, G., & Tuljapurkar, S.: Convergence in male and female life expectancy: Direction, age pattern, and causes. In: *Demographic Research,* Volume 34, Issue 1, 2016, Pages 1063-1074, ISSN: 14359871, DOI: 10.4054/DemRes.2016.34.38.

Uher, I.: *Determinanty kvality života seniorov*. Univerzita Pavla Jozefa Šafárika v Košiciach, 2014, 109 s. ISBN 978-80-8152-136-2.

Competitiveness of V4 countries at regional level NUTS 2

Eva Richterová, Martin Richter

Abstract: *In the globalizing economy, the concept of regional competitiveness has become a current issue, not only among academic and scientific circles, but also among political circles. There are still many definitions of this concept, leading to a different way of assessing competitiveness at regional level. Evaluation and comparison of V4 countries` regional competitiveness at NUTS2 level is the aim of this paper. The Regional competitiveness index (RCI) is comprised of 15 indicators covering different fields such as economy, education, health, science, social life etc. The competitiveness of V4 regions is compared not only with each other but also with the average of European Union in four different years 2006, 2009, 2012 and 2015. There are considerable differences in a competitiveness of individual V4 regions. The most competitive regions are Czech region: Praha on a first place and Slovak region: Bratislava on a second place, both with higher RCI than EU average. All other V4 regions have RCI below the EU average. In terms of competitiveness, measured by RCI, there are huge disparities inside of each analysed country. In all V4 countries, the most competitive regions are those in which the capital city is situated.*

Key words: V4 · Competitiveness · Regions · Regional competitiveness index · Disparities

JEL Classification: A1 · A10 · C01

1 Introduction

In the globalizing economy, the concept of competitiveness at macroeconomics level has become a current issue among academic, scientific and political circles. The growth of the national competitiveness is one of the main goals, pursued by each national government. However, factors that determine competitiveness vary greatly not only among nations but also between regions. For this reason, the regions become central geographic units for assessing competitiveness. Enhancing the competitiveness of the regions is part of the Europe 2020 strategy, which aims to promote smart, sustainable and inclusive growth for the EU that requires the active involvement of the regions. All regional policies supported by the European Regional Development Fund are currently orientated on the support of the development of regions and at the same time on the reduction of disparities between them. Despite of that, there is no uniform definition of regional competitiveness, because it can be understood differently at different level. According to Porter (2004), the only meaningful concept of macro-level competitiveness is productivity. Porter argues that the main aim of the regions is to produce a high and growing standard of living for their citizens. Realization of this goals depends on the productivity of the economy, which is measured by the value of the output, produced by a unit of labour and capital. Productivity depends not only on the quality and features of products but also on the efficiency with which they are produced and on the ability of the economy to mobilize its available human forces. 'Regional competitiveness is the region's ability to attract and keep firms with stable or growing market shares in an activity, while maintaining stable or growing standards of living for those who participate in it' (Stoper, 1997). The European Commission (1999) perceives regional competitiveness as an ability of regions to generate, while being exposed to international competition, relatively high income and employed levels. The competitiveness of the region depends not only on highly competitive and non-competitive firms, but also on the common features that characterize the region and affect the competitiveness of all firms located in it. Capello and Nijkamp (2009) report that regions' competitiveness is an integral part of the theory of regional development and emphasize that local specifics and local material and non-material assets have become strategic factors for the competitiveness of the region. In assessing competitiveness, regions cannot be perceived as separate units but as part of wider economic systems, networks and flows of resources. Therefore, the competitiveness of the region is also influenced by the strength of external trade links, the efficiency of external communication, transport links, national and international policies, and by the

Ing. Martin Richter, Ph.D., Slovak University of Agriculture in Nitra, Department of Economics (FEM), Tr. A. Hlinku č. 2, 949 76 Nitra

Ing. Eva Richterová, Ph.D., Slovak University of Agriculture in Nitra, Department of Statistics and Operations Research (FEM), Tr. A. Hlinku č. 2, 949 76 Nitra

changing structure of external markets (Turok, 2004). In the compare to national competitiveness 'Regions compete rather on the base of the absolute advantage, which they can gain if they have excellent technological, social, infrastructure or institutional assets that are external, but enrich individual firms, so that no set of alternative factor prices can lead to a geographic reallocation of economic activity' (Camagni, 2002).

Due to the unclear definition of regional competitiveness, there are number of methods for evaluating regional competitiveness, but most common is creating complex index. The most famous index at the regional level NUTS2 is Regional competitiveness index RCI, created every three years (2010, 2013, and 2016) by Annoni, Dijkstra and Gargano. RCI measures the different dimensions of competitiveness at the regional level NUTS2 in EU. Authors of RCI claim that 'the regional level is important because most competitiveness factors are not evenly distributed over space and many are influenced or even determined by regional and local authorities' (Annoni, Dijkstra, Gargano, 2017). The RCI is built on the methodology of the Global Competitiveness Index of the World Economic Forum (GCI-WEF) with some key differences, mainly due to the regional dimension. The RCI is composed of 74 indicators, divided into 11 pillars that describe the different fields of competitiveness (Figure 1). They are classified into three groups: Basic, Efficiency and Innovation. The Basic group includes five pillars representing the basic key drivers of all economy's types: Institutions, Macroeconomic stability, Infrastructure, Health, and Basic education. Efficiency group includes three pillars, created from factors related to a more skilled labour force and a more efficient labour market: Higher education, training and lifelong learning, Labour market efficiency, and Market size. Drivers of improvement are part of the Innovation group, which consists of three pillars: Technological readiness, Business sophistication, and Innovation.

Figure 1 Conceptual framework of RCI 2016
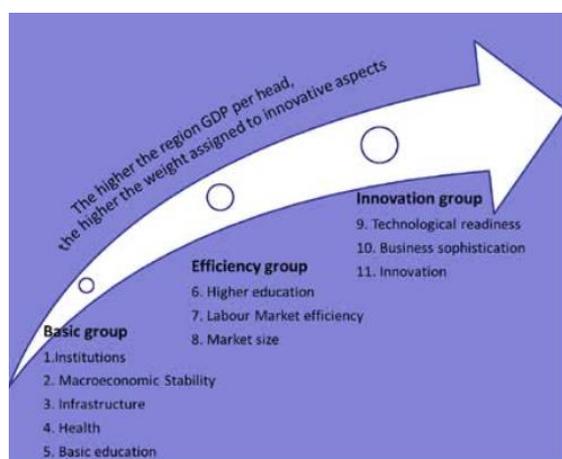
Source: The EU Regional Competitiveness Index 2016 (Annoni, Dijkstra ,Gargano, 2017)

The main aim of RCI is help regions to measure their competitiveness and compare it with other regions in their country and abroad and on that basis to plan their long-term development.

Another known regional competitiveness index is UK Competitiveness Index, created by Huggins and Thompson (2016). The UK Competitiveness Index evaluate the competitiveness of the UK's regions and localities. Index has been designed to be an integrated measure of competitiveness focusing on both the development and sustainability of businesses and the economic welfare of individuals. The UK Competitiveness Index is constructed by the 3-Factor model consists of a linear framework for analysing competitiveness based on: (1) input, (2) output, and (3) out-come factors (Huggins, Thompson, 2016).

World knowledge competitiveness index (Huggins, Izushi, Davies, Shougui, 2008) is an overall benchmark of the knowledge capacity, capability and sustainability of each region, and the extent to which this knowledge is translated into economic value and transferred into the wealth of the citizens of each region. According authors regional competitiveness depends on an ability of each region to anticipate and successfully adapt to internal and external economic and social challenges, by providing new economic opportunities, including higher quality jobs. WKCI compares 145 regions across 19 knowledge economy benchmarks. The model consists of four key components: (1) Capital Inputs, (2) Knowledge Economy Production, (3) Regional Economy Outputs (including Knowledge Economy Outputs), and (4) the Sustainability Link. Each of these components, except for Knowledge Economy Production, has representative variables, while Knowledge Economy Production is regarded as a production function that transforms Capital Inputs into Regional Economy Outputs (Huggins, Izushi, Davies, Shougui, 2008).

2 Methods

The database, using to create an index, consists of a wide range of indicators assessing the competitiveness of V4 regions NUTS2. The choice of indicators is based on RCI sub-pilots, but their database is more extensive. Chosen indicators standing on the input side as drivers of competitiveness and on the output side as outcomes of competitiveness. The aim is to measure the competitiveness of the regions based on economic indicators and on social, demographic indicators, indicators of science and technology development and innovation. Selected 15 indicators, obtained from the Eurostat database, are chosen to evaluate the V4 countries` regional competitiveness at NUTS2 level. Namely Gross domestic product, Gross value added, R&D expenditure, R&D researchers, Human resources in science and technology, Employment rate, Unemployment rate, Employment in technology and knowledge-intensive sectors, Economic activity rate, Infant mortality rate, Persons aged 25-64 with tertiary education attainment, Medical doctors, Hospital beds, Number of establishment, Average number of usual weekly hours of work in main job. All data are in relative term in due to different size of chosen regions. Index is created for 35 regions of V4 countries and years 2006, 2009, 2012 and 2015. Firstly, the data are normalised by logarithm transformation. Second, modified to the same direction of development. The positive trend in the variables Unemployment rate, Infant mortality rate and Average number of usual weekly hours of work is a decrease. These variables are multiplied by -1 (EPI, 2012). Variables are in different units, so the variables standardization by min-max transformation is needed. The relationship for the calculation is:

$$U_{ij}^t = \frac{x_{ij}^t - \min_k (x_{ik}^t)}{\max_k (x_{ik}^t) - \min_k (x_{ik}^t)},$$

where:

U_{ij}^t — is a standardized indicator at time t,

x_{ij}^t — is the value of the j-th indicator of the i-th region at time t,

$\min_k (x_{ik}^t)$ — is the lowest value of the indicator within a specified time horizon,

$\max_k (x_{ik}^t)$ — is the highest value of the indicator within a specified time horizon.

As a result, there are indicators with the same scale. The regions with the best score compared to other regions reach values close to 1, while the worst-performing regions reach values close to 0 (OECD, 2008).

The fourth step is the indicators weight determination. Individual weights are assigned based on an analysis of the correlation matrix structure, which serves to assess the dependence of the variables. Weights obtained by this method depend on the intensity of the correlation and on the number of strongly correlated variables (Pacáková, 2003). Weights are calculated according to the relationship:

$$v_j = \frac{\left| \sum_{i=1}^{n} r_{ij} \right|}{\sum_{j=1}^{n} \left| \sum_{i=1}^{n} r_{ij} \right|},$$

where :

v_j — is the weight of the j-th indicator,

n — is the number of indicators from which the index is constructed,

r_{ij} — is Pearson's correlation coefficient.

The last step is the aggregation of indicators with an additive method according to the formula (Nardo, Saisana, Saltelli, Tarantola, 2005):

$$I_i^t = \sum_{j=1}^{k} v_j^t U_{ij}^t,$$

where:

I_i^t - is an indicator of the i-th region at time t,

v_j^t - is the weight of the j-th indicator at time t,

U_{ij}^t - is a standardized indicator of the i-th region of the j-th variable at time t.

The results are analysed using box plots, bar graphs and line graphs, using MS Excel and SAS.

3 Research results

The most competitive V4 countries` region in 2015 is Czech region: Praha, with the highest value of Regional competitiveness index 0,843. The Czech region: Praha is the seat of the Czech capital city. Other Czech regions achieve value of RCI between 0,639 (Czech region: Jihovýchod on the third position in RCI rankings) and 0,432 (Czech region: Severozápad). The value of RCI for the Czech region: Praha represents a maximum value for this country and an outlier (Figure 2: box plot for Czech Republic). This leads us to the conclusion that huge disparities within country are detected, but almost all Czech regions (the only exception is Czech region: Severozápad) are at the top of the RCI rankings. The second most competitive V4 countries` region in 2015 is capital city Slovak region: Bratislava with the RCI value 0,774 (maximum value for Slovak Republic). Huge disparities between capital region and others are detected in Slovak republic too. Other regions get significantly lower RCI values. Slovak region: Stredné Slovensko achieves RCI 0,463, Slovak region: Západné Slovensko achieves RCI 0,424 and Slovak region: Východné Slovensko achieves the minimum value of RCI for Slovak Republic 0,404. On the fourth position after Czech region: Jihovýchod is other region with capital city Hungarian region: Közép-Magyarország with RCI 0,624. Other Hungarian regions reach value of RCI between 0,521 (Hungarian region: Nyugat-Dunántúl) and 0,366 (Hungarian region: Észak-Alföld). The Hungarian region: Észak-Alföld with minimum value of RCI for the country, is the third least competitive region of the V4 countries. The most competitive Poland region is again the one with capital city Poland region: Mazowieckie with RCI 0,534. In the whole rankings, this most competitive Poland region is on the ninth position. Other Poland regions reach value of RCI from 0,502 (Poland region: Dolnoslaskie) to 0,325 (Poland region: Warminsko-Mazurskie). The least competitive Poland region is also the least competitive region in whole RCI rankings. The values of RCI, reached by Poland regions are in average the lowest, so we can consider the Poland as the least competitive country across V4 countries.

The average RCI value in all V4 countries is higher than median, which suggests that the average is overstated by the RCI value for regions with capital cities and other regions achieve substantially lower value of RCI than maximum (Figure 1). The biggest difference between maximum and minimum value of RCI within a country is in Czech Republic (0,410), the lowest in Poland (0,209).

**Figure 2** Box plots for V4 countries' RCI in year 2015
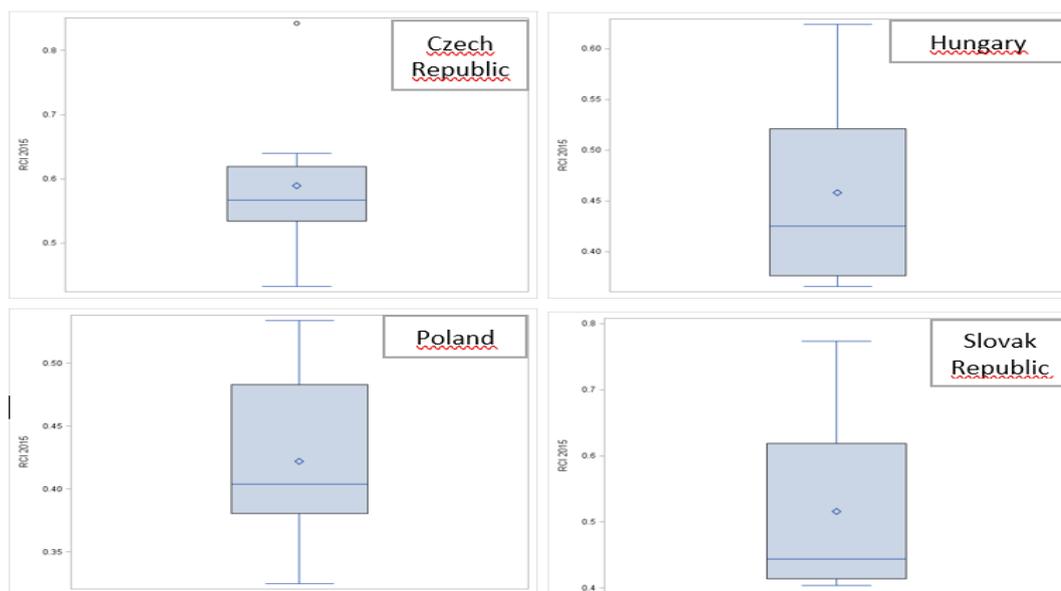
Source: Own calculations, using software SAS

There are no big changes in the position of V4 regions in RCI rankings during years 2006, 2009, 2012 and 2015 (Figure 3). On average, the Regional competitiveness index is increasing every year, but in some regions faster. In all analysed years, the most competitive region is Czech region: Praha, the second most competitive region is Slovak region:

Bratislava. In years 2006, 2009, 2012 on third position in RCI rankings is Hungarian region with capital city: Közép-Magyarország. The position of those three regions with capital city is not influenced by World economic crisis (their position is not changed in year 2009 compare to year 2006). But in year 2015 the competitiveness of capital Hungarian region grows slower than the competitiveness of Czech region: Jihovýchod and the Hungarian region falls to fourth place. The Czech region: Jihovýchod jumps from fifth position in year 2006 to the fourth position in years 2009, 2012 and to the third position in year 2015. The Czech region: Jihozápad is in the year 2006 on the fourth position, but the next analysed year falls on the fifth position and stays there also on the year 2012 and 2015. On the other hand, the least competitive V4 region is, except year 2009, Poland region: Warminsko-Mazurskie. By contrast, in 2009, the position of this Polish region is improving by four places. Also, another Poland region: Swietokrzyskie, which is in average one of the less competitive regions, improve its position after World economic crisis by three places. But in year 2015 this Poland region is again the second least competitive region in RCI rankings. So closely after World economic crisis, the competitiveness of more competitive regions decreases deeper than the competitiveness of less competitive regions. In common we can say, that one of the impacts of World economic crisis is disparity decrease between strong and weak competitive regions, except regions with capital cities. But few years after crisis the disparities between more competitive and less competitive regions are growing again, not only between countries but also within countries.

Figure 3 Development of RCI in V4 countries at regional level NUTS2 in years 2006, 2009, 2012 and 2015
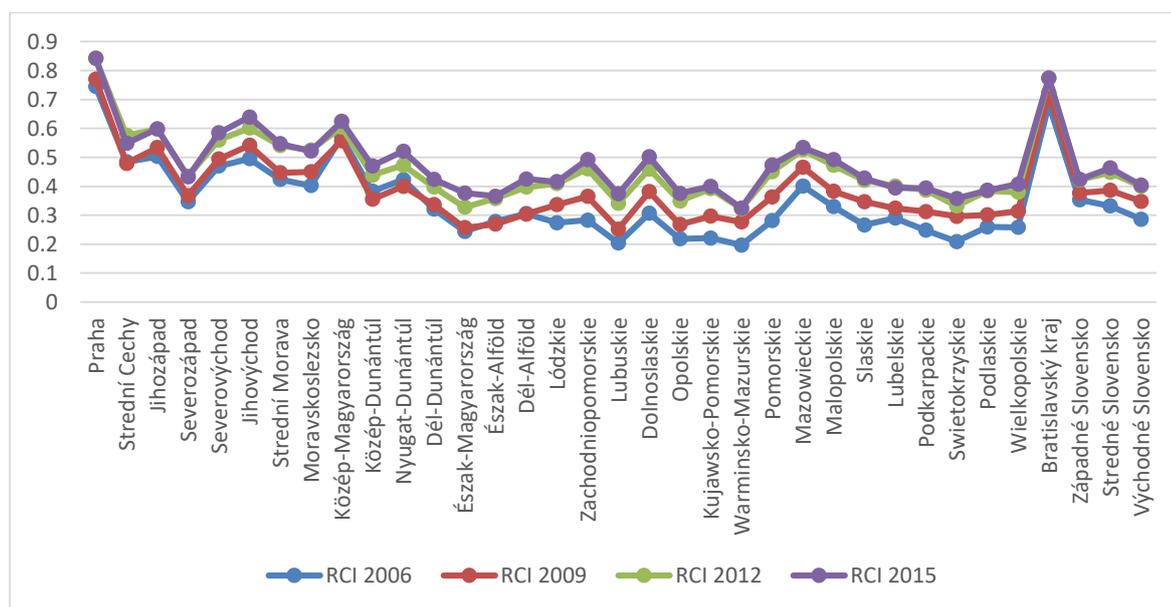
Source: Own calculations, using MS Excel

In the last part of article, competitiveness of V4 countries` regions are compared to the competitiveness of European Union in average (Figure 4, regions with capital city are highlighted in red, the RCI score for the average of EU is y = 0). Only two most competitive regions Czech region: Praha and Slovak region: Bratislava reach higher RCI score than average of Europe Union. All other V4 countries` regions achieve RCI score lower than the EU's average.

Figure 4 Comparison of V4 regional competitiveness with EU average in year 2015
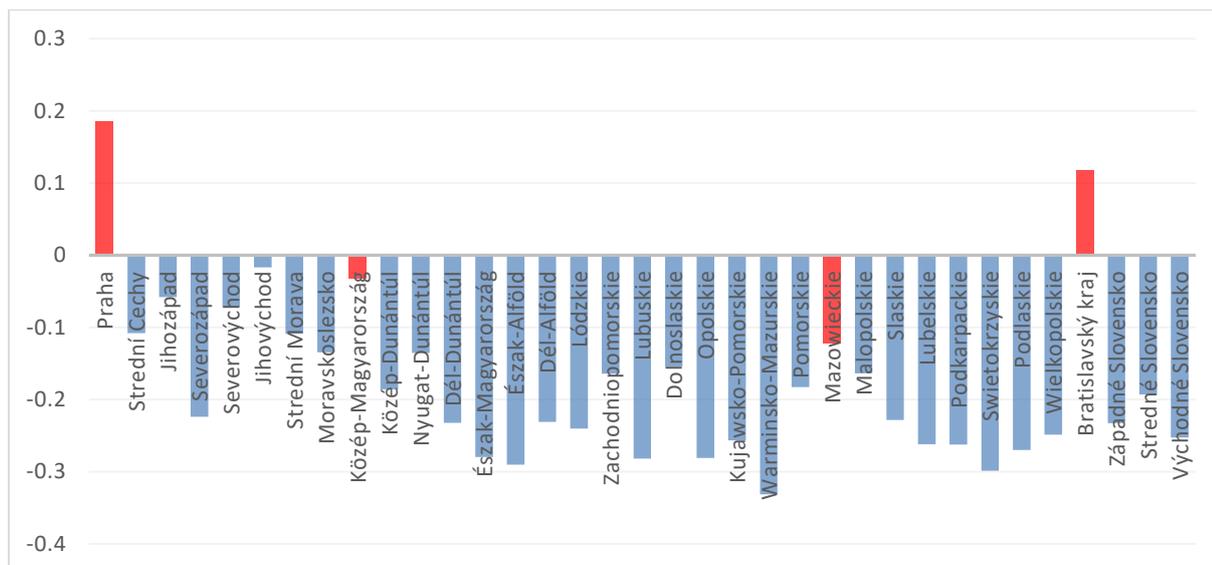
Source: Own calculations, using MS Excel

4 Conclusions

According to the created Regional competitiveness index in 2015 for V4 countries` regions, the most competitive region is Czech region: Praha on the first place, and Slovak region: Bratislava on the second place. Those two most competitiveness regions are on the top positions also in a Nevima and Melecky`s study (2011), named Regional competitiveness evaluation of Visegrad four countries through econometric panel data model. Similar findings is also in Lengyel`s study, named Competitiveness of Metropolitan Regions in Visegrad countries (2016). In this study Lengyel declares that the strong and rising Czech, Slovak and Hungarian regions can be found near the Austrian border in one block, while the polish regions are more dispersed in space in terms of competitiveness. The least competitive region is Poland region: Warminsko-Mazurskie followed by Poland region: Swietokrzyskie. Almost all Czech regions are at the top of the RCI rankings. At the bottom of RCI rankings are almost all Poland regions. In average the most competitive V4 country is Czech Republic, the least competitive V4 country is Poland. In all analysed country is the most competitive region the one, in which the capital city is situated. This finding is not confirmed by a Nevima and Melecky`s study, in which the most competitive Hungarian region is Nyugat – Dunántúl and the most competitive Poland region is Lubulske (both are not capital cities). The result`s differences can be caused by various calculation`s method and by different competitiveness indicators (Nevima and Melecky use only Gross domestic product, Gross fixed capital formation, Gross expenditure on research and development and Net disponible income of households). Huge disparities are identified inside of every V4 country between capital region and all other regions and between more competitive regions and less competitive regions.

In selected years 2006, 2009, 2012, 2015 there is not a big difference in RCI rankings. In every year the most competitive region inside each country is capital region. Thanks to the time horizon, we can analyse also impact of World economic crisis in year 2009. RCI rankings shows that World economic crisis leads to decreasing disparities between strong competitive regions and weak competitive regions inside of countries. But disparities are growing again in year 2012 and 2015.

In comparison with the RCI score for EU's average, only two most competitive regions Czech region: Praha and Slovak region: Bratislava reach higher RCI score than EU's average. All other regions have RCI score lower than EU's average.

Finally, we would like to emphasize that the goal of each country should not only be to increase the competitiveness of the country but also to strengthen the competitiveness of separate regions. Only reducing disparities between regions, balancing and increasing the competitiveness of each region can lead to a sustainable increase in the competitiveness of the whole country.

References

Annoni, P., Dijkstra, L., & Gargano, N. (2017). The EU Regional Competitiveness Index 2016. [online]. [cit.2018-10-12]. Available on: <http://ec.europa.eu/regional_policy/sources/docgener/work/201701_regional_competitiveness2016.pdf>.

Camagni, R. (2002). On the concept of territorial competitiveness: sound or misleading? [online]. [cit.2018-10-02]. Available on: <http://www.yorku.ca/ishd/LEDCD.SP/Links%20BQ/B5_Territorial%20competitiveness_camagni.pdf>.

Capello, R., & Nijkamp, P. (2009). *Handbook of Regional Growth and Development Theories*. Edward Elgar Publishing, UK, 2009, ISBN 978 1 84720 506 3

EUROPEAN COMMISSION. 1999. Sixth periodic report on the social and economic situation of regions in the EU. [online]. [cit.2018-10-15]. Available on: <http://ec.europa.eu/regional_policy/sources/docoffic/official/reports/toc_en.htm>.

EPI 2012. Environmental Performance Index and Pilot Trend Environmental Performance Index. [online]. [cit.2018-10-09 Available on: <http://epi.yale.edu/sites/default/ files/downloads/2012-epi-full-report.pdf>.

Huggins, R, & Thompson, P. (2016). UK Competitiveness Index 2016. [online]. [cit.2018-10-12]. Available on: <https://orca.cf.ac.uk/104593/1/R%20Huggins%202018%20UK%20Competitiveness%20Index%20report.pdf>.

Huggins, R., Izushi, H., Davies, W., & Shougui, L. (2008). World Knowledge Competitiveness Index 2008. [online]. [cit.2018-10-12]. Available on: <https://research.aston.ac.uk/portal/files/3601627/World_knowledge_competitiveness_index_2008.pdf>.

Lengyel, I. (2016). Competitiveness of Metropolitan Regions in Visegrad countries. In *Procedia, Social and Behavioral Sciences. 2016*. [online]. [cit.2018-10-03]. Available on: <https://ac.els-cdn.com/S1877042816303202/1-s2.0-S1877042816303202-main.pdf?_tid=0b3e1b48-8074-4b0a-a7eb-1099325100e2&ac-dnat=1547459685_aa658fc14e2b93223bf73600d51e1162>.

Nardo, M., Saisana, M., Saltelli, A., & Tarantola, S. (2005). Tools for Composite Indicators Building. [online]. [cit.2018-10-03]. Available on: <http://ice.ucdavis.edu/waf/www.compositeindicators.jrc.ec.europa.eu/Document/EUR%252 021682%2520EN_Tools_for_Composite_Indicator_Building.pdf>.

Nevima, J., & Melecký, L. (2011). Regional Competitiveness Evaluation of Visegrad Four Countries through Econometric Panel Data Model. In Liberec Economic Forum. 2011. [online]. [cit.2018-10-03]. Available on: <https://www.researchgate.net/profile/Piotr_Tworek/publication/268522171_Public_investments_as_a_way_of_stimulating_the_economic_development_in_Poland/links/546f7ce30cf24af340c08e6f/Public-investments-as-a-way-of-stimulating-the-economic-development-in-Poland.pdf#page=348>.

OECD. (2008). *Handbook on constructing composite indicators.* [online]. [cit.2018-10-12]. Available on: <http://www.oecd.org/std/leadingindicatorsandtendencysurveys/42495745.pdf>.

Pacáková, V. a kol. (2003). *Štatistika pre ekonómov*. IURA Edition, Bratislava, 2003, ISBN 80-89047-74-2

Porter, M., E. (2004). Building the microeconomic foundations of prosperity: findings from the Microeconomic competitiveness index. [online]. [cit.2018-10-06]. Available on: <http://www.isc.hbs.edu/pdf/GCR_0203_mci.pdf>.

Stroper, M. (1997). *The regional world: Territorial Development in a Global Economy.* Guilford Press, New York, 264 s., ISBN 1-57230-315-8.

Turok, I. (2004). Cities, regions and competitiveness. [online]. [cit.2018-10-06]. Available on: <http://led.co.za/sites/led.co.za/files/documents/181.pdf>

The Engel expenditure curve and consumer behaviour

Ivana Faltová Leitmanová, Filip Petrách, Václav Beran

Abstract: *Consumer behaviour is analysed in context of expenditures, that consumer (household) spends for buying of goods and services in most easiest and theoretical most often mentioned point of view. One of the instruments, which is suitable for using in this context, it is Engel´s expenditure curve. Although Engel´s curve has many constraints, it can be used as a partial indicator of well-being. The analysis of the relationship between expenditure and consumer incomes between years 1993 and 2017 is focused on the application part of the contribution. In the case of the transition of the economy from the current phase of the business cycle to the next one, it is also possible to expect an able change in household expenditures and consumer habits, where recession usually leads to a reduction in incomes and to a restructuring of household consumption expenditure.*

Key words: Consumption · Income · Expenditures · Engel´s curve

JEL Classification: D11 · D12 · I32

1 Introduction

Engel in his thesis about household welfare monitoring in 1857, focused on analyzing household consumption patterns that were used on the basis of real data to test the formulated hypothesis. In the first step, household expenditure categories were classified and subsequently these categories of expenditure were analyzed. It was primarily about identifying which types of household spending could best be used to estimate the welfare of households (Chai and Moneta, 2017).

Houthakker (1957) made a comparison of elasticity for food, clothing, housing and other expenditure items in relation to total household expenditure and household size on data from 30 countries. And he found that although these elasticities are very similar, they are not the same, and Engel's conclusions can be confirmed.

Kiedaisch et al. (2018) note, that while the aggregate level of household expenditure, is spread across the categories and individual spending categories are rising with household income growth, the different types of households mentioned above are no longer valid. Household expenditure patterns at disaggregated levels show that rich households concentrate their spending on certain spending categories. And since each household is focused on a certain expenditure category, the difference in spending can´t lead to an increase at aggregate level when there is a decline in individual spending. This creates space for research in so-called average behaviour in the area of consumption patterns.

The originally created curve for individual consumers can be modified for groups of consumers as summaries of individual curves provided that there is no external influence on consumption. It is possible to obtain a "group" English curve, which shows the expenditure on household goods of the given income group and allows to track the change in goods and services expenditures following the change, growth of household incomes.

Chai and Moneta (2013) see considerable potential in the use of Engel's approach to exploring changes in consumption following an understanding of the essence of consumer needs, that is changing in the context of changes in household income. This, along with economic growth, represent significant endogenous factors, that affect demand. However, this does not mean that there are no open questions about the importance of changing consumer needs over time, as well as the impact of past experiences on changing needs and their satisfaction. He states that goods that serve a limited number of needs tend to show the Engel curve in a similar shape compared to the shape of Engel's curve for goods that meet a wider range of needs.

doc. Ing. **Ivana Faltová Leitmanová, CSc.,** Jihočeská univerzita v Českých Budějovicích, Ekonomická fakulta, Katedra ekonomiky, Studentská 13, 370 05 České Budějovice, e-mail: leitman@ef.jcu.cz

Ing. **Filip Petrách, Ph.D.,** Vysoká škola technická a ekonomická v Českých Budějovicích, Ústav podnikové strategie, Katedra ekonomiky, Okružní 517/10, 370 01 České Budějovice, e-mail: petrach@vstecb.cz

doc. Ing. **Václav Beran, DrSc.,** Jihočeská univerzita v Českých Budějovicích, Ekonomická fakulta, Katedra ekonomiky, Studentská 13, 370 05 České Budějovice, e-mail: beran@ef.jcu.cz

The level of saturation of needs in relation to spending on individual commodities, according to Aitchison and Brown (1954), leads to the conclusion that the shape of the curve for typical goods behaves as luxury goods at low incomes and as necessary for high incomes.

Engel's law would also be tested in the Czech Republic on the basis of the years 2010-2013 when analysing changes in the living standard of its inhabitants (Hovorková, 2015). Similarly, in Romania, where Neagu and Teodor (2017) tested it for the period 1997-2016, the perception of a close correlation between income levels and consumption expenditure was confirmed.

However, testing of the Engel curve takes place not only at the level of individual countries or at the level of individual groups of households but also, for example, in relation to age groups. Specifically, Gorry and Scrimgeour (2018) found that since the late 1990s households of seniors reported a decline in spending shares for food. At the same time, this decline is greater than expected as a result of moving to the English curve and is greater than the unexplained drop in food expenditure for non-seniors households. The explanation is partly related to the development of living costs for individual categories of households, respectively. of the age groups and, therefore, partly with the consideration of the correctness of indexation in the area of social security, which would compensate older people for faster inflation.

Effort to solve the problem of the original "united" consumer price index, with the difference in consumer baskets not only in relation to income distribution, were developed by Beatty and Crossley (2018).

2 Methods

This paper analyses the issue of consumer behaviour in relationship to the income of households and expenditure on goods and services generally and especially on food and beverages and on housing as a key groups of this expenditures. Data was obtained from Eurostat and OECD statistics.

In first step was investigated the development of household expenditures by particular groups in EU countries in period 1996 – 2012.

In next step was analysed relationship between consumption and income in 30 OECD countries and there was found dependency between these two variables – Household housing consumption, percentage of households' net adjusted disposable income (EH) and Gross household adjusted disposable income per capita (IN). Trends between these two variables were focused in terms 1999 and 2015. According to Mark (2007) in the case, that the random quantities with the common two-dimensional normal distribution, the choice correlation coefficient for the concrete values (x_1,y_1), (x_2,y_2), ... (x_n,y_n). Selective correlation coefficient is given by this formula:

$$r = \frac{\sum_{i=1}^{n}(x_i-\overline{x})(y_i-\overline{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\overline{x})^2 \sum_{i=1}^{n}(y_i-\overline{y})^2}} \tag{1}$$

Selected relationships were tested with Spearmen´s correlation coefficient on the level of significance $\alpha = 0.05$.

3 Results

Between 1996 and 2012 in EU countries, household spending trends were differentiated for each spending group. Nevertheless, a lower environmental burden could be observed in connection with the lower growth rate of those expenditure items, where the environmental burden is most significant. The figure 1 shows groups of expenditure trends, that eliminate the effects of price inflation, although the development of these expenditures can be also caused by accession of new member countries, primarily in 2004 and 2007, the same as by increase of using ICT in smart households in this period.

Figure 1 Trends in absolute expenditure in household consumption categories per capita
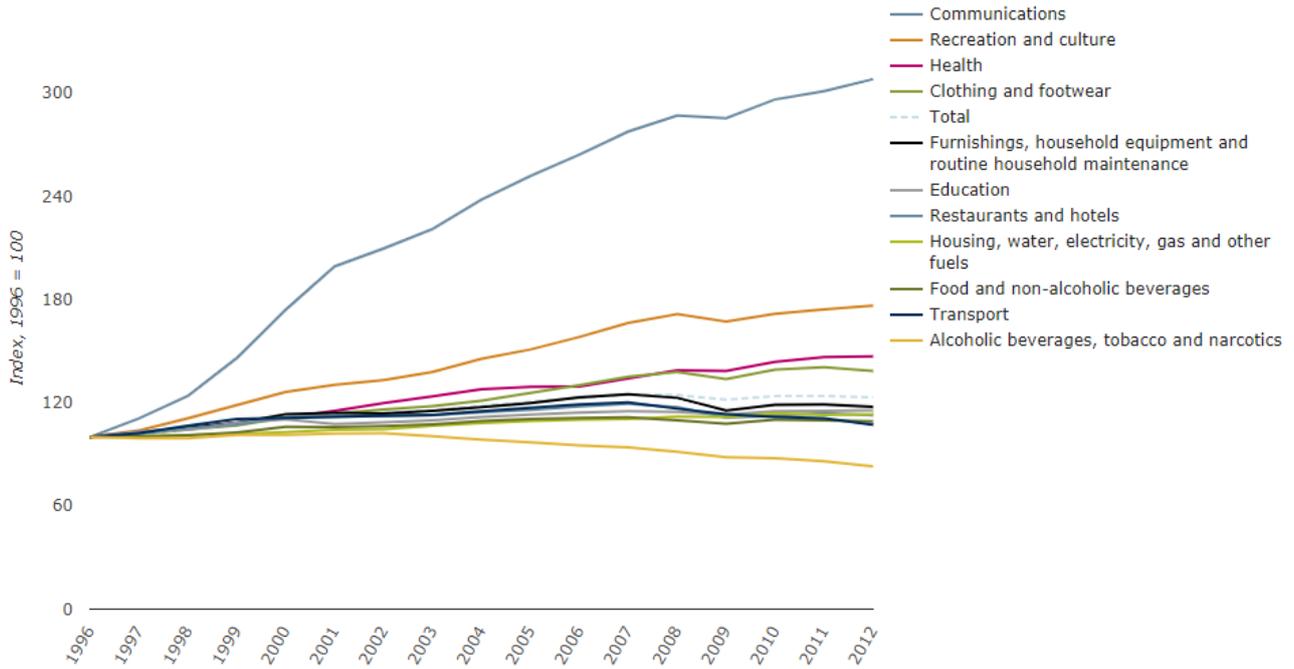
Source: www.eea.europa.eu

Following analyses of causality between Household housing consumption, percentage of households net adjusted disposable income and Gross household adjusted disposable income per capita in 1999 and 2015 in selected OECD countries was founded below listed trends.
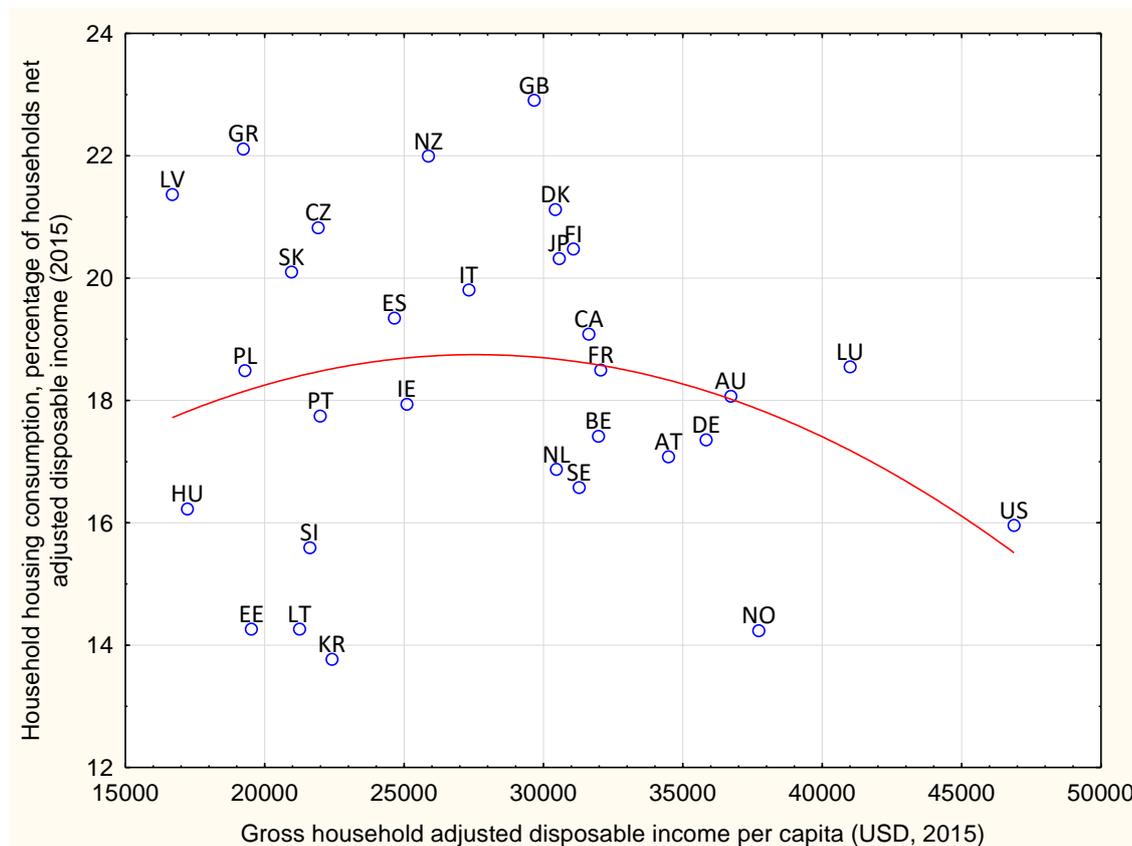
Figure 2 Household housing consumption, percentage of households net adjusted disposable income (1999) vs Gross household adjusted disposable income per capita (USD, 1999)
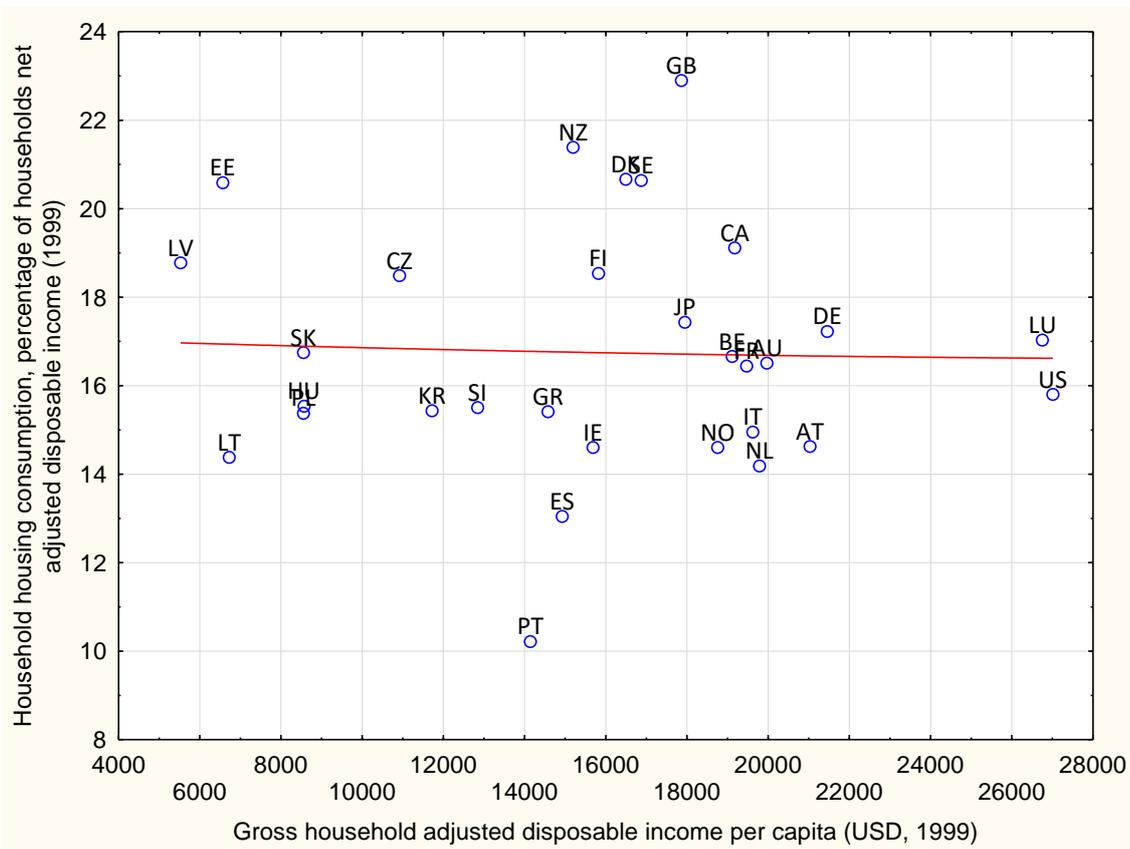
Source: data.oecd.org, own processing

Although for most of the countries surveyed, the proportion of housing expenditures stayed proportionally preserved in relation to income, there exceptions exist. In 1999, there was a smaller variation in the proportion of housing expenditures relative to income, there was different relationship in case of Portugal (the proportion of expenditures to average disposable income). On the other hand, in Great Britain was relationship between housing expenditures and average disposable income over-proportional in a given year.

Figure 3 Household housing consumption, percentage of households net adjusted disposable income (2015) vs Gross household adjusted disposable income per capita (USD, 2015)

Source: data.oecd.org, own processing

In 2015, dispersion in housing expenditure relative to income increased on the one hand (e.g. Spain, Lithuania, Korea, Norway where the expenditure was under-proportional or below the median). On the other hand, in the period under review, the Great Britain showed an over-proportional level of this expenditure compared to median. In addition, in 2015 Denmark, New Zealand, Czech Republic, Slovakia, Latvia, deviated in given trend.

The relationship between Household housing consumption, percentage of households net adjusted disposable income (y) and Gross household adjusted disposable income per capita (x) in 1999 reflects this formula $y = 17,1281-3,1688E-5x+4,7624E-10x^2$ and in 2015 this formula $y = 12,1447+0,0005x-8,6876E-9x^2$. It is evident, that there was a bigger autocorrelation and dependency of these two variables in 1999 beside the year 2015.

Table 1 Correlation Matrix

Variable	Correlation matrix, p < ,05000 N=30						
	Average	Standard deviation	EH (USD, 2015)	IN (USD, 2015)	EH (USD, 2006)	IN (USD, 2006)	EH (USD, 1999)	IN (USD, 1999)
EH (USD, 2015)	5079,15	1394,295	1,000000	0,880912	0,959153	0,861695	0,935461	0,877771
IN (USD, 2015)	27895,33	7473,687	0,880912	1,000000	0,882113	0,917603	0,871307	0,917438
EH (USD, 2006)	3840,03	1234,955	0,959153	0,882113	1,000000	0,912475	0,973383	0,917292
IN (USD, 2006)	22091,88	6707,058	0,861695	0,917603	0,912475	1,000000	0,884339	0,983971
EH (USD, 1999)	2630,13	1009,941	0,935461	0,871307	0,973383	0,884339	1,000000	0,907910
IN (USD, 1999)	15721,23	5548,934	0,877771	0,917438	0,917292	0,983971	0,907910	1,000000

Source: data.oecd.org, own proccesing

Researched variables (Housing expenditures of household, disposable income adjusted) was analysed in three terms, also years 1999, 2006 and 2015 show important causality in their relationship. The most significant causality was founded in 2006 and it was quite similar with the year 1999. The smallest causality was founded in 2015, which illustrated bigger dispersion in comparison among countries, how shows Figure 3.

4 Conclusion

In the context of available literary sources, statistical surveys and the results of empirical research, consumer spending on households is a broadly complex issue. With changing consumer behaviour factors, including the macroeconomic environment and its stability, the level of household incomes, consumer habits and demands in the context of a constantly evolving and changing legislative framework (tax burden, transfers, increasing recycling requirements, etc.) there are changes in the consumption structure. This changes the consumer basket, just as the prices of individual items change in the consumer basket. Here, for example, a significant increase in communication-related expenditure can be mentioned.

Although between 1999 and 2015 the proportion of housing expenditures stayed proportionally preserved in relation to income of surveyed countries, there exceptions exist. In 2015 was bigger variation in the proportion of housing expenditures relative to income, than in 1999 (in Great Britain, in one way, and e.g. Denmark, New Zealand, Czech Republic, Slovakia, Latvia in opposite way). The most significant causality between housing expenditures of household and disposable adjusted income was founded in 2006 and it was quite similar with the year 1999. The smallest causality was founded in 2015, which illustrated bigger dispersion in comparison among countries.

In the case of the transition of the economy from the current phase of the business cycle to the next one, it is also possible to expect an able change in household expenditures and consumer habits, where recession usually leads to a reduction in incomes and to a restructuring of household consumption expenditure. The economic policy makers should therefore take account of these facts in the creation and designing of economic policy instruments in connection with the wider social economic objectives.

References

Aitchison, J., & Brown, J. (1954). A Synthesis of Engel Curve Theory. *The Review of Economic Studies, 22*(1), 35-46. Retrieved from http://www.jstor.org/stable/2296222.

Beatty, T. K., & Crossley, T. F. (2018). *Lost in translation: What do Engel Curves tell us about the cost of living?* (No. 6886). CESifo Group Munich.

Chai, A., & Moneta, A. (2010). Retrospectives: Engel curves. Journal of Economic Perspectives, 24(1), 225-40.

Chai, A., & Moneta, A. (2013). Back to Engel? Some evidence for the hierarchy of needs. In *Long Term Economic Development* (pp. 33-59). Springer, Berlin, Heidelberg.

Gorry, J., & Scrimgeour, D. (2018). Using Engel curves to estimate consumer price index bias for the elderly. *Contemporary Economic Policy*.

Household expenditure on consumption categories with differing environmental pressure intensities. Retrieved from http://www.eea.europa.eu/.

Houthakker, H. S. (1957). An International Comparison of Household Expenditure Patterns, Commemorating the Centenary of Engel's Law. Econometrica, (25)4, 532-551.

Hovorková, J. (2015). Evaluation of Consumer Standard of Living in the Czech Republic in the Period 2010-2013: Application of Revealed Preference Theory in Discussion with Engel's Law. *Acta Oeconomica Pragensia*, University of Economics, Prague, 2015(6), 21-46.

Kiedaisch, C., Chai, A., & Rohde, N. (2018). *The saturation of spending diversity and the truth about Mr Brown and Mrs Jones.*

Marek, L. at al. (2007). *Statistika pro ekonomy – aplikace.* Praha: Kamil Mařík – Professional Publishing.

Neagu, M. I., & Teodoru, M. C. (2017). Testing the Engel's law in the consumption pattern of Romanian population. *Studia Universitatis „Vasile Goldis" Arad–Economics Series*, 27(3), 33-53.

Impact of the CAP subsidies on the family farm economy: Case study of the selected countries' data

Neringa Stonciuviene, Ilona Kiausiene

Abstract: *European Union Common Agricultural Policy (CAP) has evolved considerably to help farmers face some challenges. This paper investigates the impact of subsidies from the CAP on the family farm economy in the selected countries: Lithuania, Hungary, Slovakia and Czech Republic. Different targets of the farm subsidising determined the choice of countries. In Lithuania, the key priorities consisted of ensuring a certain level of farmers' income, maintaining the current production level, revitalising the livestock sector, and uncovering new markets for domestic products. The most important priority in Hungary, as well, as in Czech Republic, was subsidising of 'viable food production'. Slovakia's main priorities include enhancing productivity and reducing unemployment in rural areas.*

The study used the Farm Accountancy Data Network (FADN) database information about the farms received subsidies, broken down into six economic size classes. The paper investigates the links between subsidies and output, between subsidies and net income, between subsidies and average farm capital.

Key words: Common Agricultural Policy · Subsidies · Farm Size · Productivity.

JEL Classification: H25 · Q18

1 Introduction

The financing of agricultural policy of the EU is one of the key issues that is related to the functioning and reforms of this CAP (Marković *et al.,* 2012). Its main purpose is to guarantee the minimum levels of production, ensure fair living standards for the European farmers (Walls *et al.,* 2016). The research conducted by M. Rizov *et al.* (2013) reveals that up to 2005 when subsidisation was closely related to the production, these payments had a negative effect on the farm productivity. In some countries, as it was stated by the scientists, there has been determined a decrease of the overall agricultural productivity by 4%. After the decoupling of subsidies from the production, the results differ: the research conducted by the scientists in EU-15 countries reveals a positive link between subsidies and productivity and its increase. Kazukauskas *et al.* (2010) provide analogous information after conducting a study on Denmark, Holland and Ireland farms, where the effect of subsidies on productivity was analysed. The authors state that the decoupling of subsidies from the production had a positive and significant effect on the productivity. In line with the goals of the development strategy of the EU by 2020, the CAP during the subject period should provide a sustainable economic development of agriculture and balanced rural development in all the regions of the Union (Marković *et al.,* 2012).

The farm subsidies are an important source of income for farmers (Lososová *et al.,* 2017). In return, farmers are obliged to carry out agricultural activity and respect a number of standards regarding food safety, environmental protection, animal welfare and the maintenance of land in good environmental and agricultural conditions. Under certain conditions, the Member States may decide to reduce the amount of the decoupled direct payment and base the amount on the quantity of output or the number of animals that a farmer has. The EU average share of direct payments in agricultural factor income in 2011–2015 stood at 28% (European Commission, 2013). The CAP 2014–2020 accounts for 38% of the EU budget. Under the 2014–2020 Multiannual Financial Framework, in total €408.31 billion is earmarked for the CAP, of which the largest part (€308.72 billion) is allocated to the first pillar; whereas, the remaining €99.6 billion is allocated to the second pillar (Sgueo *et al.*).

The Member States have the flexibility to transfer 15% of their direct payment envelope from Pillar 1 to Pillar 2 as well as in the opposite direction from Pillar 2 to Pillar 1. In the case of the transfer from Pillar 2 to Pillar 1, 12 Member States are permitted to transfer additional 10%, bringing the maximum transfer permitted up to 25% (Art. 14 of Reg.

Prof. Dr. Neringa Stonciuviene, Agriculture Academy of Vytautas Magnus University, Bioeconomy Development Faculty, Research Institute for Bioeconomy, Universiteto 10, Akademija, Kauno r., Lithuania, e-mail: neringa.stonciuviene@vdu.lt

Assoc. prof. Dr. Ilona Kiausiene, Agriculture Academy of Vytautas Magnus University, Bioeconomy Development Faculty, Research Institute for Business and Rural Development, Universiteto 10, Akademija, Kauno r., Lithuania, e-mail: ilona.kiausiene@vdu.lt

(EU). In the scientific literature, the influence of CAP subsidies on agricultural business is researched. L. Latruffe *et al.* (2016) analysed the association between agricultural subsidies and dairy farm technical efficiency in the European Union. This research shows that the effect of subsidies on technical efficiency may be positive, null or negative, depending on the country. As it is claimed by these authors, it is largely recognized that, conceptually, subsidies can influence the decision making of the agricultural producers in terms of input use, labour allocation, production choices and/or investment.

The CAP aims at improving the productivity of the farming sector and the standard of living for farmers in the EU (Massot, 2016). M. Rizov *et al.* (2013) investigate the impact of subsidies on the total factor productivity of farms in the EU. The authors employ a structural, semi-parametric estimation algorithm, directly incorporating the effect of subsidies into a model of unobserved productivity by using samples from the FADN for EU-15 countries. According to this research, subsidies had a negative impact on the farm productivity in the period before the decoupling reform was implemented; after the decoupling, the effect of subsidies on productivity was more nuanced, as in several countries, it turned positive.

When analysing subsidisation, it should be reviewed how the amount of subsidies differ in different size farms. As it was stated by L. Latruffe *et al.* (2016), the research on the links between subsidies and farm size can be interpreted as a measure of subsidy intensity. The main aim of this research is to discover and measure the links between subsidies and output, between subsidies and net income, between subsidies and average farm capital. The countries that have been selected for the research are Lithuania, Hungary, Slovakia and the Czech Republic that are characterised by agricultural priorities, for example, preserving historically formed farming practices, improving agricultural structure in order to strengthen the position of smaller operators.

2 Methods

As the strategic considerations with regard to integrating CAP into the set of Europe 2020 objectives has been strengthened for the programmes 2014–2020, the perspectives for the future amendments should seek enhanced effectiveness and balanced development across the European rural regions (Matthews, 2016). This paper investigates the impact of subsidies from the CAP on the family farm economy in the selected countries: Lithuania, Hungary, Slovakia and the Czech Republic. FADN data have been used for the research. The research was conducted during 2004–2016.

In the first stage of the research, there has been analysed how much subsidies farmers get for their farms, according to the six economic size classes, in the selected countries, and certain tendencies have been determined. The research analyses subsidies (excluding investments), e.g., subsidies for the current operations linked to production, not investments (http://ec.europa.eu/agriculture/rica/infometa_en.cfm?METAVAR=SE605).

The calculations have been made by using the following formula (Bartosevičienė, 2011):

$$T_d = \frac{y_i}{y_{i-1}} \times 100 \qquad (1)$$

where:

T_d tempo (range) of increase/decrease

y_i data of the current period

y_{i-1} data of the previous period

The correlation–regression analysis has been conducted in the second stage of the research. This method is applied in order to evaluate how the subsidies are related to output, net income and average farm capital. The factors that have been selected for the research are treated as they were discussed in the FADN database. Output is the total of crops and crop products, livestock and livestock products and other output (http://ec.europa.eu/agriculture/rica/infometa_en.cfm?METAVAR=SE131). Farm net income is the heading number in farm return, e.g., remuneration to fixed factors of production of the farm (work, land and capital) and remuneration to the entrepreneur risks (loss/profit) in the accounting year (http://ec.europa.eu/agriculture/rica/infometa_en.cfm?METAVAR=SE420). The average farm capital is the average value of the working capital: livestock, permanent crops, land improvements, buildings, machinery and equipment, circulating capital (http://ec.europa.eu/agriculture/rica/infometa_en.cfm?METAVAR=SE510). Correlation answers the question whether there is a link between features, what is its direction and strength, and regression is a concretised form of a link (Martišius, 2014). The correlation coefficient is calculated according to the formula (Valkauskas, 2013):

$$r = \frac{\sum(x-\bar{x})*(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 * \sum(y-\bar{y})^2}} \qquad (2)$$

The correlation coefficient changes from -1 to 1. A strong correlation link is such, which correlation coefficient is <-0.7 and >0.7. The link is perceived as statistically important if p<0.05. In order to evaluate the links of interval variables, the Pearson coefficient is calculated.

Regression is applied to determine interrelation. Regression is the average value range of the functional consequence feature when the argument, cause feature, is changing (Martišius, 2014). When conducting the research, the regression equations are created. The regression line equation is represented by the following formula (Martišius, 2014):

$$y = a + b*x \tag{3}$$

where y – average value of consequence feature, x – cause feature value, a and b – coefficients of regression equation. Coefficient b reveals how the average value of consequence feature changes when the cause feature value changes by one unit (Martišius, 2014). In order to determine the link strength of the regression equation variables, the following link closeness indicators are calculated: 1) correlation coefficient r; 2) determination coefficient R^2. If R^2 (R Square) >= 0.89, the model describes the data well; if $R^2 < 0.20$, the model is not suitable to describe the data.

3 Research results

The previously mentioned four countries that have been selected for the research, i.e., Lithuania, Hungary, Slovakia and the Czech Republic, have similarities and differences in the area of farm subsidies. As it has been noted by the European Commission, the general objective of 'viable food production' (European Commission, 2016) was the most important one in Hungary and very important in Lithuania. Hungary, out of all the counties that have been selected for the research, differs from others by the fact that it is closely linked to supporting young farmers; moreover, the attention was given to the simplification of the support system for small farmers. In Lithuania, the key priorities consisted of ensuring a certain level of farmers' income, maintaining the current production level, revitalising the livestock sector and uncovering new markets for domestic products. The objective of 'viable food production' is thereby considered the most important for Slovakia at the same time aiming to decrease unemployment. Slovakia's main priorities include enhancing productivity and reducing unemployment in the rural areas. The Czech Republic has attached the importance to 'viable food production' as well, providing support for income through the increase of productivity.

The objective of 'balanced territorial development' (European Commission, 2016) was considered as quite important in Lithuania and Slovakia as well. In Lithuania, direct payments were implemented in order to help the rural population and involve more young people in agriculture, village renewal and providing main services. The eastern part of Slovakia suffers from unemployment; therefore, the government's choices are directed towards addressing these issues. While in the Czech Republic and Hungary, the 'balanced territorial development' was not a priority and received little attention. However, in Hungary, there exist the intention of supporting the creation of jobs and village renewal.

The objective of 'sustainable management of natural resources' (European Commission, 2016) was understood as less of a pressing issue in Lithuania and received limited attention in Hungary and Slovakia. However, in Lithuania, certain specific environmental issues were addressed in details in the RDP, such as afforestation, biodiversity, water management and preserving forest systems. In Hungary, the greening was implemented with high flexibility, as, for example, the chemical weed control is allowed on fallow land. In the Czech Republic, 'sustainable management of natural resources and climate action' is focused on a harmonised approach for increased productivity while increasing the environmental protection and quality as well.

The summary of choices of the selected countries in the implementation of CAP is presented in the Table 1.

Table 1 Summary of CAP implementation choices

Indicators		Lithuania	Hungary	Slovakia	Czech Republic
Budgets 2014 - 2020 bill. EURr	Pillar 1	2.73	7.62	2.62	5.24
	Pillar 2	1.61	3.45	1.56	2.17
Transfer from Pillar 2 to pillar 1 %		no flexibility between the two Pillars	15	21.3	3.4-1.3
Small Farmers Scheme		No small farmers scheme	Implemented	No small farmers scheme	Not implemented
Voluntary Coupled Support %		up to 15	15	13	15

Source: produced by European Commission, 2016

In countries that have been selected for the research, the family farms fairly differ in their economic size. The economic size of a holding is determined on the basis of the total standard output of the holding expressed in Euro (Commission Regulation, 2008). The statistical data (Eurostat Statistics Explained, 2016) reveal that very small and small farms prevail in Lithuania and Hungary. In these countries, they make 80–88% of all farms. In Slovakia, very small and small farms compose 70%, whereas in the Czech Republic, such farms make a bit more than 30% of all farms. Most of the big economic size farms among the selected countries are in the Czech Republic (almost 40%). FADN database provides information about farmers' received subsidies for their farms by distributing them according to the six economic size classes. In Figure 1, there can be seen how much subsidies were given to the selected countries during 2004–2016.

Figure 1 Average total subsidies (excluding on investments) to the farms of the selected countries by the economic size classes in EUR
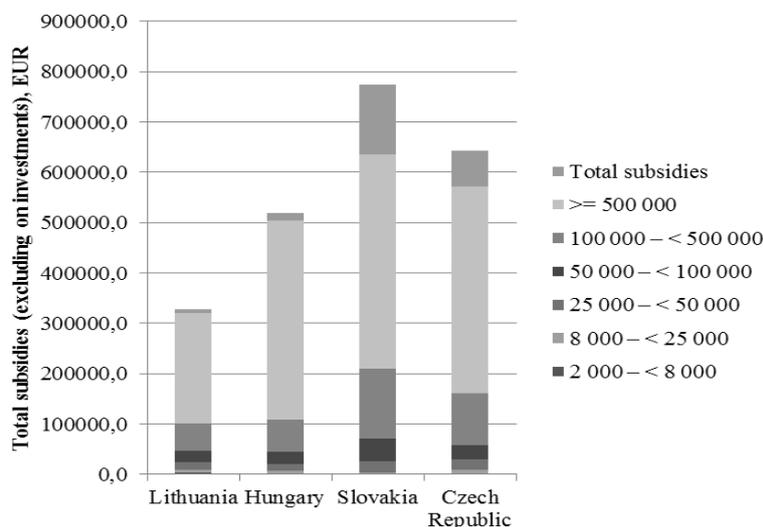
Source: Own processing on the data of EUFADN Database

In the countries that were selected for the research, all the farms of different economic size classes got subsidies for production during the surveyed period. The biggest sums of subsidies for farms each year were received by Slovakian farmers and the smallest by Lithuanian (even 15−17 times smaller than Slovakian farmers). The data that is provided in Figure 1 reveal that there has been observed a tendency in all the surveyed countries: the higher is the farm's economic class, the bigger subsidies are received. During 2011−2016, the sums of subsidies received by the Lithuanian highest economic class farms ($>= 500\,000$ EUR) were 49−72, and in Hungary, they were 176−253 times bigger than the subsidies received by the lowest economic class farms ($2\,000 – < 8\,000$ EUR). The analysis of FADN database revealed that the biggest increase of the subsidisation during the surveyed period was in Lithuania and the biggest decrease for the Hungarian farms. When analysing the range of subsidisation of various economic size classes, there is no apparent increase or decrease tendency: in various countries, the subsidies increased as well as decreased for different economic size farms.

Further on, there have been analysed the links between subsidies and output, between subsidies and net income, between subsidies and average farm capital. The data of research are presented in Table 2.

Table 2 The links between subsidies and output, between subsidies and net income, between subsidies and average farm capital in the farms of the selected countries.

Country	Regression equation	Determination coefficient (r^2)	Correlation coefficient (r)	p-value
Total subsidies vs Total output				
Lithuania	y = 3.5319 x + 2678.9	0.7279	0.8532	0.0002
Hungary	y = 3.2922 x + 17146.1	0.7299	0.8544	0.0002
Slovakia	y = 1.3826 x + 315066	0.1861	0.4313	0.1411
Czech Republic	y = 1.3973 x + 179123	0.5397	0.7347	0.0042
Total subsidies vs Net income				
Lithuania	y = 0.7596 x + 6377.4	0.2603	0.5102	0.0748
Hungary	y = 1.8392 x – 11633.4	0.8865	0.9415	0.0000
Slovakia	y = 0.292 x – 48830	0.0308	0.1755	0.5663
Czech Republic	y = 0.4389 x + 2763.9	0.2745	0.5240	0.0661
Total subsidies vs Average farm capital				
Lithuania	y = 9.386 x – 1176.4	0.8883	0.9425	0.0000
Hungary	y = 5.6116 x + 39175.2	0.8665	0.9308	0.0000

| Slovakia | y = -7.0274 x + 2,0797 | 0.5605 | -0.7486 | 0.0032 |
| Czech Republic | y = 1.2041 x + 555833 | 0.0593 | 0.2434 | 0.4229 |

The calculated determination coefficient reveals that in Lithuania, the received subsidies' average farm capital determined 88.8%, in Hungary 86.6% and in Slovakia, a bit less, i.e., 56.1%. (Table 3). In Lithuania and Hungary, there has been estimated a strong positive link (correlation coefficients are 0.9425 and 0.9308, respectively). In Slovakia, there has been established a reverse link between the mentioned indicators (r = -0.7486): this indicates that when subsidies increase, the average farm capital decreases.

The received subsidies had a significant influence on the overall output as well (Table 3). When analysing the interrelations between the received subsidies and the overall output in the three of the surveyed countries, i.e., Lithuania, Hungary and the Czech Republic, it has been determined that the dependence between variables is direct; the calculated regression equations reveal that when subsidies increase by 1 EUR, the overall output increase from 1.3973 EUR in the Czech Republic to 3.5319 EUR in Lithuania. The determination coefficients (r^2) show that the range of the overall output of the received subsidies in the mentioned countries is determined by 66.6% on average.

The performed calculations show that in the three analysed countries, the received subsidies had the smallest influence on the net income. Only in Hungary, there has been determined a very strong (r = 0.9415) and significant (p = 0.0000) interrelation. The regression equation (Table 3) allows to state that when subsidies increase by 1 EUR, the net income increase by 1.8392 EUR in Hungary. The perceived determination coefficient allows making a conclusion that the received subsidies explain 88.6% of the net income range.

As it has already been mentioned there is a very different number of farms, according to the different economic size classes, in different countries; therefore, there have been analysed the links between subsidies and output, between subsidies and net income, between subsidies and average farm capital in the farms of the selected countries by different economic size classes (Table 3).

Table 3 The links between subsidies and output, between subsidies and net income, between subsidies and average farm capital in the farms of the selected countries by different economic size classes

Economic size class	Czech Republic	Lithuania	Hungary	Slovakia
Total subsidies vs Total output				
Economic size class 2 000 - < 8 000 EUR	-	0.249748	0.617843	-
Economic size class 8 000 - < 25 000 EUR	0.385128	0.149726	0.571624	0.948250
Economic size class 25 000 - < 50 000 EUR	0.129218	0.117984	0.318079	0.786638
Economic size class 50 000 - < 100 000 EUR	0.568484	0.304940	0.738234	0.248995
Economic size class 100 000 - < 500 000 EUR	0.398355	0.455445	0.801995	0.342152
Economic size class >= 500 000 EUR	0.731888	0.926621	0.637404	0.234275
Total subsidies vs Net income				
Economic size class 2 000 - < 8 000 EUR	-	0.186978	0.617286	-
Economic size class 8 000 - < 25 000 EUR	0.571985	-0.059556	0.839583	0.739234
Economic size class 25 000 - < 50 000 EUR	0.621656	0.096456	0.824134	0.578509
Economic size class 50 000 - < 100 000 EUR	0.561991	0.271607	0.880324	-0.252079
Economic size class 100 000 - < 500 000 EUR	0.380047	0.499772	0.886158	-0.158256
Economic size class >= 500 000 EUR	0.578537	0.692483	0.759621	-0.027721
Total subsidies vs Average farm capital				
Economic size class 2 000 - < 8 000 EUR	-	0.391323	0.341518	-
Economic size class 8 000 - < 25 000 EUR	0.436173	0.811985	0.615511	0.977950
Economic size class 25 000 - < 50 000 EUR	0.373066	0.675501	0.690828	0.657382
Economic size class 50 000 - < 100 000 EUR	0.496854	0.677608	0.673798	0.068388
Economic size class 100 000 - < 500 000 EUR	0.413477	0.703419	0.931431	-0.262212
Economic size class >= 500 000 EUR	-0.126204	0.942528	0.694566	-0.633571

When analysing the dependence of farmers' farms, according to six economic classes, between the received subsidies and the overall output in Hungary, it has been determined that the biggest influence of the received subsidies on the overall output had the farms that belong to the fifth economic size class; the correlation coefficient is 0.801995, and there has been revealed a statistically significant link (p < .05000) (Table 4). Whereas in Lithuania, there is a very strong and statistically significant link between the mentioned variables (r = 0.926621; p < .05000) that has been found for the farmers' farms that belong to the sixth economic class (economic size class >= 500 000 EUR), and in Slovakia, it is on the contrary, i.e., for the farms belonging to the first economic class (r = 0.948250). In the Czech Republic, the received subsidies had a significant influence on the overall output only for farmers' farms in economic size class 50 000 - < 100 000 EUR (r = 0.568484); moreover, in this country, the farm subsidies that were perceived by the farmers belonging to

the second, third and fourth economic classes determined the changes in net income (even though there has been determined only medium strength link).

To sum up, it could be stated that the subsidies received in Lithuania, Slovakia and the Czech Republic had the smallest influence on the net income. In Lithuania, the average farm capital had the biggest influence on the received subsidies during the surveyed years; in the Czech Republic, the subsidies are a bit more related to the net income range. In Hungary, the received subsidies had the biggest influence on all analysed indicators: the overall output, net income and average farm capital. In Slovakia, there has been determined a reverse link between the received subsidies and average farm capital, which indicates that when subsidies increase, the average farm capital decreases.

4 Conclusions

The research has been conducted to analyse the influence of subsidies (excluding investment) on economy of family farms of the selected countries. The paper investigates the links between subsidies and output, between subsidies and net income, between the subsidies and average farm capital. The received subsidies during the investigated period in the selected countries are very important. It is especially clearly seen when analysing subsidisation, according to the farm economy size classes.

The influence of the received subsidies differs as well. It depends on the level of a country's economic development, sum of received subsidies, subsidisation intensity etc. The performed calculations revealed that in the less economically developed countries, the farm subsidies that were received by the farmers had bigger influence on output, net income, average farm capital. This correlates with H. Walls *et al.* (2016) and K. Marković *et al.* (2012) conclusions that the EU strategy in CAP should provide a sustainable economic and environmental development of agriculture and balanced rural development in all the regions of the Union.

Acknowledgement

References

Bartosevičienė, V. (2011). *Ekonominės statistikos pagrindai*. Kaunas: Technologija. 112 p.

European Commission. (2008). Commission Regulation (EC) No 1242/2008 of 8 December 2008 establishing a Community typologu for agricultural holdings. Available at: https://eur-lex.europa.eu/LexUriServ.do?uri=OJ:L:2008:335:0003:0024:EN:PDF

European Commission. (2016). Mapping and analysis of the implementation of the CAP. *Final report.* Available at: https://ec.europa.eu/agriculture/sites/agriculture/files/external-studies/2016/mapping-analysis-implementation-cap/fullrep_en.pdf

European Commission. (2013). Share of direct payments and total subsidies in agricultural factor income. Available at: https://ec.europa.eu/agriculture/sites/agriculture/files/cap-post-2013/graphs/graph5_en.pdf

Eurostat Statistics Explained. (2016). Small and large farms in the EU - statistics from the farm structure survey. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/Small_and_large_farms_in_the_EU_-_statistics_from_the_farm_structure_survey

Kazukauskas, A., Newman, C., & Sauer, J. (2010). CAP reform and its impact on structural change and productivity growth: a cross-country analysis. *Proceedings of the 114th European Association of Agricultural Economists Seminar on Structural Change in Agriculture (EAAE'10)*.

Latruffe, L., Bravo-Ureta, B. E., Carpentier, A., Desjeux, Y., & Moreira, V. H. (2016). Subsidies and Technical Efficiency in Agriculture: Evidence From European Dairy Farms. *American Journal of Agricultury Economics*, 99(3), 783-799.

Lososová, J., Kopta, D., & Zdeněk, R. (2017). Development and Structure of Subsidies in Agriculture. *The International Scientific Conference INPROFORUM 2017*. Available at: http://ocs.ef.jcu.cz/index.php/inproforum/INP2017/paper/viewFile/946/603

Marković, K., Njegovan, Z., & Pejanović, R. (2012). Former and Future Reforms of Common Agricultural Policy of the European Union. *Economics of Agriculture,* 59(3), 483-498.

Martišius, S. A. (2014). *Statistikos metodai socialiniuose ekonominiuose tyrimuose*. Vilnius: Technika. 578 p.

Massot, A. 2016. The Common Agricultural Policy (Cap) and the Treaty. Fact Sheets on the European Union, European Parliament. Available at: http://www.europarl.europa.eu/atyourservice/en/displayftu.html?ftuid¼ftu_5.2.1.html.

Matthews, A. (2016). The future of direct payments, in European Parliament, Research for AGRI Committee – Reflections on the Agricultural Challenges Post-2020 in the EU: Preparing the Next CAP Reform, IP/B/AGRI/CEI/2015-70/0/C5/SC1, Brussels, Directorate-General for Internal Policies, Policy Department B: Structural and Cohesion Policies, 3-86.

Rizov, M., Pokrivcak, J., & Ciaian, P. (2013). CAP subsidies and productivity of the EU farms. *Journal of Agricultural Economics*, 64(3), 537–557.

Sgueo, G., Tropea, F., & Augere-Granier, M-L. (2016). How the EU budget is spent: Common Agricultural Policy. Available at: https://epthinktank.eu/2016/07/20/how-the-eu-budget-is-spent-common-agricultural-policy/

Valkauskas, R. (2013). Socioekonominė statistika. Vilnius: Vilniaus universiteto leidykla. 178 p.

Walls, H. L., Cornelsen, L. Lock, K., & Smith, R. D. (2016). How much priority is given to nutrition and health in the EU Common Agricultural Policy? *Food Policy*, 59, 12-23.

Fundamentals of the Tensor Theory of Utility upon the Riemann Manifolds

Tomáš R. Zeithamer, Jiří Pospíšil

Abstract: *The paper deals with the fundamentals of tensor theory of utility in Riemann's spaces. Using the Riemann tensor field of curvature, the occurrence criterion of retail gravitation is formulated. The method of measuring utility in N - dimensional Riemann spaces, which was first used in Einstein 's 4 - dimensional general theory of relativity, is described including motion of image point of consumer along the utility hill.*

Keywords: Consumer economics · Differential geometry · Economics of Sun–Earth relationships · Physical economics · Space economics

JEL Classification: A12 · B41 · C02 · D11

1 Introduction

By the end of the 1930s, John William Reilly completed a study that dealt with the quantification of the observed economic phenomenon, which he called retail gravitation. The results of the study were summarized by J. W. Reilly first in an article in a journal published by the University of Texas in Austin (Reilly, 1929). In addition to this article, the results of the study also featured a monograph titled "Law of Retail Gravitation". The monograph was published at Knickerbocker Publishing House, New York in 1931 (Reilly, 1931). This study was based on economic surveys conducted across the US for three years. Statistical evaluation of the results of economic surveys provided a conclusion on the quantification of retail gravitation: retail attracted to a large settlement is directly proportional to the population and inversely proportional to the square of distance from the settlement. The Law of Retail Gravitation was derived from Newton's Gravitational Law in 2011 year by Tomáš R. Zeithamer and Jiří Pospíšil (Zeithamer, 2015; Zeithamer, 2016 a; Zeithamer, 2016 b; Zeithamer, & Pospíšil, 2017).

2   The measurement of utility in Riemann´s spaces

Comparing the effectiveness of consumer economic activities with the expenditures and costs associated with these activities makes it possible to explain the behavior of consumer entities on the market. Efficiency in the case of an individual is quantified by the utility resulting from the consumption of individual goods. In this paper it is assumed that the consumer acting rationally decides to set up such a consumer basket that satisfies the axiom of utility maximization with respect to the individual consumer income level. In addition, based on homo sapiens genetic studies, it is assumed that the consumer's decision-making process includes a nonsatiation axiom. It is further assumed that the preferences fulfill the preference completeness axiom and the transitivity axiom, allowing for a complete arrangement of a set of preferences and a creation of the preferential scale. The qualitative or quantitative scale of utility is the result of consumer preferences.

Let us denote $X_1, X_2, \ldots, X_{N-1}$ the quantities of individual goods, then under otherwise the same conditions the utility U is the function F of the amount of consumed goods, i.e.

$$U = F(X_1(t), X_2(t), \ldots, X_{N-1}(t)). \tag{1}$$

where t is time. In the N dimensional Riemann space, the consumer is represented by the point C, which has the coordinates

$$C = [X_1(t), X_2(t), \ldots, X_{N-1}(t), F(X_1(t), X_2(t), \ldots, X_{N-1}(t))]. \tag{2}$$

The consumer's image point moves in the $N-$ dimensional Riemann space along $(N-1)-$ dimensional utility hill, which is $(N-1)-$ dimensional differentiable hypersurface in the Riemann $N-$ dimensional space. On the utility hill

Ing.Tomáš R, Zeithamer, Ph.D., Economic University, Prague, Faculty of Informatics and Statistics, Department of Mathematics, Ekonomická 957, 140 00 Prague, Czech Republic, e-mail: zeith@vse.cz

Prof. Ing. JiříPospíšil, CSc., Czech Technical University in Prague, Faculty of Civil Engineering, Thákurova 7,166 29 Prague, Czech Republic

a symmetric covariant metric tensor field of the second order with components $g_{\mu\nu}(x_1, x_2, \ldots, x_{N-1})$, $\mu, \nu = 1, \ldots, (N-1)$ is defined.

In the Riemann $N-$ dimensional space a reference coordinate system Σ is introduced, in which the $(N-1)$ coordinate axes $x_1, x_2, \ldots, x_{N-1}$ correspond to the number of $(N-1)$ kinds of commodities, whereas the $N-$th axis corresponds to the utility U (see Fig. 1 – Utility Hyperplane and Fig. 2 – Utility Hypersurface (Utility Hill)).

The hypersurface defined by equation (1) is an example of a curved Riemann (non-Euclidean) space with $N-1$ dimensions and metric form

$$ds^2 = g_{\mu\nu}dx^\mu dx^\nu, \qquad \mu, \nu = 1, 2, \ldots, N-1. \tag{3}$$

Coordinate functions $g_{\mu\nu}$ are the covariant components of the metric tensor field, which is symmetric, i.e. the $\binom{N-1}{2}$ conditions $g_{\mu\nu} = g_{\nu\mu}$ are applied to its $(N-1)^2$ components. Thus, this metric tensor field generally has only

$$(N-1)^2 - \binom{N-1}{2} = \binom{N}{2} \tag{4}$$

different components. We also require that the determinant g to be different from zero, i.e.

$$g = \begin{vmatrix} g_{11}g_{12}, \ldots, g_{1N-1} \\ g_{11}g_{12}, \ldots, g_{1N-1} \\ g_{11}g_{12}, \ldots, g_{1N-1} \\ \ldots\ldots\ldots\ldots\ldots \\ g_{11}g_{12}, \ldots, g_{1N-1} \end{vmatrix} = \left| g_{\mu\nu} \right| \neq 0, \tag{5}$$

so the equations

$$g_{\mu\kappa}g^{\mu\lambda} = \begin{cases} 1 & \text{for } \kappa = \lambda \\ 0 & \text{for } \kappa \neq \lambda \end{cases} \tag{6}$$

have a non-zero solution and give the contravariant components of the metric tensor field, which are also symmetric.

The equation of geodesics in Riemann's space has the form

$$\frac{d^2 x^\nu}{ds^2} + \Gamma_{\mu\kappa}^\nu \frac{dx^\mu}{ds}\frac{dx^\kappa}{ds} = 0, \qquad \mu, \nu, \kappa = 1, 2, \ldots, N-1, \tag{7}$$

where

$$\Gamma_{\mu\kappa}^\nu = \frac{1}{2}g^{\nu\lambda}\left(\frac{\partial g_{\lambda\kappa}}{\partial x^\mu} + \frac{\partial g_{\mu\lambda}}{\partial x^\kappa} - \frac{\partial g_{\mu\kappa}}{\partial x^\lambda}\right) \tag{8}$$

are signs for Christtoffel symbols $\begin{Bmatrix} \nu \\ \mu\kappa \end{Bmatrix}$.

In conclusion, in physical economics, astrobioeconomy and holistic space economics, more complex variables are also useful in addition to vectors, which are also independent of the coordinate system, but are determined by more than three "components". Their properties are different according to the number of components, but we summarize them under the common name of the tensors, respectively, more precisely tensor fields. If the obtained data sets lead to the conclusions described by tensor equations, then invariantness of the tensor equations with respect to the selection of the coordinate system can be utilized to model retail systems. This invariantness means that if the tensor equation is valid in one reference system, it will apply in all reference systems (Horák, 1927; Horák, Krupka & Šindelář, 1961; Horák & Krupka, 1976; Kučera & Horák, 1963; Kleczek, 2002; Kleczek, 2011). Thus, such an invariantness property of tensor equations can be used in modeling the geometric structures of space-time manifold while the acquired geometric structures models allow applications in physical economics, astrobioeconomics and holistic space economics.

3 The criterion of the occurrence of the retail gravitation field

The possibility to introduce such coordinates for which all components (8) are zero, characterizes the Euclidean space which is defined by this property for any number of $N-1$ dimensions. However, not only the metric form but also the equation of geodesics in the curvilinear coordinates in the Euclidean space formally do not differ from the equations of the geodesiscs in the general Riemann space. This raises the question of how to distinguish the curved Riemann space from the flat Euclidean space without the empirical search for the Cartesian coordinate system with the constant components of the metric tensor field? The solution to this task concerns the basic geometric characteristics of the space that can not depend on the choice of the reference system. For this reason, the problem can only be solved by expressing the curvature of the space with a tensor field whose components disappear in the whole space only when it is Euclidean. Then, all the components of the tensor field searched in each reference system will be zero. By this tensor field, which

makes it possible to decide whether it is a flat space or a curved space independently of the choice of the coordinate reference system, is Riemann curvature tensor field whose components in arbitrary coordinates are of the form

$$R^{\nu}_{\kappa\lambda\mu} = \frac{\partial \Gamma^{\nu}_{\kappa\lambda}}{\partial x^{\mu}} - \frac{\partial \Gamma^{\nu}_{\kappa\mu}}{\partial x^{\lambda}} + \Gamma^{\nu}_{\kappa\sigma}\Gamma^{\sigma}_{\mu\lambda} - \Gamma^{\nu}_{\lambda\sigma}\Gamma^{\sigma}_{\kappa\mu} \,. \tag{9}$$

The simpler Ricci tensor field of the second order $R_{\kappa\mu}$ for retail gravitation has significance for application of geometry in holistic space economics. This simpler tensor field is created by contraction of the Riemann curvature tensor field for retail gravitation, i.e.

$$R_{\kappa\mu} = R^{\lambda}_{\kappa\lambda\mu} \,, \tag{10}$$

The next contracting mixed Ricci tensor field for retail gravitation leads to curvature invariant for retail gravitation field

$$R = R^{\nu}_{\nu} = g^{\kappa\nu}R_{\kappa\nu} \,. \tag{11}$$

4 Conclusion

This paper is the output of the preparatory work for the upcoming project "Economics of Sun-Earth Relationships" and it is at the same time pioneering the work of the new direction of research in the field of holistic space economics, astro-bioeconomics.The methodology developed by Professor Albert Einstein in the theory of relativity in the time span of 1905 to 1916 (Einstein, 1914, 1915, 1916 a, 1916 b) was applied to describe the field of retail gravitation. A quantitative criterion for determining the presence of retail gravitation was established, i.e. the occurrence of a retail gravitation field is equivalent to the non-zeroing of the Riemann curvature tensor field for retail gravitation.
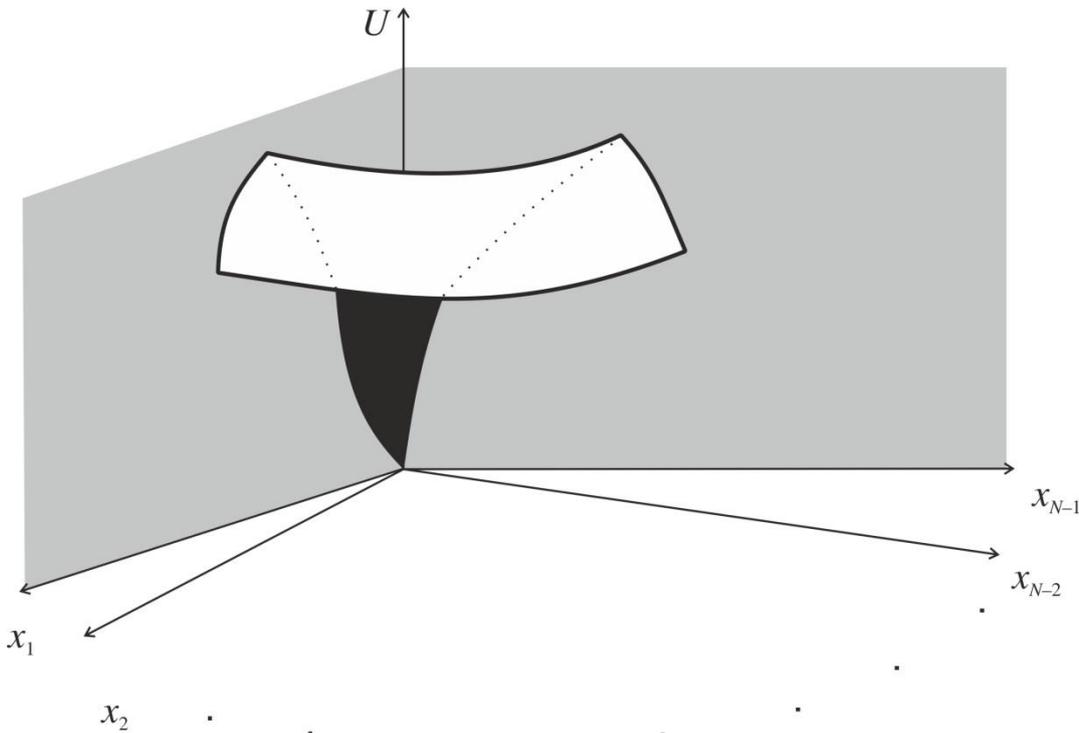
Acknowledgements

Figure 1 Utility Hyperplane
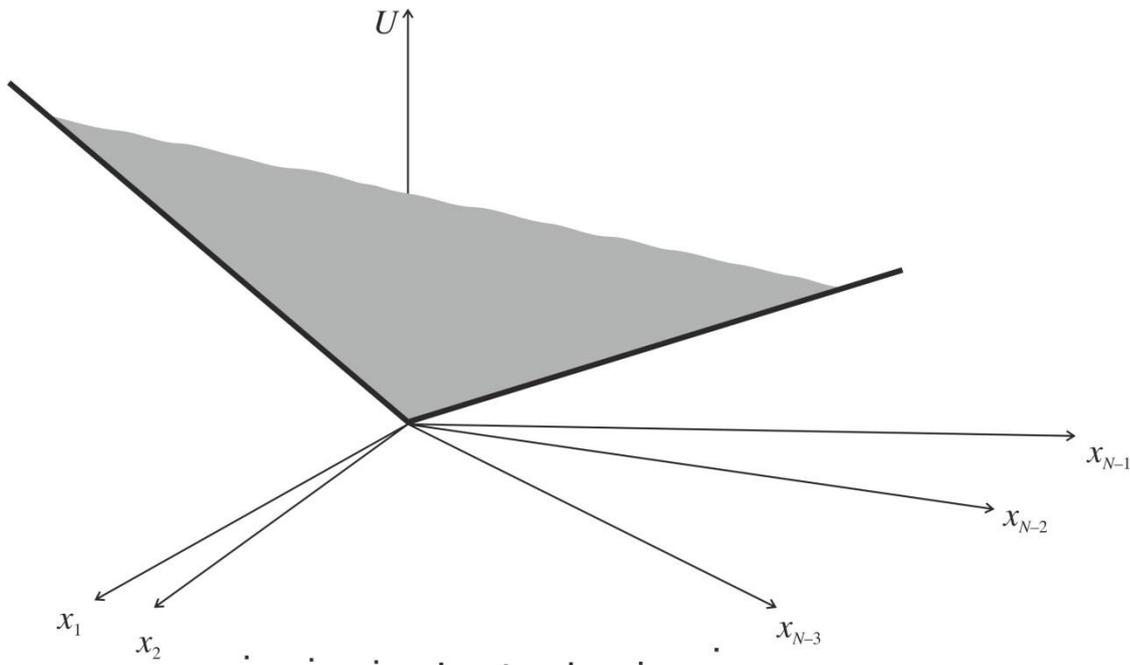
In this figure, the utility hill is $(N-1)$ – dimensional flat hypersurface in the N – dimensional Riemann space with othogonal reference coordinate system, where coordinate axes are straight lines. The metric of hyperplane is determined by symetric tensor field g (metric tensor) with non-zero diagonal components while non-diagonal components are equal to zero.

Figure 2 Utility Hill

In this figure, the utility hill is $(N-1)$ – dimensional curved hypesurrface in the N – dimensional Riemann space with orthogonal reference coordinate system, where coordinate axes are straight lines. The metric of the utility hill is determined by the symmetric tensor field g (metric tensor) whose non-diagonal components are different from zero.

References

Einstein, A. (1914). Die formale Grundlage der allgemeinen Relativitätstheorie. *Sitzungsber. k. preuss. Akad. Wiss.*, 41, 1030 – 1085.

Einstein, A. (1915). Die Feldgleichungen der Gravitation. *Sitzungsber. k. preuss. Akad. Wiss.*, 48, 844 – 847.

Einstein, A. (1916 a). Die Grundlage der algemeinen Relativitätstheorie. *Ann. Phys.*, 49, 769 – 822.

Einstein, A. (1916 b). Näherungweise Integration der Feldgleichungen der Gravitation. *Sitzungsber. k. preuss. Akad. Wiss.*, 32, 688 – 696.

Horák, Z. (1927). Sur une généralisation de la notion de variété. *Publications de la Faculté des Sciences de l´Universté Masaryk*, No. 86.

Horák, Z., Krupka, F. & Šindelář, V. (1961). *Theoretical Physics for Technological Sciences* (*Technická fyzika* (in Czech)). 3 ed. Prague: SNTL.

Horák, Z. & Krupka, F. (1976). *Physics* (*Fyzika* (in Czech)). Prague: SNTL, Bratislava: ALFA.

Kleczek, J. (2011). *Life with the Sun and in theUniverse – A New Science – Bioastronomy* (Život se Sluncem a ve vesmíru – nová věda bioastronomie (in czech)), Editorial Series Phoenix, Prague: PASEKA Publishing House.

Kleczek, J. (2002). *Great Encyclopedia of theUniverse* (Velká encyklopedie vesmíru (in Czech)), Prague: Academia, 2002, ISBN 978-80-7432-075-0.

Kučera, J. & Horák, Z. (1963). *Tensors in Electrotechnics and Physics* (*Tenzory v elektrotechnice a ve fyzice* (in Czech)), Prague: Publishing House of Czechoslovak Academy of Sciences.

Reilly, W. J. (1929). Methods for the Study of Retail Relationships.*University of Texas Bulletin*, No. 2944, Nov. 1929.

Reilly, W. J. (1931). *The Law of Retail Gravitation*. New York: Knickerbocker Press, USA.

Zeithamer, T. R. (2015). Methodology of Theoretical Physics in Economics: Vector Theory of Retail Gravitation Law. In: M. Pech (Ed.), *Proceedings of The International Scientific Conference INPROFORUM 2015*. 05. 11. 2015 – 06. 11. 2015, České Budějovice (on line). České Budějovice: Czech Republic, University of South Bohemia, pp. 199 – 203.

Zeithamer, T. R. (2016 a). Methodology of Theoretical Physics in Economics: Intensity Vector of Retail Gravitation. In: *Proceedings of the 15th Conference on Applied Mathematics APLIMAT 2016*. 02.02. 2016 – 04. 02. 2016, Bratislava: Slovak Republic, Slovak University of Technology, pp. 1147 – 1153.

Zeithamer, T. R. (2016 b). Theoretical Background for the Globalization of Retail Gravitation. In: T. Klieštik (Ed.), *Proceedings of the 16th International Scientific Conference on Globalization and Its Socio-Economic Consequences*, 05 – 06 October 2016, Rajecké Teplice. Zilina: Slovak Republic, University of Zilina, pp. 2482 – 2489.

Zeithamer, T. R. & Pospíšil, J. (2017). Stationary Fields of Retail Gravitation in Mechanisms of Globalization Relating to the Sun-Earth Relations. In: T. Klieštik (Ed.), *Proceedings oft he 17th International ScientificConference on Globalization and Its Socio-Economic Consequences*, 4th – 5th October 2017, Rajecké Teplice, University of Zilina, Faculty of Operation and Economics of Transport and Communications, Department of Economics, Zilina: Slovak Republic. pp. 3053 – 3060.

SESSION

CRIMINAL ASPECTS OF ENTREPRENEURSHIP IN THE EUROPEAN
CONTEXT AND INSOLVENCY PROCEEDINGS

Consumer protection in case of discrimination

Zuzana Frantíková

Abstract: The article will deal with the consumer protection in case of discrimination. Equality and freedom from discrimination are outlined as basic human rights that may be protected by private and public law which brings different legal means of protection. Discrimination may link to dignity if discrimination is based on reasons such as race, ethnicity, nationality, gender, sexual orientation, age, disability, religion, belief, and worldview or it also may be connected to nationality, place of residence and disadvantages citizens of other EU Member States. Discrimination is regulated by many laws still it is not enough because in cross border transactions they were many unjustified discriminatory behaviour where businessmen were not willing to enter transactions with foreign customers. In this connection, on 28 February 2018, the Council adopted Regulation (EU) 2018/302 of the European Parliament and of the Council on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence or place of establishment within the internal market and amending Regulation (EC) 2006/2004 and (EU) 2017/2394 and 2009/22 / EC, effective from 3. 12. 2018. This paper describes public consumer protection in case of discrimination using public data.

Key words: Consumer protection · Freedom from discrimination · Equality

JEL Classification: K1· K13

1 Introduction

Equality and freedom from discrimination are outlined as basic human rights by the Universal Declaration of Human Rights. Furthermore, this principle could be found in many European laws starting from article 21 of EU Charter of Fundamental Rights saying that "any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited," over the Treaty on European Union, to many directives. In the Czech law it is enshrined in article 1 and 3 of the Charter of Fundamental Rights. This principle is also regulated in article 6 of Act No. 634/1992 Sb., on consumer protection, which states "the seller must not discriminate against the sale of goods or the provision of services by the consumer." However, there is no explanation what the notion of discrimination in the Consumer Protection Act means. This concept was, for example, defined in the decision of the Supreme Administrative Court, ref. number 8 As 35/2005 of 11 April 2006, which states that discrimination is "a discriminatory treatment of the same entities, which is detrimental to some of the entities assessed, i. e. discrimination of equality and denial and limitation of the rights of these equal subjects." A similar definition would be found in the judgment of the Constitutional Court of the Czech Republic ref. number Pl. ÚS 15/02 of 21 January 2003 stating that "certain legislation which favors one group or category of persons over others can not in itself be classified as a breach of the principle of equality. The legislator has some discretion as to whether such preferential treatment will ensue. It must ensure that the privileged approach is based on objective and reasonable grounds (the legitimate aim of the legislature) and that there is a relationship of proportionality between this objective and the means to attain it (legal advantages)." To summarize it, different treatment of equal subjects without objective and reasonable grounds establishes discrimination that is protected by private and public law, which will be explained in the paper (Commentary, p. 77-79). In the USA consumer discrimination in credit market was found out (Hawley, C. B., & Fujii, E. T., 1991). According to Walsh, G., & McGuire, D. (2007) several disadvantaged groups experience marketplace discrimination in service establishments because of dissimilarity, and implicitly inferiority. Discriminated consumers may become frustrated and dissatisfied.

On the other hand, there is also a phenomenon where customers discriminate minority workers (Combes, P. P., Decreuse, B., Laouenan, M., & Trannoy, A., 2016) or when "female servers are being held to a very high standard, and if this standard is not met, they are treated unfavorably in comparison to male servers who produce the same level of service quality by customers" (Parrett, M., 2011, p. 1). According to Leonard, J. S., Levine, D. I., & Giuliano, L. (2010)

Mgr. et Mgr. Zuzana Frantíková, Palacký University Olomouc, Faculty of Law, Tř. 17. listopadu 8, 771 11 Olomouc, e-mail: zuzka.frantikova@gmail.com

customers do not discriminate because the profit does not rise only due to the fact whether the customers are being served by the same race. On the contrary, customers of baseball matches do discriminate black pitcher or black hitters (Andersen, T., & Croix, S. J. L. ,1991) However, in the Czech Republic there are no studies dealing with this theme.

2 Methods

In this paper there is an emphasis put on analytical method of logical deduction and on method of legal comparison. The purpose of this paper is to achieve by means of interpretation and scientific methods reliable description of consumer protection with respect to the prohibition of consumer discrimination and its regulation de lege lata in the Czech legal order. The paper uses the data published in the *Press release of 19 of September 2014* by the Czech Trade Inspection Authority. The data used herein are only illustrative; they are not further processed.

3 Consumer protection in case of discrimination

Under the Czech law discrimination of consumers is protected by private and public law. Administrative offenses are offences defined in the administrative laws; an administrative offense can generally be an offense committed by a responsible person whose features are listed in the law and with which the law combines the threat of sanctions. In the lawful and democratic state public authorities are bound by the ban of arbitrariness because public administration is a subordinate and law-controlled activity. Therefore, the lawful statement of the facts of the administrative offense must not be vague, otherwise the nullum crimen sine lege certa principle may be exceeded. Whether actions of businessmen are discriminating or not depends on circumstances providing that businessmen have contractual autonomy of will which represents a fundamental principle in private law and therefore they can contract with anybody under any conditions. Nevertheless, it is not always easy to distinguish whether consumers are treated differently due to objective reasons or whether principle of freedom from discrimination was violated. This was the reason why the EU accessed to regulation within the area of geo-blocking – discrimination based on geographical location of consumers. The EU decided to specify activities which are not approvable by the law. On 28 February 2018, the Council adopted Regulation (EU) 2018/302 of the European Parliament and of the Council on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence or place of establishment within the internal market and amending Regulation (EC) 2006/2004 and (EU) 2017/2394 and 2009/22 / EC, effective from 3. 12. 2018. The adopted regulation is intended to prevent discrimination on grounds of nationality, place of residence or place of establishment. This regulation is intended to unify access, sales or payment terms when purchasing goods and services in another EU country.

3.1 Discrimination in the Czech Republic

The study done by the Czech Trade Inspection Authority during the first term of the year 2014 showed that consumers rights have been violated in 365 cases representing 52,9%, nevertheless the freedom from discrimination was violated only in nineteen cases which represents 2,8 % of the total violations. According to the Czech Trade Inspection Authority the consumer discrimination was violated from the following reasons:

- due to race or ethnic origin

This reason occurred in five cases. All of them were related to the Roma ethnic group. In one case the seller forbade the citizens to enter his premises. In the rest of cases real estate agencies implemented provisions so they services were not provided to Roma ethnic group.

- due to nationality

In 6 cases the owner of the restaurant charged the customers of different nationality an extra fee for the service; in 2 cases this was a refusal to accommodate tourists from the Russian Federation.

- due to age

There were 4 cases in total. In 1 case there was a limitation of participation by the age of 18 on a travel agency tour, and the organizer was also required to enter the demonstration event at the age of 18 years, without justifying this limitation. The age of the consumer was also a reason not to provide the services offered in one catering facility. Another finding was the discriminatory restriction of the consumer credit claim, when the conditions for granting the loan stated that for the duration of the contract the client must meet the age range of 20-70 years.

- others

In 1 case this was an unreasonable denial of the sale of goods to selected consumers and in 1 case, double pricing was recorded in accommodation (Press release, 19. 9. 2014). The study showed that the discrimination does not belong to severe problems as it represents only 2,8 of 365 violations in the Czech Republic.

3.2 Private law defence

It is not only administrative law, which protect consumers, consumers are also protected by Act No. 198/2009 Sb., Anti-discrimination Act. The Antidiscrimination Act regulates in detail the right to equal treatment and the prohibition of discrimination in case when goods and products are offered to public and in the matter of the access to those goods and products. The Antidiscrimination Act distinguishes between the direct and indirect discrimination. The discrimination is defined as an unequal treatment realized because of race, ethnic origin, nationality, sex, sexual orientation, age, disability, religion, creed or individual political opinions or nationality. A person touched by the discrimination have these means to defend himself such as refrain, remedy and compensation. In case when a person's reputation or dignity or respect in society has been harmed, the person shall also have the right to monetary compensation for non-material damage.

4 Conclusion

As it was described above, freedom from discrimination and equality principle are basic principles regulated in many national and international fundamental documents and are regulated by national and international laws from public and private sector. This paper highlights the new EU regulation which was adopted to support EU single market to prevent businessmen from avoiding cross border transactions or modifying them through different conditions with foreigners although they do not have reasonable and justified reasons for it. Although EU still feels that there are barriers preventing from the creation of internal digital single market represented by geo-blocking, public data used here gained from the Czech Trade Inspection Authority shows that discrimination is not the principle problem even though they are rare case when customers are discriminated due to race, ethnic, nationality or age when goods or services are not provided to them or are provided them under different conditions mainly for double prices. Unfortunately, there are no data available that would show cases where Czech people where discriminated based on their nationality, especially in cases of online transaction.

References

Act No. 198/2009 Sb., antidiscrimination act, as amended

Act No. 634/1992 Sb., on consumer protection, as amended¨

Andersen, T., & Croix, S. J. L. (1991). Customer racial discrimination in major league baseball. Economic Inquiry, 29(4), 665-677.

Combes, P., Decreuse, B., Laouénan, M., & Trannoy, A. (2014). Customer Discrimination and Employment Outcomes: Theory and Evidence from the French Labor Market.

Charter of Fundamental Rights No. 2/1993 Sb.

Czech Trade Inspection Authority. (2014, September 19). *Press release of 19 of September 2014*. Retrieved from https://www.coi.cz/diskriminace-spotrebitelu/

EU Charter of Fundamental Rights

Judgment of the Constitutional Court of 21 of January 2003, ref. number Pl. ÚS 15/02

Judgment of the Supreme Administrative Court of 11 of April of 2006, ref. number 8 As 35/2005

Hawley, C. B., & Fujii, E. T. (1991). Discrimination in consumer credit markets. Eastern Economic Journal, 17(1), 21-30.

Leonard, J. S., Levine, D. I., & Giuliano, L. (2009). The Review of Economics and Statistics, 92(3), 670-678.

Parrett, M. (2011). Customer Discrimination in Restaurants: Dining Frequency Matters, 87–112. https://doi.org/10.1007/s12122-011-9107-8

Regulation (EU) 2018/302 of the European Parliament and of the Council on addressing unjustified geo-blocking and other forms of discrimination based on customers' nationality, place of residence or place of establishment within the internal market and amending Regulation (EC) 2006/2004 and (EU) 2017/2394 and 2009/22 / EC. Official journal. L 60 I, 2 of March 2018, p. 1–15.

Vítová, B. (2016). *Act on Consumer Protection. Commentary* (1st ed.). Praha: Wolters Kluwer.

Outcomes, C., Walsh, G., Mcguire, D., Walsh, G., & Morwitz, V. (2007). Minority Consumers' Experiences of Marketplace Discrimination in Services: A Conceptual, 34, 278-279.

ISBN 978-80-7394-726-2

9 788073 947262