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MEASURING RETURNS ON INVESTMENT IN EDUCATION: LESSONS FOR SUSTAINABLE AND INNOVATIVE EDUCATION POLICY

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ABSTRACT

The relationship between education and labor market is significant and complex. Education increases employment opportunities and reduces the chance of occurrence and duration of unemployment. Earnings, among other things, represent private returns on investment in education and are in the center of the analysis of this article. The main aim of this article is to estimate private and social returns on investment in primary, secondary and tertiary education in selected old and new member states of the European Union (EU) by using two methods (Earnings function and Short-cut method) based on the Mincer equation. Results have shown that there is no statistically significant difference between the estimated private and social returns on investment in primary, secondary and tertiary education in groups of old and new EU members. New members converge towards the old members, at least when it comes to returns on investment in these three education levels. The results also indicate the existence of low and negative returns on investment in education in both old and new EU members. Thus, this article with its new findings contributes significantly to the literature that studies the universality of conclusions on returns on investment in education and the methodology that is used.

KEY WORDS

education, education policy, investment, return, Mincer equation, European Union

CLASSIFICATION

JEL: I20, I26, I28

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INTRODUCTION

The analysis of the relationship between human capital and economic growth has been in the center of attention of scientists since the second half of the last century. However, it is only with New Economic Growth Theories, especially Human Capital Theory, that human capital becomes involved and becomes one of the key factors in explaining the process of economic growth as seen in [1-9] and others. Undoubtedly, a significant contribution is reflected in the promotion of the idea that investing in human capital has multiple positive effects on both the individual and society as a whole. These effects have been termed human capital externalities in research [10-12] also point out that investing in human capital leads to technological progress and innovation, and ultimately increases the productivity of other factors in the growth process. In addition, [13] sees the greatest contribution of the new models in the fact that economic growth can grow indefinitely because the returns on investment in human capital will not fall with the growth and development of the economy as assumed in earlier theories. [14] who emphasizes the "economic importance of human capital, especially education," in economic growth and who believes that "only a small portion of growth and income can be explained by available physical capital", and [15], for whom education is a key factor which leads to the realization of different levels of wages in the labor market (growth of individual investments in education, regardless of gender and race will lead to increase in wages) are among key authors of Human Capital Theory. The state appears to be the most important investor in education through appropriate institutions that are part of the public spending system. However, individuals also invest in education. [1, 15-18], and [19-20] argued that all consumption aimed at improving productivity is an investment in human capital. [20; p.161] states that of all these investments, the most important is the investment in education and that "rates of returns are the best and most comprehensive way to measure the economic effects of education".

Main aim of this article is to empirically estimate the rates of returns on investment in education for three levels of education (primary, secondary and tertiary) in old and new members of European Union (EU). The old EU members are considered to be the EU15, i.e. 15 countries that gained full membership before 2004, while the new members are considered to be the countries from the last three enlargements, namely those from 2004, 2007 and 2013, i.e. 13 new members of the European Union. The defined time period for which the return on investment in education is estimated is from 1985 to 2014. For the purpose of empirical analyses, the data for the member states of the European Union in the defined period of time are available in International Social Survey Program (ISSP) database. Estimates of the return on investment in education have been made by using two methods based on the Mincer equation [18] which has its theoretical background in the Human Capital Theory. Those methods are Earnings function and Short-cut method. This article seeks to examine the universality of the conclusions on returns on investment in primary, secondary and tertiary education and the effects of the chosen methodology on the estimation. In addition, unlike most research on this topic, this research recognizes the need to assess returns on investment in education in Central and Eastern European countries during the transition process and transition reforms, and for the first time estimates returns on investment in education during and after the transition process of the new members of the EU. This has been the main motivation for this research.

The article is structured as follows. The next section provides a theoretical basis for investigation and discusses the existing empirical literature. Detailed elaboration of the important aspects of the conducted empirical analysis that includes the data used, variables, models and methods is provided in section 3 of this article. Discussion of the results and conclusion are provided in sections 4 and 5 respectively.

THEORETICAL FRAMEWORK: THE RELATIONSHIP BETWEEN EDUCATION AND LABOUR MARKET

From the aspect of theoretical framework, three directions have been identified to deal with the analysis of the relationship between education and certain aspects of labour market. The first deals with the analysis of the relationship between education, employee productivity and wages. Authors such as [18, 21, 22] viewed education as part of Human Capital Theory by analysing the contribution of education to productivity growth and earnings. [18] analysed the returns on investment in education through wage growth, while [23] analysed wage adjustments due to existing (different) characteristics of work. Other authors have also investigated different levels of earnings relative to completed education [23-28]. In literature, this is known as the returns on investment in education analysis. The authors grouped in the second direction analysed the connection between education and employment opportunities. It was shown in [29] that education increases employment opportunities and that educated workers are more productive than less educated ones, whose level of productivity is limited to specific jobs. [30] showed that education reduces the possibility of the occurrence and duration of unemployment, while [31] showed that unemployment increases the demand for education. Lastly, the third direction in theory deals with the analysis of the problem of mismatch of education and labour market skills and the existence of asymmetric information on labour market, which leads to sending wrong signals to companies and individuals looking for employment. Within this group, authors have analysed phenomena such as migration and brain drain [32], overqualification [33], and lack of education [34]. Authors such as [35-38] and [39] are also included in this theoretical direction, whose research is focused on the effectiveness of active labour market policies in reducing unemployment.

In case of investment in education, costs and benefits can be analysed on the same principle as when investing in some other sectors, projects, etc. According to [18], private benefits are measured by individual earnings. The easiest way to calculate private returns on investment in education is to monitor individual wages in labour market. Wages or salaries are the value paid for normal working hours that includes the basic wage, living expenses and other guarantees and payments. It does not include overtime work, bonuses, family allowances and other social benefits and payments that the employer pays directly to employees [40]. Thus [41] showed that one additional year of completed formal education brings an increase in earnings of 6 % to 10 %. A positive effect of investing in education at the individual level has been demonstrated in all the leading studies [18, 42]. In calculating private returns on investment in education, only opportunity costs are observed in most cases, while in estimations of public returns on investment in education, social costs imply government spending on education. However, benefits for society are also non-monetary (non-financial) benefits for individuals, the so-called externalities of education that include benefits such as improving health, social mobility, reducing inequality, etc. which have been most often cited [43, 44; p.148, 45].

Research often shows different and even contradictory results when it comes to all education levels and private and social rates of returns on investment in education. Estimates by authors such as [46-52] dealt with estimates of returns on investment in education in OECD countries, then the United States, the United Kingdom, Sweden, etc. However, literature dealing with estimates of returns on investment in education in developing countries has been less available. [53] focused on the return on investment at three levels of education in Turkey, [54] estimated the return on investment in education in China, [55] in South Africa and [56] in Colombia. One of the factors that has led to a relatively small number of studies on the return on investment in education in developing countries has certainly been a limited availability of data needed for quantitative analyses. There is an even greater gap in the available scientific literature in

terms of estimates of returns on investment in education in EU Member States, especially in the new Member States during the transition process. [57] included 39 studies and 11 countries in the their meta – analysis. The authors concluded that the speed of economic transformation (speed of the reform process) and the degree of economic imbalance measured by economic volatility are key factors in explaining the differences in rates of returns on investment in education in the analysed countries. [58] estimated the returns on investment in education for eight countries in transition for the period from the beginning of the transition process (1992 for all countries), with the exception of Hungary where returns are estimated from 1986 to 2002. The authors concluded that the evidence for the existence of a significant increase in returns in transition countries during the analysed period was weak. The gap in scientific literature regarding the comprehensive analysis of returns on investment in education in these countries, using a unique methodology in its assessment as well as the need for this type of research, is the key argument for justifying the research in this article. Additionally, this article bridges the gap by using the identical methodology and data from the same databases to answer the research questions.

A dominant methodology for estimating the return on investment in education is the one based on the Mincer equation, noting that in scientific literature there are different methods for estimating parameters and variations in the use of different variables in estimation. The use of the least squares method is visible in the work of [8] Harmon et al.; Quantile regressions in [8] and [59]; Instrumental variables in [60] and [61] and Heckman's two-stage model in [62]. Also, the analysis showed the existence of significant differences and contradictory conclusions regarding the estimates of return on investment in education. Authors in [28] also stated that there had been attempts to determine patterns of return on investment in education, but that this had proved impossible because studies used different models, patterns, and coverage, making them further incomparable. One of the most significant contradictions is found in the works of Carnoy and Psacharopoulos. [5, 6, 63] based on the analyses of the United States and Korea, state that rates of return on investment in primary, secondary, and tertiary education increase with the country's level of development. Authors in [64; p.71] point out that returns on investment in lower levels of education may fall faster than returns on investment in higher levels of education, especially in periods of rapid growth and industrialization. This could further mean that, for example, investing in tertiary education will have a greater impact on growth when a country reaches higher levels of development. Unlike Carnoy, other authors [2, 24-28] conclude that rates of return on investment in primary education are always the highest regardless of the level of development the country is at. Thus, rates of return on investment in education fall with the growth of the country's level of development. Some authors [65, 66] disagree with Psacharopoulos's theses and argue that concentrating investment in primary education would only further increase inequality and poverty. Likewise, the study on returns on investment in education in China [67] shows that returns on investment in secondary education and higher levels of education are higher than returns on investment in primary education. The same conclusions were reached in the analysis of the return on investment in education in Nigeria [68], and earlier [69] in the case of Papua New Guinea. On the other hand, we find scientific research that proves Psacharopoulos's thesis that the returns on investment in primary education are always the highest no matter what level of development the country is at. Works of [70] on the example of Thailand, [71] on the example of China and [72] on the example of Singapore show the greatest returns on investment in primary education. In addition to the aforementioned dominant view of returns on investment in education, we also encounter a group of authors whose conclusions are in the middle, that is, they have elements of both Carnoy's and Psacharapoulos's ideas. Conclusion in [73] is that the rate of return on investment in education during the first years is almost zero until it begins to grow rapidly until the age of 12 when it falls again. Authors in [23] also came to similar conclusions considering that

returns on investment in secondary education are much higher than those in primary and tertiary education. Individual country studies such as the analysis of returns on investment in education in Sweden [48], Turkey [53] and Colombia [56] also present similar conclusions. The analysis of the existing scientific literature provides insight into another important feature of research on the impact of human capital on economic growth, and that is the analysis of the effects of different levels of education (primary, secondary, tertiary) on economic growth. However, regardless of the level of education observed and the variables used, science is unique in the view that the development of human capital is a prerequisite for economic progress and that this should be taken into account at all stages of defining development and other policies. The gap in the scientific literature regarding the comprehensive analysis and estimation of returns on investment in education in selected countries and using a unique methodology in their assessment are key arguments for justifying the research focus of this article.

METHODOLOGY

DATA SOURCES

The core database used is ISSP. Authors in [73-75] used the ISSP [76] database for the purpose of estimating the return on investment in education. Sampling methods vary from country to country and change from year to year. Methods vary and some countries use a simple random sample while other countries apply systematic sample selection, namely a stratified random sample. This article also employs data from the World Bank's Development Indicators database and the EUROSTAT.

STATISTICAL ANALYSIS

We use the Earnings function and the Short-cut method, both based on the Mincer equation [18] to estimate the return on investment in education in selected EU member states. However, as proposed by [24], we employ the Extended Mincer equation or the Earnings Function which includes dummy variables PRIM (primary education), SEC (secondary education) and TER (tertiary education) for the three education levels. By including different levels of education in the Mincer equation, the assumption of equal returns on investment in education for all levels of education is avoided. The dependent variable lnW_{ij} denotes the logarithmic value of an individual's earnings *j* in time or year *i* and as such allows the analyses of the percentage change and the impact of independent variables in the model. The variable S_{ij} from the basic Mincer equation (represents the total number of years an individual *j* has spent in formal education) has been replaced by three dummy variables denoting the three levels of education. The variable Exp_{ij} denotes the years of work experience of an individual *j* in time (year) *i*, i.e. it enables the inclusion of the labour market segment in the analysis. The value of this variable is obtained by subtracting from the number of years spent in formal education and the number of years (age) at the beginning of education. Finally, the variable Exp^2_{ij} represents the squared value of the variable Exp_{ij} (years of work experience). Accordingly, we specify the following models to be estimated:

$$lnWij = \beta_0+\beta_1 \cdot PRIM+\beta_2 \cdot SEC+\beta_3 \cdot TER+\beta_4 \cdot Exp_{ij}+\beta_5 \cdot Exp_{ij}^2+\beta_6 \cdot GENDER+\beta_7 \cdot MARRIAGE+YR+\varepsilon_{ij}. \quad (1)$$

Equation (1) also contains additional dummy variables: GENDER – dummy variable denoting gender; MARRIAGE – dummy variable indicating marital status and the variable YR which indicates the year of the research, i.e. the year for which the return on investment in education is assessed. According to the International Standard Classification of Education (ISCED), each level of education is assigned an appropriate number of years of formal education. Private returns on investment in primary education (r_1) are calculated using the following equation:

$$r_1 (primary\ education\ vs.\ illiterate)=\beta_1/S_p, \quad (2)$$

where β_1 is the regression coefficient with the variable PRIM and S_p is the number of years of education for the level of primary education**.** Private returns on investment in secondary education (r_2) are calculated using the following equation:

$$r_2\,(secondary\ vs.\ primary\ education)=(\beta_2-\beta_1)/(S_s-S_p), \quad (3)$$

where β_2 is the regression coefficient with the variable SEC, β_1 is the regression coefficient with the variable PRIM, S_s is the number of years of education for the level of secondary education, and S_p is the number of years of education for the level of primary education. Ultimately, private returns on investment in tertiary education are calculated as follows:

$$r_3\,(tertiary\ vs.\ secondary\ education)=(\beta_3-\beta_2)/(S_t-S_s), \quad (4)$$

where β_3 is the regression coefficient with the variable TER, β_2 is the regression coefficient with the variable SEC, S_t is the number of years of education for the tertiary education level and S_s is the number of years of education for the secondary education level. In order to estimate the regression coefficients with three variables of interest (PRIM, SEC and TER), a multiple regression analysis was performed as defined by equation (1). As one of the arguments in favour of using the Mincer extended equation, [26] cites a problem that may arise when estimating returns on investment in primary education. He states that there is a significant asymmetry when estimating returns for this level of education. Namely, students attending primary education (in most cases 6 to 12 years of age) are not able to earn during the same period, so it is wrong to calculate opportunity costs (as lost earnings) for the entire period. Further, articles [77] and [26] state that this problem is most effectively solved by using the extended Mincer equation because in that case a shorter period of time can be assigned to opportunity costs.

The Short-cut method is considered to be a simpler form of the Earnings function because the estimation using this method requires the average wage earned in labour market with a certain level of education in the year *i* [18]. In the Short-cut method for estimating the return on investment in education, private returns on investment in education in the year *i* are calculated as follows [18, 24]:

$$r_{ki}\,(private)=\frac{\overline{Y}_{ki}-\overline{Y}_{(k-\Delta S)}}{S_k*\overline{Y}_{(k-\Delta S)}} \quad (5)$$

The variable r_{ki}(*private*) in (5) refers to private returns on investment in education for the level of education *k*, where $k = 1$ for primary education, $k = 2$ for secondary education and $k = 3$ for tertiary education in time (year) *i*. The variable $\overline{Y}_{ki}$refers to the average earnings of an individual with a completed *k* level of education in a year *i* while the variable $\overline{Y}_{(k-\Delta S)}$ is the average earnings of an individual with a completed first lowest level of education. Ultimately, the variable ΔS is the difference in years of education between *k* and the first lowest level of education and the variable S_k is the number of years of education corresponding to the level of education *k*. One of the disadvantages of this method is the absence of a variable that includes years of work experience (*Exp*).

The Short-cut method also allows calculation of social returns on investment in education in the year *i*, as follows:

$$r_{ki}\,(social)=\frac{\overline{Y}ki-\overline{Y}_{(k-\Delta s)}}{Sk*(\overline{Y}_{(k-\Delta s)}+G_{ki})} \quad (6)$$

In the equation (6), $\overline{Y}_{ki}$ represents the average earnings of an individual with completed *k* level of education in the year *i*, *Sk* is the number of years of education corresponding to the level of education *k*, ΔS is the difference in years of education between *ki* of the first lowest level of education, while *Gki* represents government spending per pupil for the level of education per year *i*. Social returns on investment in education in the Short-cut method are estimated by additional inclusion of government spending (G_k) for the *k* level of education. Using both methods, returns on investment in primary, secondary and tertiary education are estimated.

RESULTS

REGRESION ANALYSIS

Our methodological approach is multiple regression analysis based on the Mincer earnings function and Short-cut method as defined in equation (1) and equations (5, 6), respectively. The obtained regression coefficients are shown in table below.

Table 1. Regression analysis (old and new member states).

		Unstandardized Coefficients		Standardized Coefficients	*t*	Significance
		Unstandardized partial regression coefficient (B)	Std. Error	Beta		
New members EU	Constant	–204,7	0,614		–333,617	0
	PRIM	0,21	0,015	0,088	13,716	0
	SEC	0,458	0,016	0,17	28,472	0
	TER	0,724	0,017	0,18	41,951	0
	Exp	0,01	0,001	0,15	19,595	0
	Exp^2	0	0	–0,241	–30,932	0
	Gender	0,275	0,005	0,12	60,054	0
	Marriage	0,042	0,005	0,018	8,472	0
	YR	0,104	0	0,693	338,306	0
Old members EU	Constant	–49,349	0,407		–121,313	0
	PRIM	0,559	0,008	0,338	69,667	0
	SEC	0,937	0,009	0,503	109,633	0
	TER	1,2	0,009	0,527	133,025	0
	Exp	0,031	0	0,675	96,766	0
	Exp^2	0	0	–0,656	–95,425	0
	Gender	0,357	0,003	0,216	115,225	0
	Marriage	0,042	0,003	0,025	12,624	0
	YR	0,027	0	0,256	132,012	0

According to the results of the regression analysis, each additional year of work experience in the group of new members of the European Union brings an increase of about 1 % of salary, while in the group of old members it is 3,1 %. Men in the new EU member states earn on average about 27 % more than women, while the difference in the group of old members is about 37 %.

ESTIMATES BASED ON THE EARNINGS FUNCTION

PRIM, SEC and TER from Table 2 are the results of regression estimates with the above three variables and are needed to calculate private returns on investment in primary (r_1), secondary (r_2) and tertiary education (r_3).

Table 2. Regression coefficients and private returns on investment in education estimated by the Earnings Function in the old and new members of the EU, 1985 - 2014, (%).

	PRIM	SEC	TER	r_1	r_2	r_3
Old EU members	0,559	0,937	1,200	9,3	6,3	6,6
New EU members	0,21	0,458	0,724	3,5	4,1	6,6

The largest gap between the old and new members of the EU, according to the estimates obtained using the Earnings Function, is visible at the level of primary education and it

decreases when the level of education increases. The results of the estimated returns on investment in education in the group of old members are in line with the thesis in [26] that returns on investment in education are highest at the level of primary education regardless of the level of development of the country. The pattern of return on investment in education in the old EU member states is in line with a previous research [78] who points out the existence of the highest returns on investment in primary education, followed by a decline in returns on investment in secondary education and a slight increase again in tertiary education. The authors call this a U-shaped pattern. However, the estimated returns on investment in education in the group of new EU members show a different pattern. Namely, the returns in this group are more in line with previous researches [67-69], which pointed out the existence of the highest returns from investing in secondary and tertiary education. The ideas in [25, 26] are partly applicable to both groups of countries analyzed, at least as far as the pattern of return on investment in education is concerned. Namely, the author believes that it may come from a slight increase in return on investment in education in the transition from secondary to tertiary education. The average return on investment in education in the group of old members is 7,4 %, which is close to the OECD average (7,5 %) according to [28], while the average return on investment in education in the group of new EU members was lower than the estimated returns in the group of old members and amounted to 4,7 %.

Table 3. Regression coefficients and estimated private returns on investment in education by the Earnings function in the old member states of the EU, 1985 - 2014, (%).

Country	*PRIM*	*SEC*	*TER*	r_1	r_2	r_3
Austria	–0,097	0,219	0,269	–1,6	5,3	1,3
Belgium	0,187	0,456	0,743	3,1	4,5	7,2
Denmark	–0,09	0,126	0,37	–1,5	3,6	6,1
Finland	–0,077	0,212	0,479	–1,3	4,8	6,7
France	0,226	0,55	0,878	3,8	5,4	8,2
Germany	0,19	0,473	0,781	3,2	4,7	7,7
Ireland	–0,027	0,289	0,602	–0,4	5,3	7,8
Italy	–0,169	0,224	0,466	–2,8	6,6	6,0
Netherlands	0,161	0,336	0,556	2,7	2,9	5,5
Portugal	0,36	0,78	1,193	6,0	7,0	10,3
Spain	0,162	0,451	0,754	2,7	4,8	7,6
Sweden	0,006	0,182	0,404	1,0	2,9	5,6
United Kingdom	–0,592	0,3	0,592	–9,9	14,9	7,3

Private returns estimated by the earnings function in this group of countries were highest at the level of tertiary education in all countries except the United Kingdom, Austria and Italy as seen in Table 3. Earlier estimates of returns on investment in education in the United Kingdom have shown significant differences when compared to other countries. Namely, [23] estimated returns on investment in education for the United Kingdom between 7 % and 9 % (OLS estimates) and 11-15 % (estimates using instrumental variables), while estimates for other countries averaged around 6 % (OLS estimates) and 9 % (estimated using instrumental variables). [74] also point to relatively higher estimates of return on investment in education in the United Kingdom (8-10 %) than the average of other countries (6,5 %). Table 3 also shows negative returns on investment in education, exclusively at the level of primary education. According to the literature [73, 79] the occurrence of negative returns on investment in education is not uncommon as they are the same indicators of the existence of low returns for a certain level of education. The same applies to the results presented in Table 4.

Table 4. Regression coefficients and private returns on investment in education estimated by the Earnings function in the new EU member states, 1985-2014, percentage.

Country	*PRIM*	*SEC*	*TER*	r_1	r_2	r_3
Bulgaria	0,077	0,345	0,484	1,3	4,5	3,5
Croatia	0,094	0,367	0,66	1,6	4,6	7,3
Cyprus	–0,186	0,429	0,481	–3,1	10,3	1,3
Czech Republic	–0,07	0,098	0,319	–1,2	2,8	5,5
Estonia	–0,104	0,053	0,365	–1,7	2,6	7,8
Hungary	0,282	0,575	0,849	4,7	4,9	6,9
Latvia	–0,09	0,175	0,365	–1,5	4,4	4,7
Lithuania	–0,129	0,1	0,368	–2,2	3,8	6,7
Poland	0,028	0,221	0,655	0,5	3,2	10,9
Slovakia	0,152	0,364	0,665	2,5	3,5	7,5
Slovenia	0,047	0,45	0,731	0,8	6,7	7,0

The highest private returns on investment in tertiary education were recorded in all countries except in two cases: Bulgaria and Cyprus, where the highest returns on investment in secondary education were estimated. Estimated returns on investment in education in the new members of the Union show the highest average returns on investment in Hungary, Poland and Slovenia (above the average of the new members). These results are in line with the results of individual studies of these countries, namely: a growth in return on investment in education in Hungary during 1989-1996. [80]; a growth in return on investment in education in Poland during 1992-1995 [81] and a growth of returns on investment in education in Slovenia during 1993 [82]. [58] cite the example of Hungary and Poland as the countries with the highest returns on investment in education among the eight transition countries analyzed. The authors cite structural reforms and institutional frameworks as possible explanations for higher returns in Hungary and Poland, specifically citing a planned and structured education reform during the transition process as an important success factor. The estimate also shows the lowest average returns on investment in education (including old and new members of the European Union) in Austria (1,7 %). Authors [83] emphasize the existence of low returns on investment in education in Austria, citing the period 1981-1997 as the period of the largest decline in return on investment in education. Low average returns on investment in education in the group of old EU member states were also recorded in Sweden. [48] analyses the decline in returns on investment in education in Sweden.

ESTIMATES BASED ON SHORT-CUT METHOD

Estimated private returns on investment in primary, secondary and tertiary education in the new EU member states by the Short-cut method are highest at the tertiary education level, as is the case with the Earnings Function-based estimate.

Table 5. Private returns on investment in education estimated by the Short-cut method, old and new members of the EU.

	$r_{1(private)}$	$r_{2(private)}$	$r_{3(private)}$
Old EU members	7,8	6,3	7,8
New EU members	8,1	6,3	7,7

However, the estimation of private returns using the Short-cut method showed significantly higher returns in all countries, and especially higher returns at the level of primary education (Bulgaria, Croatia, Cyprus, Latvia, Slovakia). Nevertheless, the highest average returns estimated by the Short-cut method as is the case with the Earnings Function are in Hungary and Poland. Also, the estimates based on the Earnings Function show negative returns on

investment, which are almost non-existent in Short-cut method estimates (except in the case of Austria, Denmark and Estonia).

During the period from the beginning of the transition process of the new EU members, the average private return on investment in primary education was about 7 %, while estimating the return based on the Earnings Function we get an average return of 3,5 % for the same level education. And [84] emphasizes the importance of secondary education with special emphasis on vocational education in centrally planned economies, stating that significant financial resources have been invested in this level of education. Namely, planned production, which in a large number of cases referred to the exploitation of natural resources or their simple processing, required knowledge and skills at the level of primary and / or secondary vocational education. Additional justification for low returns from investment in primary and secondary education in the new member states of the Union, and in the above context, is in a significant share of persons with completed primary and secondary education in the structure of employees in the pre-transition period. These conclusions are consistent with the earlier conclusions of [85] and [58] who also point out the growth of returns in the first stages of transition and the absence of significant growth in the later stages of the process. The increase in returns on investment in education since the beginning of the transition is linked to the first phase of education reforms, which, according to [86-90], saw a significant inflow of foreign funding. However, there was no significant increase in return on investment in education during the same time period in the old member states. [74] state that there is a global trend of declining returns on investment at all levels of education during the 1990s and especially in the second half of the decade. [57] recorded an increase in average private returns on investment in education in transition countries from about 5 % (1989) to about 8 % (1990s). The evaluation by the Short-cut method showed identical results for the new members of the Union during these two periods. It also showed that average returns on investment during the 2000s remained at the same level as during the 1990s (8 %). [91] states that transition countries still face the problem of lack of skilled labor, which, according to [81], has led to a certain increase in returns which, according to the same author, has slowed down and is expected to stagnate and eventually decline. The estimated average returns on investment in education in the old member states of the Union began to fall in the 2000s compared to the 1990s. From a theoretical point of view, [22] states that the decline in return on investment in education comes with an increase in the share of the population with a high level of education, or generally due to an increase in the level of education of the workforce. This is also known in literature as the Becker's Woytinsky Lecture Hypothesis. [27, 74] also state the same reason for the decline in returns on investment in education.

Estimation of return on investment in education with the Short-cut method shows that in both groups of countries returns on investment in primary education were the highest, which is consistent with [2, 24-27] who believes that returns on investment in education are always the highest for primary education no matter what level of development the country is at. Also, the results of estimates of returns on investment in education using the Short-cut method show the largest decline in returns on investment in tertiary education during the period of initial transition reforms in the new member states (1988-1993) in contrast to [64], who emphasize the existence of a faster decline in returns from investing in lower rather than in higher levels of education.

In the group of old EU member states, the highest social returns on investment were recorded at the level of tertiary education, except in the case of Austria, where the highest social returns on investment in secondary education were recorded. Authors [83] cite an increase in the supply of highly educated labour as one of the reasons for the decline in the return on

investment in education in estimating the return on investment in education in Austria during the period 1981-1997. In [79], as previously stated in the article, authors consider that negative returns on investment are an indicator of very low returns on investment in education.

Table 6. Social returns from investment in primary, secondary and tertiary education for old and new EU members, average.

	Primary education	Secondary education	Tertiary education
Old members EU	6,4	9,7	15,2
New members EU	6,5	9,9	17,1

If we look at the period before the transition of the new members (1985-1990), the first phase of transition (1991-1990) and the second phase of transition and integration (2000-2014), the average social returns on investment in education are given in the table below:

Table 7. Average social returns on investment in education, 1998-2013, percentage.

	1986-1990	1991-1999	2000-2014
Old members EU	7,0	8,0	7,0
New members EU	5,0	8,0	8,0

Average social returns on investment in education in the old members of the Union indicate a decline during the 2000s, while average social returns on investment in education increased in the new members of the Union over the same time period. Namely, the old members of the European Union after 2001 also recorded a decline in investment in education, especially in tertiary education (a decline of 6 % of GDP in 2005 compared to the level of investment in 1998).

Table 8. Average investment in primary, secondary and tertiary education in old and new EU member states, 1998-2013, (% of GDP pc).

	Investment in primary education	Investment in secondary education	Investment in tertiary education
Old members EU	19,8	25,8	34,4
New members EU	19,2	22,4	26,7

The difference in investment at the tertiary education level is the biggest. According to [28, 92-93,], primary education is more socially profitable in low-income countries while secondary and tertiary education are more socially profitable in middle- and high-income countries. [92] showed that social returns from investment in tertiary education are highest in the case of developed countries (20 %) and are low or even negative at the level of secondary education because the benefits of secondary education coverage are small in comparison to costs. However, according to [26], social returns from investing in secondary education are highest.

DISCUSSION

NONLINEARITY IN RETURNS ON INVESTMENT IN EDUCATION

The research results in this article are partly in line with earlier findings by [23, 73, 75] which suggested nonlinearity in returns on investment in education. Namely, the linearity in returns would mean an increase in return on investment in education with an increase in the level of education. Authors such as [23, 73, 75] also point out the existence of nonlinearity in terms of the increase in return on investment in secondary education relative to primary education and the decrease in return on investment in tertiary education relative to secondary education. However, the pattern of nonlinearity in the scientific literature that deals with returns on investment in education is unclear. [73] argues that endogeneity in education may partly explain the increasing returns from investment in education from the beginning of the education process, but not the declining returns from the increasing levels of education.

The estimated returns on investment based on the Earnings Function and Short-cut method in this article show nonlinearity, as is the case with previous research [73, 75]. Nonlinearity occurs, among others due to:

- The assessment of return on investment in education considers only the quantity of education through the number of years spent in education without considering the quality of education and equal access to quality education for all participants in the education process.
- The assessment of the return on investment in education does not consider the specifics of national labour markets, which primarily refers to the relationship between the level of wages and labour productivity. [9] emphasises the existence of higher wages relative to the level of productivity in the public sector compared to the private sector, which can ultimately lead to the emergence of nonlinearity.
- The mismatch between the education system and the needs of labour market leads to a shortage or surplus of labour with certain knowledge and skills, which significantly affects the return on investment in education [26].

The most significant difference in terms of returns at different levels of education between the old and new members in the research exists at the level of tertiary education in the pre-transition period and the period from the beginning of the transition process. Namely, this is a period during which the new members were still predominantly centrally planned economies or were at the very beginning of the transition process, where market forces of supply and demand for certain skills did not affect the level of wages in labour market. [93] states that wage inequality was much lower during the transition process compared to the then OECD average. The increase in returns on investment in tertiary education in the new member states was recorded after 2007, where returns averaged 8 %. Returns from tertiary education in this group of countries during 1995-2014 ranged between 6-10 %, [26, 28, 49] and is the average for high-income countries and OECD countries. [69] also highlights the existence of a convergence of returns on investment in education in transition countries to a world average of 10 %. [26, 28] also concludes that the general picture of the return on investment in education is in fact based on the law of declining returns despite the slight increase in returns relative to the level of development of the country. If we analyse the return on investment by the level of education estimated by the Short-cut method, we come to the following conclusions about possible trends and patterns:

- return on investment in primary education in the new EU member states follows the trends in the old member states,
- the returns on investment in tertiary education in the old members of the Union in the second half of the 1980s were higher than the returns in the new members. The beginning of the transition (1990-1994) is described as a period marked by instability, but after that there comes an increase in returns on investment in tertiary education. However, as stated in [58], the evidence for the existence of increasing returns on investment in education is weak.

However, according to some authors, instabilities in terms of return on investment in education in the new member states of the Union during the transition process were not great given the number and importance of reforms. [57] offered an explanation based on reforms that focused on the liberalization of legislation, in particular labour legislation as well as other institutional constraints related to the regulation of wage levels in labour market. The faster the reforms were implemented, the faster the returns on investment adjusted to the market. [94] states that the countries in which the so-called Shock therapy (Bulgaria, Slovakia, and the Czech Republic) had higher average returns than investments in education in comparison to other countries. Also, other successful transition countries (Hungary, Poland) have returns on investment in education that are above average, as estimated in the research in this doctoral dissertation. Article [15]

emphasises the importance of structural transformations by stating that more educated individuals are able to better adapt and respond to new challenges and opportunities, which alleviates initial instabilities in labour market. Finally, [95] and [96] highlight a change in the value system in these new economies that took education into account when defining wages in labour market. The analysis of estimated returns on investment in primary, secondary and tertiary education using The Short-cut method shows an overall slight decline in returns on investment in education in all countries, and this is in line with the conclusions in [8, 26, 28, 73, 75, 97] regarding global trends in returns on investment in education.

NEGATIVE RETURNS ON INVESTMENT IN EDUCATION AND LESSON FOR SUSTAINABLE EDUCATION POLICY

Negative returns on investment in education are not uncommon and modern scientific literature especially in cases where returns are estimated in developed countries. A situation where there is a disparity in knowledge and skills in scientific literature is known as the case of overqualification and/or insufficient qualification of the workforce (persons accept employment where their level of knowledge and skills does not match job description and job tasks) [98]. In literature, we find more detailed analyses related to the cases of supply-side problems (supply increase). [99] analysed the case of the United Kingdom, stating that the increase in student enrolment in the mid-1980s, together with lower costs per student, led to a decline in returns on investment in education. [100] states that in the case of the United States during the 1970s, there was a decline in returns on investment in tertiary education due to an increase in the supply of university graduates. Authors such as [101] also state that a similar phenomenon is possible in developed countries during financial instabilities and crises when there is an increase in supply due to a falling employment and ultimately a fall in return on investment in education. [99] further states that the patterns of supply and demand in labor markets of developed countries have shown over the last forty years that there is a trend of insufficient qualifications at the beginning of the transition process and that after that comes a period of retraining as the transition process finalizes. Share of highly educated people in the total workforce has increased significantly in recent decades. Authors such as [79, 99, 102, 103] state that this is especially significant in the case of developed countries where investment returns fall and there is an increase in the level of education of the total population. The return on investment in education is reported to fall between 5-26 % in the event of retraining in developed countries [98, 99, 102, 104]. In addition to the stated (possible) reasons for the mismatch between supply and demand in labour market, which can be stated to be temporary, [99] argues that retraining is the result of a serious imbalance and as such may be permanent. The author also states that retrained individuals continue to be retrained for a given job over time and that retraining is the result of an inefficient resource allocation and also brings cost to both the individual and the society. As the only solution, the author cites a more efficient allocation of available resources. One of the basic policies that appears as a possible solution to the problem of negative returns on investment in education is labour legislation or a legal framework that will regulate labour market and thus significantly affect the return on investment in education. This applies in particular to legal provisions regarding the minimum wage that most directly affects supply and demand in labour market. However, as such, it can create a picture of non-existence of the need for education in society and ultimately lead to a decline in the return on investment in education [105, 106] cite Russia and other (communist) countries as cases where there are negative returns on investment in education resulting from government intervention or some other (non-market) compensation and compensation for work.

CONCLUSION

Investing in education is significant, whether it is investing in inputs or outputs of education, or in the process itself. However, contemporary literature that deals with returns on investment in

education, shows discrepancies in terms of conclusions, as well as recommendations and practical implications of research. We see a key difference in the reflections of authors Carnoy and Psacharopoulos. Namely, [5, 6, 63, 107] believes that returns on investment in education depend on the level of development of the country, while [2, 24-27] considers that returns on investment in primary education are always highest regardless of the level of development of the country. Estimated returns on investment in education in the EU member states indicate the existence of a gap between the old and new members of the Union and the absence of a significant increase in the return on investment in education. Using the Earnings function, we can see that estimated average private returns on investment in education in the new EU member states are lowest at the level of primary education. They increase with the increase of the level of education, which makes returns linear, while the results of the cutting method show nonlinearity, i.e. a U-curve. This research confirms the theses of [108] and [68], that different levels of return on investment in education are the result of using different methodologies in assessment, although this research went a step further by focusing on assessing returns by using data from the same (consistent) source. [2, 24-27] believes that returns are always highest for the level of primary education no matter what level of development the country is at. However, this article uses identical methods which lead to contradictory assessment results. Ultimately, one of the research objectives of this article is to contribute to scientific literature and to contemporary methodological discussions regarding the methodology for estimating the return on investment in education. Authors such as Menon [109, 110] have shown that Elaborate method and Short-cut method are interchangeable, and that both methods indicate significant heterogeneities between groups of countries and between countries separately.

This article, although covering a relatively long period of time (1985-2014), did not show homogeneous patterns of return on education investment in these two groups of countries but rather indicated significant heterogeneities among the countries themselves. Therefore, it is necessary to interpret the relationship between wages and levels of education for each country separately, taking into account its specifics such as the relationship between education policy and other policies (e.g. labour market policy and budgetary policies) and national reforms (whether transitional reforms or integration process), and taking into account regional and global trends in education, such as the growing importance of international organizations, regional projects, programs, etc. Another potential limitation of work is the data used in estimating the return on investment in education. Namely, estimating the return on investment in education using methods based on the Mincer equation requires data at the micro level, which in most cases are collected through differently designed questionnaires and collection methods in general. All research created in this way has its own limitations. Taking into account the declining returns on investment in tertiary education as well as the significant expansion of this level of education across EU countries, it is necessary to further analyse specific policies that could be used to overcome labour market mismatches such as identifying active policies and other policies that will stimulate a higher level of labour market flexibility.

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