THE MEDICINE EDUCATION INVESTMENT EVALUATION METHODS

E + M

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1. Introduction

In the last few years, increasing attention has been paid to the development of health policies. But side by side with the presumed benefits of policy, many analysts share the opinion that a major drawback of health policies is their failure to make room for issues of human resources. One of most problematic issues is the remuneration policy. The evaluation of investment in education of healthcare workers can be useful in effective remuneration policy development. Generally, the efficient evaluation of investment education projects has become a relevant field of scientific and practical research.

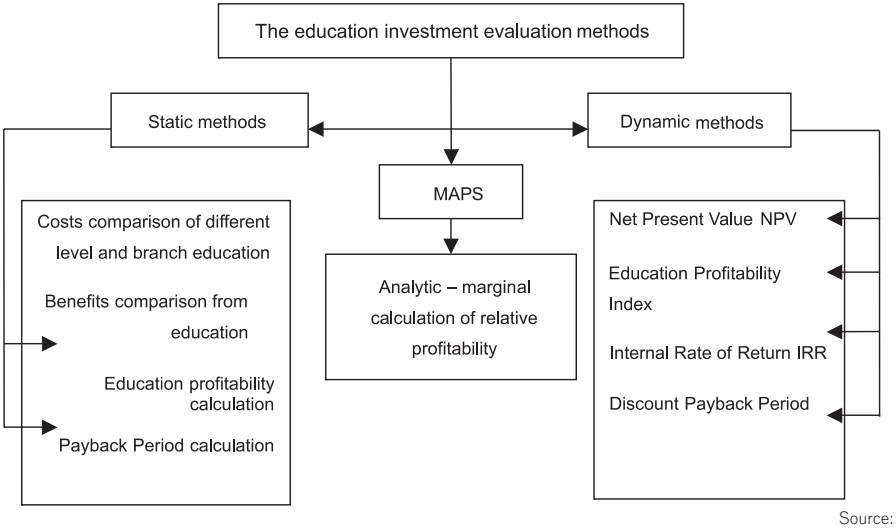
The idea that an evaluation of an investment in education must be realized by using the same evaluation criteria as those in production is hardly accepted in countries where education has been fully financed from public resources. Slovakia can be considered this type of country. Using the evaluation investment methods in education can help to increase the effectiveness of education expenditure on the one hand and on the other hand it can help create the basis for effective remuneration policy.

The main goal of the paper is to assemble a model of efficient educational investments in physician education.

2. Theoretical background

The theory of human capital [1] mentions a positive impact of qualifications and education to the issues of personal and economic prosperity potential. It can be stated that education becomes one of the relevant production factors whose allocations can be considered as economic implemented investments. When the education is treated as an investment, the efficiency of these investments should be analysed, as well.

Fig. 1: The education investment evaluation methods



Source: [3]

In scientific literature (Brealy - Mayers [2], Fotr [4], Vysušil and Fotr [13]) two main groups of investment project efficiency evaluation - static and dynamic methods - are distinguished. In static project efficiency evaluation methods time/price is not taken into account whereas in dynamic methods a discount is a necessary prerequisite. As for the investment project efficiency evaluation the main methods are ascribed for the human capital evaluation, as well. These evaluation methods are very similar to the investment projects.

The chart (Fig. 1) presents application of these basic methods in the education investment evaluation.

NPV method: assesses costs incurred, difference in earnings of university graduates and non-university graduates, number of years during which individual expects to obtain some benefits (before leaving labour market, retiring on a pension). Method depends on discount rate. Education present value depends on presumable labour age, the higher the age, the more believable, that NPV will be positive. Direct and indirect education costs are not excluded. Potential growth of earnings is not assessed.

Profitability index: identifies the relationship of investment to payoff of a proposed project. Profitability Index is also known as Profit Investment Ratio (P.I.) and Value Investment Ratio (V.I.R.). Profitability index allows to clearly identifying the amount of value created per unit of investment.

IRR for private individual: assesses personal benefit from education (difference between earnings of university graduate and non-university graduate), direct university education costs, earnings of individuals having only high school education. Life cycle of individual is used. Inner return rate for investments is equated to discount coefficient, NPV = 0.

IRR for society: evaluates difference between earnings of university graduate and non-university graduate, lease of buildings and wages of professionals.

The main difference between desirable return rate for private person and for society is such, that desirable return rate for the society is calculated taking into account costs designated to education by the state, and society.

Payback Period method: focuses on recovering costs on investments, it represents the amount of time that it takes for a capital budgeting project to recover its initial cost. Discounted payback period rule can be explained as an investment decision rule in which cash flows are discounted at an interest rate and then one determines how long it takes for the sum of the discounted cash flows to equal the initial investment.

To apply these methods it is necessary to identify money flows, i.e., to determine costs incurred and benefit obtained. In education costs and benefit calculation of not only social or costs incurred and benefit obtained by an individual, but also of benefits obtained and costs incurred by a state is necessary to assess. Parameters analyzed may be classified as direct and indirect costs as well as income, incurred by community, an individual himself, and government.

In personal direct costs we can include total value of tuition fees and related costs and in the indirect costs income lost because student during the studies is not able to work and earn money. In personal positive money flows we can measure the difference between earnings, that individual would get as non-university graduate and as university graduate. Direct costs for society can be counted as the total educational costs consisting of wages for academics, university maintenance costs and capital value, indirect costs as product and service costs, which are not assessed directly. Positive money flows for society can be explained as an additional benefit for entire society, due to increased wage with respect to education.

State direct costs of education are subsidies paid to students and institutions, lower interest rate of loans for studies, awards to very good students and the indirect costs are the decrease in income-tax revenues because students are not working and not earning. Positive money flows for society can be explained as increasing income-tax revenue; because higher taxes from bigger earnings are paid to the state.

In the assembled model of educational investments evaluation in physician education we work with social direct and indirect costs of physician education.

A general statement for education investment evaluation from the point of view of an individual is difficult to assemble, because the scope of

the benefits and the cost for individual is not known. The benefits to an individual highly depends on his personal features, the ability to be entrenched in labour market, of revealing his skills, of using knowledge obtained, depends on age, employer's attitude, University image, etc.

The most problematic area of medical education investments evaluation to measure is the calculation of costs and benefits for education. The total successfulness of education evaluation depends on the reality of costs and further benefits assessment.

1. The medical education expenditures can be relatively simple and determined exactly. Education investment effective decision-making we need to separate individual cost, which are granted from public budgets for a concrete individual according to his/her education degree and branch of study [6]. These individual expenditures could be obtained if we sum up all the current and capital costs of the medical faculty during one study cycle spend on one student, as well as other education costs (e.g. social scholarships...).

Since the investment period takes several years, it is necessary to consider time factor by the evaluation and so the determined expenditures should be recalculated according to the same time base and inflation rate as well.

2. Another step in medical education investments assessment is the estimation of total future financial benefits, which will be flowing for the state after the student's graduation. Their estimation itself is very complicated (especially by estimation of total incomes from education), because it concerns a long time period during which an income of physician is influenced by many factors as time, inflation, structural unemployment, increase or decrease of incomes outgoing from economic cycles, etc.

As for the calculation of estimated benefits from such investment could be used only an estimated income of physician, we will consider only high school/secondary school and university level of medical education.

3. Discount rate estimation. Financial capital, as well as any production factor, has its costs. In the case that the education investments are financed by external funds (i.e. state will borrow financial funds for education), the costs are interests from the received loan. If the state grants education from its own (public) resources, the costs are presented as a revenue from the invested financial funds required by the state or revenue that can be reached by other possible investments, it concerns so-called opportunity costs (e.g. discount rate of the National Bank in which loans for commercial banks are provided).

Usually private investment actions accept higher discount rates for investments with higher risk rate and vice versa. In the case of medical education investments the benefits are not directly proportional to the risk rate - i.e. unemployment rate. They are indirectly proportional, thus the discount rate should be lower.

4. Risk rate determination. By medical education investment (as well as other investments) it is necessary to take into consideration the possibility/risk that the state will not receive back the invested financial funds. This risk is generated by unemployment of medical faculty graduates, as well as by an average unemployment in the individual sectors of the whole national economy. By the risk calculation is a consideration of unemployment according to the reached education level in the whole national economy needed.

The risk (risk of unemployment) of medical faculty graduates can be calculated as a weighted arithmetic mean of individual medical branches at medical faculty as can be seen from the following equation.

$$R_{Bc,Mgr,PhD} = \frac{(\Sigma\ w_{ODBx,x,z} * (N_{ABS\ 1,2,3} + N_{ABS\ ODB} + N_{VZD} + N_{ODV})_{ODB})_{Bc,\ Mgr,\ PhD.}}{(\Sigma\ w_{ODBx,x,z})_{Bc,\ Mgr,\ PhD.}} \quad (1)$$

Where:

$N_{ABS\ 1,2,3}$ - is unemployment of medical faculty graduates according to the reached education level,

$N_{ABS\ ODB}$ - an unemployment of medical faculty graduates according to their study branches,

N_{VZD} - an average unemployment in national economy according to the level of reached tertiary (academic) education,

N_{ODV} - an average unemployment in health care sector according to the categories of the study branches,

$w_{ODBx,x,z}$ - weights of students numbers in the individual study branches at medical faculty in certain study/education level (e.g. at Bc., Mgr. or PhD. study - i.e. 1st, 2nd and 3rd academic study level).

$N_{ABS\ 1,2,3}$ can be calculated as an average annual unemployment of medical faculty graduates in certain time period (e.g. 5 years backwards) according to the reached education level. The annual unemployment can be count as a weighted mean (according to the months' amount) of registered unemployment in May and June in the corresponding year.

The unemployment of graduates according to the medical study branches NABS ODB is possible to calculate as an average annual unemployment of graduates in certain time period according to the study branch. Likewise as in the previous case it is inevitable to obtain average values of the registered unemployment in May and September of the corresponding year (according to the evidence of Office of Labour, Social Affairs and Family of the SR).

N_{VZD} presents an average unemployment in national economy according to the reached according to the level of the reached tertiary (academic) education during certain time period.

N_{ODV} presents an average unemployment in health care sector according to the categories of the study branches. By the average unemployment determination it is necessary to come out from the unemployment in the groups of sectors according to the study branches.

Final graduates' unemployment is needed to correct by a coefficient taking into account regional disparities at unemployment rate in individual regions of the SR.

This coefficient is the difference between total average unemployment value in SR and average unemployment value at individual regions. The coefficient is inevitable to determine because of compensation of regional disparities of that regions, in which the particular universities are located. The unemployment of graduates from the Košice and Prešov Self - Governing Regions could reach a higher level than the unemployment of graduates from the Bratislava Self - Governing Region. For all that, reasons of these disparities could not lie in different quality of provided education, but just in economic regional disparities of particular regions.

The appointed unemployment makes a base of a risk calculation for dynamic indicators. The risk calculation at dynamic indicators differs in comparison to the static indicators is a necessity to estimate an expected development in particular working time periods.

In case of the static indicators it is possible to determine the employment rate for an individual university/faculty as an average of estimated unemployment during the whole working life of graduate. The risk rate can be expressed also for graduates on individual study branches at secondary medical schools and secondary grammar schools, which are the second grade of education. The risk is taken into account by the calculation of the anticipated benefits from the secondary education.

The resulting graduate risk upon individual study branches of secondary education is necessary to count as a weighted arithmetic mean of unemployment rates of graduates according to the study branches, reached education and average unemployment in the national economy sectors for particular degrees of reached education for an appointed time period.

An average risk for the individual study branches of secondary education, as well as its development during the time, will be identified by the same way as in the case of academic/university education.

5. The last step in medical education investment evaluation will be the calculation of the present value of the expected financial benefits.

In many cases (except the education investments) are the financial funds for an investment expended in a relatively short time period - in 1 year. But the expected benefits from the investment are generating number of years. As we have already mentioned, all financial flows in real economy are influenced by the time factor which affect that the value of a financial unit is currently higher than in the future. It means that value of money changes during the time. Whereas the benefits arise in longer time period, it is necessa-

Tab. 1: Costs and Benefits from Medical Education in SKK

Total benefit from education	31,662,750.22
Costs for education	607,974.00
Alternative education costs for 6 years	766,179.82
Attestation costs	27,600.00
Examination costs	8,550.00
Degree costs	10,000.00
Total costs	1,420,303.83
Profit (total)	30,242,446.39

Source: Own calculations according to the statistics of the Office of Labour, Social Affairs and Family and the Institute of Information and Prognoses of Education of the SR

This table will be later modified and completed; however, it can be engaged for further calculations by means of static and dynamic evaluation methods.

ry to recount them upon the same time base, i.e. the year of investment realization. Thus the future value is recounted to the current value. That is defined as money which should be invested in order to receive a larger amount of money (at expected earnings) at a certain time period in the future.

3. The Medical Education Benefits Evaluation

Medical education benefit denotes an advanced creation of utilities in the form of GDP which increase appears by an individual as an increase of his/her personal income (financial funds). The economic benefit in the case of the state, as a main investor, is an increased amount of paid taxes (direct and indirect, from legal entities or individuals) and fund contributions as a result of higher income of the individual. Education benefits can be quantified especially at secondary school and academic/university education. Those are generating income from the moment of first employment of after graduation till he/she retires. Also by educational investment it is necessary to take into account that the benefit will not be guaranteed (especially the economic benefit). Therefore we must distinguish historical benefit and expected benefit. The historical benefit is a benefit already achieved from the investments of state to certain type of education. The expected benefit is a benefit forecast/prognostic to the future.

In the following text we display the particular methods of calculation that are at our disposal. Their results are only for illustration because they do not include all inputs (e.g. calculation of lifelong education costs and the most of indirect costs). For return rate calculation of medical education costs we used average wages of medical staff according to the actual salary bracket (pay scale).

Table 1 presents currently estimated costs and benefits in medical education considering high abstraction level. We have included the main costs connected with education in the formalized education system, as well as the alternative costs during education (6 years). There are costs for attestation, examination and degree within the education costs, too. But as we already mentioned the lifelong learning is not covered (and is not included).

4. The Static Evaluation Methods

The static methods are usually applied to less important investments with the short life period, eventually with a low discount factor. Since they do not take into account the time factor, we regard them as additional.

1. Profitability

The profitability (cost-effectiveness) stands for an ability of medical education investment to generate profit. It is not enough to only consider the calculation of profit as a difference between benefits and costs, because this does not say anything about its relationship to the paid inputs (so-called direct and indirect education costs) and the level of their appreciation. Therefore the

Tab. 2: Medical Education Investments Evaluation - Static Methods

Profitability in %	1,259.42
Rate of return in %	1,168.723
Investment costs in SKK	1,420,303.83
Profit from the investment in SKK	17,887,707.04
Duration of time period in which the investment is making benefits	37
Average annual profit from the investment in SKK	483,451.54
Investment payback period in years	2.93
Cash flow (CF) at investment duration in SKK	29,230,646.00
Average annual profit including CF in SKK	448,632.82
Investment payback period in years (if including CF)	3.17

Source: Own calculations according to the statistics of the Office of Labour, Social Affairs and Family and the Institute of Information and Prognoses of Education of the SR

profit is put into proportion to the inputs paid for its production. There can be set costs, revenues, internal capital or total capital as sources. Thus we can have several indicators which can provide different objective and relevant information.

2. Rate of Return

The rate of return stands for the „profit" level as a % resulting from medical education investments. In comparison to the profitability, where the profit is included, in the case the rate of return of the total cash flow generation by the investment is figured in.

3. Investment Payback Period

A payback period calculation (static calculation of amortization) - this method is used to find out the time period in which the medical education costs are returned (pay back). The method follows the primary effectiveness criterion - level and type of medical education which has the shortest time of amortization. The disadvantage of this method lies in the fact that it does not refer to the time period after repayment, so it does not include benefits from education after payback period. The estimated average wages were used for this calculation.

Table 2 presents the final values of listed indicators.

Considering education costs and benefits (with a bit of abstraction) the profitability of total investment has been counted up to 1,259.42%. Likewise by the above-mentioned indicator, the medical education can again be considered highly profitable. The public costs for the service provided are incomparably lower than the total benefits they induced. The estimated duration period of investment benefits is circa 37 years. The average annual profit is estimated at 483,451 SKK. As the basis of the presented values an investment payback period was approximated (calculated by the estimated profit) at 2.93 years. The fast return is a result of the approximation (average values) by the calculation. The higher payback period results if the investment cash flow is included. The CF in the investment period should reach approx 29.2 ml. SKK. This is an approximate value because the calculation includes average values and does not take into account the time factor. The average annual profit if including CF is circa 448,632.82 SKK. Thus investment payback period (if including CF) is 3.1 years.

5. The Dynamic Evaluation Methods

The dynamic evaluation methods of costs for education eliminate disadvantages of the above-mentioned methods. They take into consideration the time factor by the quantification of selected indicators.

The education investment costs and benefits are recounted to the same time base - calculation point, which could be the time of the first employment of a graduate, by the means of bearing interest or discounting. The use of discount calculates the value recounted to the particular

time period/time point. The time factor causes a change in money values which will result in bad decision-making if not taken into account. Financial and mathematical methods on dynamic basis reflect this time change whereas they come out of two basic financial principles:

- One monetary unit (one crown) has currently higher value than tomorrow (in the future) because it can be invested today thus it could bear interests immediately (in the case of education after the graduate employment). It means that benefits that are received in the future have lower value for us at the present. Therefore the expected benefits will be recounted to the present value.
- Safe money has higher value than risky money. The majority of investors would rather give up any risk. Thus it is also important to take into account the risk vs. rate by paying costs for education - i.e. the probability that the graduate would not be employ or will lose his/her job. This risk needs to be identified, evaluated and, it is inevitable, to find a way how to decrease it.

The advantage of the dynamic methods against static methods lies in systemic investigation of invested education costs during the whole period while investment generating benefits - from the beginning till the end of work (till legal retirement). The disadvantage lies especially in the discount rate determination and risk rate assessment.

Net Present Value (NPV)

The NPV method is considered to be the most exact and reliable, as well as the primary and basic method in the modern financial management. It is defined as a difference among discounted benefits from educational investment and educational costs. The basis for its calculation is the present value of the cash flow which stands for expected future benefits discounted by the rate of return which is offered for comparable investment alternatives (by education either different types and categories of education or discount rate offered by the National Bank). This rate of return is identified as a discount rate or alternative capital cost.

The net present value (NPV) expresses the net contribution of education to the state wealth. As a result the prerequisite for the alternative selection arises - to reach the maximum net present value, eventually its positive value.

Profitability Index (PI)

The profitability index method is very close connected and leads to the same results as the NPV. If the NPV equals 0, than the PI equals 1. The state can carry out the education investment if PI > 1; the higher the PI, the more profitable the education.

By the profitability index calculation they were taken into account education costs of 1,42 mil. SKK. Another indicator that is inevitable for the calculation of PI is the present value of the CF from the investment.

Discount Payback Period

The discount payback period (DPP) answers the question for how long the physician needs to be employed so that his education could be acceptable from the view of the net present value. The shorter the payback period to the investment life period (productive age), the more profitable is the education investment for the state. Such as non-discounted payback period, also DPP does not take into consideration education benefits after the payback period (after the initial investment costs are repaid).

Table 3 presents the values of listed indicators.

In the case of medical education the net present value reached the value of 2.77 ml. SKK. The profitability index reached 2.96; i.e. medical education investments are profitable and earn high values of GDP per capita. The Discount

Tab. 3: Medical Education Investments Evaluation - Dynamic Methods

Net present value of investment	2,777,392.00
Present value of the CF coming out from the investment	197,695.85
Profitability index	2.96
Discount Payback Period	13.09

Source: Own calculations according to the statistics of the Office of Labour, Social Affairs and Family and the Institute of Information and Prognoses of Education of the SR

Payback Period for the education of a physician is approximately 13 years.

6. Conclusion

There is limited amount of public disposable resources; a permanently increasing financial demand by the different branches of the public sector and an insufficient capability of institutions and government departments to define their financial requirements objectively involve in carrying out the reform of public finance. Lots of countries face the problem of what can and what cannot be financed by public funds, as well as show how to utilize the disposal public funds effectively. Likewise in other branches of the public sector, also in the education system the financial demands overrun the total amount of financial funds which can be allocated from the state annual budget. Therefore it is inevitable that in order to ensure high quality medical education development their will be a need to create a financial system that will strengthen an objective distribution and utilization of public financial funds. This requires the analysis of the current financial system, as well as criteria which affect the amount of assigned (allocated) financial funds. It is also necessary to take into account the individual and socio-economic objectives by the public finance decision-making.

The most effective and fastest way for the state to achieve an effective allocation of financial funds is to liberalize the education market and let the market relations influence the price for education. Nevertheless the medical education costs effectiveness improvement by pure market means is hardly accessible because of its high social importance and a big influence on the socio-economic development of the country. It is, however, necessary to carry out an application of certain market principles to the medical education financing process itself which will force the objective allocation of financial funds.

The theoretical analysis of the education system and its determination within the public sector should forego any process of the medical education costs effectiveness improvement. This analysis will answer the controversial question about the financing of particular levels and types of medical education. Another important step is to analyze the microeconomic and macroeconomic aspects of medical education. The education system, in order to fulfil its main function, should be at a mutual balance with its external surroundings. The education system should reflect changes in the demographic development, economic structure of the country, natural preconditions etc. The microeconomic aspects of medical education include exact ways of educational institution financing and the way how the financial funds flow to the client (student), as well as the state administration and education institutions management. The medical education costs effectiveness increase thus requires the solving of a number of problems concerning the complex public finance management.

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ABSTRACT

THE MEDICINE EDUCATION INVESTMENT EVALUATION METHODS

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Development of health care system and effectiveness and efficiency of health care services is increasingly dependent on the investments of human resources thus preserving and educating intellectual capital. Many research studies proved the importance of educational investments as the factor to develop partial sectors in economy. The education becomes one of the relevant production factors whose allocations can be considered as implemented investments. Once the education is treated as an investment subject, the efficiency of these investments must be analysed, as well.

The goal of our paper is to present a set of analytical data connected with economic value of education and career preparation in health care.

Brief theoretical part of this paper highlights the general theory of the different educational investment evaluation methods. In scientific literature there are two main groups of investment project efficient evaluation; static and dynamic methods. In static project efficiency evaluation methods time price is not taken into account whereas in dynamic methods discount is a necessary pre-requisite. To apply these methods it is necessary to identify money flows, i.e., to determine costs in-curred and benefits obtained.

The analytical part applies investment efficiency evaluation method on educational investments in health care (for example, physician education) in Slovakia.

The study uses a quantitative approach to investigate the research question and analyzes the original collected survey data from our own research.

When talking about education costs and benefit, it is necessary to assess not only the social or costs incurred and benefits obtained by an individual, but also benefits obtained and costs in--curred by the state.

The expenses dedicated to acquire education and competences in medicine should be considered as a special investment field. The evaluation of these investments' efficiency will assist in effective earnings system in health care development. For efficiency evaluation of educational investments modified models of discounted money flows can be applied.

Key Words: *Economic value of education. Educational investments. Investments evaluation methods - static and dynamic. Health care system. Education in medicine. Physicians' education.*

JEL Classification: *I22*