
Changes in private returns to education caused by the tertiary education expansion in Slovakia

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Abstract. *This article brings evidence on tertiary education expansion in Slovakia and explores possible effects of this expansion on private returns to education. It focuses particularly on intergenerational differences in private returns to education. The question is whether tertiary education expansion has decreased private returns to education and whether there are differences in the value of education acquired by different generations. European Union Community Statistics on Income and Living Conditions data were used to answer this question. Private returns to education were estimated using a standard Mincerian approach. The value of tertiary education of persons under 45 years old showed to be behaving differently in time than the value of tertiary education of persons aged 45 and older. This development may be caused by the recent tertiary education expansion in Slovakia.*

Keywords: private returns to education, tertiary education expansion.

JEL Codes: J31, J38, J18

1. Introduction

Practically all the European countries face a historically unique expansion of tertiary education. Especially in countries which had experienced a centrally planned economy, the transition to modern schooling brings some fairly radical shifts. Their population over 45 years old, with dominantly secondary education has to compete on the labour market with younger, more educated age groups. A sharp increase in numbers of tertiary education students and graduates during the end of the Nineties and after 2000 may in future put pressure on wage inequality based on age and education. Slovakia in this respect offers a perfect example, with one of the sharpest increases in tertiary education accessibility forced also by demographic changes. Tertiary education (TE) expansion presents an international trend, which is already rooted in national and supranational strategies. European strategy Europe 2020 offers a perfect example, with its benchmark saying that in 2020 tertiary education attainment of 30-34 year olds should at least reach 40 percent. (European Commission, 2010) This paper questions the consequences of such development on private returns to education of individuals. It looks at the change in the value of education between generations.

2. Theoretical assumptions

If we consider education as a good, TE expansion brings an increase in supply of this good. If the supply is growing, the unit price is supposed to decrease. The human capital theory argues at this point, that education presents a good, which directly increases the productivity of a worker and thus results into a higher wage of such worker, regardless of the amount of tertiary educated on the market. On the other side, the screening hypothesis says that if the proportion of population able to complete TE grows, the value of TE falls down. This reasoning is based on a so-called signalling function of education, when in an asymmetric information environment where employers are seeking quality work force, the information on attained education is one of few available information speaking about the qualities of individuals. If education becomes more available, the signalling information of education gets weaker.

In connection to such reasoning, we can imagine three possible situations resulting from the TE expansion. In the first situation, the value of education stays nearly the same in time and between generations. This is in line with the human capital approach, when despite the growing supply of tertiary educated education keeps its value because its contribution to the productivity remains the same.

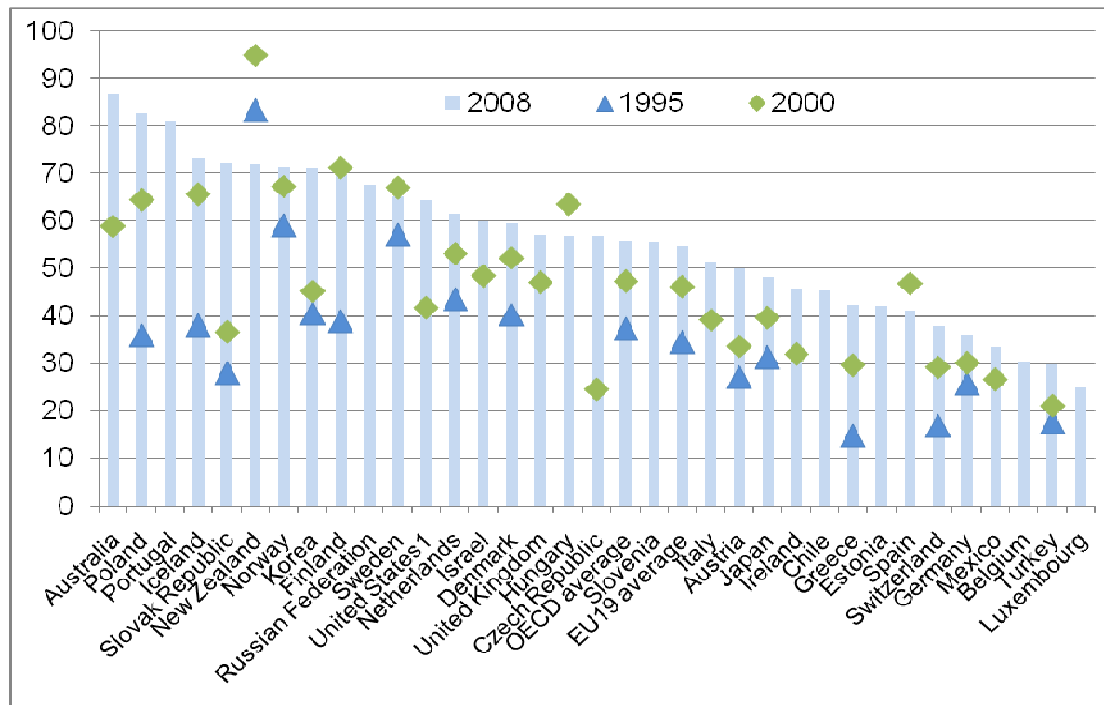
In the second situation, the overall value of education is decreasing due to the TE expansion, directly reacting on the rise in supply of tertiary educated.

In the third situation, the value of education acquired before and after the TE expansion is diverging, thus there are differences in the dynamics of the value of education between age groups. This hypothetical situation is in line with the screening function of education, when employers react on the weakening of the signalling function of TE acquired after the TE expansion.

The research question of this article rises from these three hypothetical situations resulting from the TE expansion. We are asking: What is the reaction of the Slovak labour market on the TE expansion? The reaction of the market will be observed by looking at the changes in private returns to education.

3. Tertiary education expansion in Slovakia

Slovak labour market offers one of the best environments to test the effect of TE expansion. This is thanks to an extreme increase in tertiary education availability after 2000. According to 2008 entry rates to tertiary education (type A), Slovakia was the country with the fifth highest figure among all OECD countries, with over 70 percent. On the other side, when looking at 1995 figures Slovakia was the sixth worst performing among OECD countries in this indicator. Slovakia thus fulfils two preconditions of a TE expansive environment, with high entry rates after 2008 and extreme rise of entry rates in the last years.

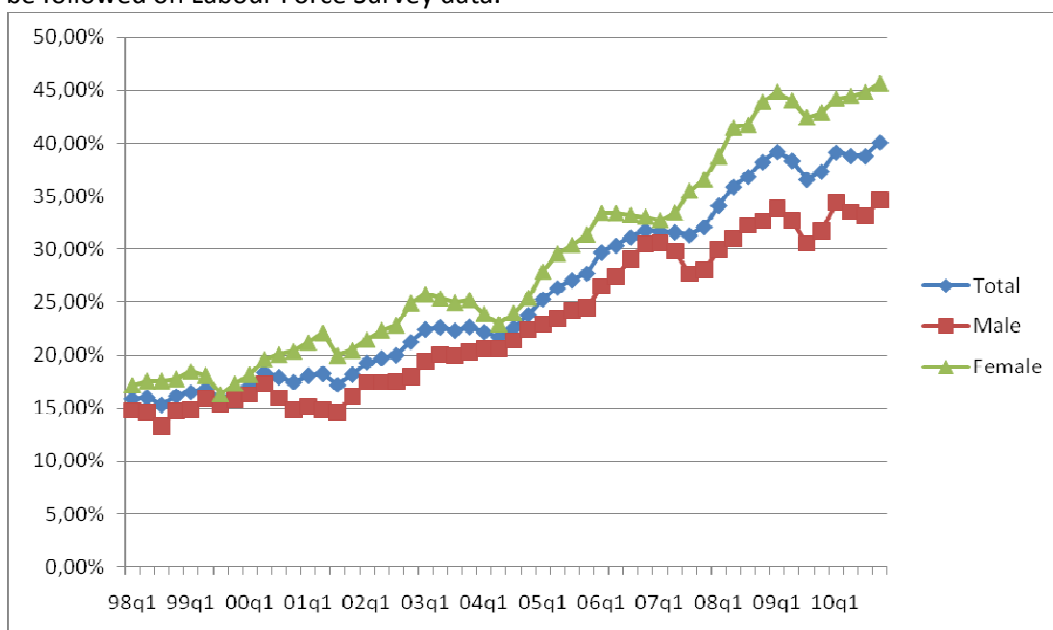


Source: (OECD, 2010), Table A2.4

Fig. 1: Entry rates into tertiary-type A education (1995, 2000 and 2008)

A similar situation can be observed also in the case of Poland and partially also the Czech Republic. The rise in TE entry rates in these countries was exceptional basically due to two reasons. Firstly, because of the increase of absolute numbers of students and graduates of TE. Secondly, also because of a sharp decrease

of the population of 19 year olds, which is set as the reference category to count the entry rates. Moreover, the starting position of these countries was from very low entry rates into TE because the central planning before 1989 held the accessibility of tertiary education down due to ideological reasons. Thanks to the change of the political system, the year 1989 can be considered also as the start of TE expansion. The difference in entry rates in the early Nineties and after 2000 is for these reasons outstanding. Based on this evidence we could conclude that different age groups have faced different availability of TE. The entry rates, according to the OECD definition (OECD, 2009), do not follow the individual availability of TE in a strict sense, as far as they present a simple ratio of TE enrolment and the population in the reference year. Individuals may enter TE also in age that differs from the reference age. The real participation of individuals in TE can be followed on Labour Force Survey data.

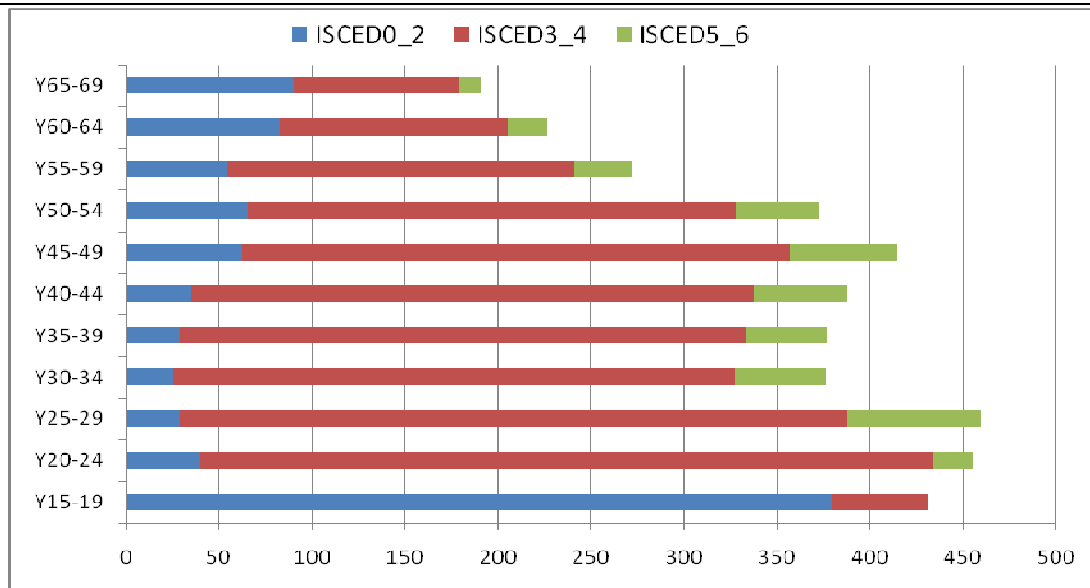


Source: Author's calculations using Labour Force Survey data

Fig. 2: Participation in tertiary education of the age groups 20-24

According to the Labour Force Survey, the participation in TE has more than doubled in case of young men and almost tripled in case of young women between 20 and 24 years. This has happened during 12 years on which we have evidence. Individuals have faced a fairly different TE availability on different ends of this short period. There are reasons to assume that before 1998 the participation in TE was even lower than 15% in 1998.

Due to demographic waving, in Europe linked with the end of the World War 2, contemporary labour market in Slovakia employs two extensive demographic waves. One has just entered the labour market, with its peak around the age of 30. The second has its peak around the age of 50. We can speak about two generations, one has just entered the productive age and the second is before retirement. To separate these two generations we will use the threshold age of 45 years. For simplification I will refer to individuals younger than 45 as to sons and to individuals 45 and older as to fathers.



Source: Eurostat

Fig. 3: Slovak population according to age and educational attainment in thousands of persons (data for 2004- the beginning of the reference period)

4. Data and Methodology

The research question asks for the reaction of Slovak labour market on the recent TE expansion. We will be looking for this reaction by looking at private returns to education. To measure these, we will employ a standard methodology originally brought by Jacob Mincer (Mincer, 1974). This methodology is based on a linear regression equation with individual's wage set as dependent variable and individual characteristics, such as education, set as independent variables. The coefficients of returns to education will be estimated using European Union Community Statistics on Income and Living Conditions (EU-SILC) ¹ microdata from rounds 2005-2010, which offer the reference period of 2004 to 2009.

To answer the research questions, two variations of the Mincer equation were used. They differ in the way of measuring the educational level of individuals. The first one uses the number of years spent in schooling. The second uses dummy variables for three educational levels, namely: tertiary, upper secondary and primary together with lower secondary. The standard formulation of a Mincerian equation is as follows:

$\ln(W) = \sum_i \beta_i X_i + \varepsilon$ where W is presented by the average hourly earning, counted using gross income from labour and usual number of hours worked per week. X_i is a vector of various characteristics of workers and employers. The characteristics included in the vector are the same for both equations with the exception of the above-mentioned educational level. Individual characteristics include:

- years of schooling/educational level dummy

(The years of schooling were assessed from the declared highest level of attained education, as the average of possible educational trajectories leading to declared level of education)

- experience (Based on the answer to: "Number of years spent in paid employment")
- experience squared (According to the Mincer's equation usage)
- gender dummy
- dummies for region (NUTS 2 level: Bratislava, Western Slovakia, Middle Slovakia, Eastern Slovakia)
- dummies for economic sector (Agriculture and Mining, Industry, Services, Public Services)

¹ For more information on methodology of the survey see:

http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=2005-S-116-114302

These equations were applied on the total employed population. The results will report only the coefficients of returns to education. All other variables are used as control variables. Complete results of the regression can be found online, follow the links in the footnote under each table. The following table displays some descriptive statistics of the dependent variable from the beginning and the end of the reference period.

	2004			2009		
Over 45	Mean	Std. Deviation	N	Mean	Std. Deviation	N
Under 45	87.45	77.61	3798	116.69	132.34	3785
Over 45	90.27	60,37	2187	119.63	62.45	2661
Total	88.48	71.80	5985	117.90	109.06	6446
Gender	Mean	Std. Deviation	N	Mean	Std. Deviation	N
Male	97.11	69.97	3021	132.07	142.08	3239
Female	79.68	72.59	2964	103.59	55.81	3207
Total	88.48	71.80	5985	117.90	109.06	6446
Education level	Mean	Std. Deviation	N	Mean	Std. Deviation	N
Primary and Low secondary	63.99	42.19	232	82.65	43.41	188
Upper secondary	81.69	64.03	4577	107.64	69.84	4675
Tertiary	119.78	93.09	1175	152.48	179.47	1581
Total	88.48	71.81	5984	117.91	109.08	6444
Quintile of experience	Mean	Std. Deviation	N	Mean	Std. Deviation	N
1	85.81	93.70	1569	107.49	182.12	1407
2	87.94	50.30	1558	122.04	77.44	1518
3	92.78	68.79	1385	125.31	98.16	1293
4	85.93	51.39	1049	119.91	62.28	1410
5	87.43	44.66	357	113.72	57.78	795
Total	88.12	68.52	5918	118.02	109.19	6423
Region (NUTS 2)	Mean	Std. Deviation	N	Mean	Std. Deviation	N
Bratislava	117.22	112.84	785	143.28	132.88	661
Western Slovakia	82,74	68.52	2138	117,76	148.38	2284
Central Slovakia	85.35	57.49	1462	114.98	67,39	1657
Eastern Slovakia	84.90	57.31	1600	111.61	60.33	1844
Total	88.48	71.80	5985	117.90	109.06	6446
Industry	Mean	Std. Deviation	N	Mean	Std. Deviation	N
Agriculture and mining	84.68	97.67	256	99.44	47.62	430
Manufacturing	88.42	56.41	1983	123.49	93.07	1745
Services	86.07	75.06	1997	123.32	212.26	1042
Public Services	91.48	79.03	1709	122,73	62.83	1599
Total	88.35	71.85	5945	121.05	120.15	4816

Source: Author's calculations using EU-SILC data

Fig. 4: Descriptive statistics of the dependent variable

5. Results

We have applied the above-described equation on the Slovak working population, which was split into those younger than 45 and those of 45 and older. The following table reports the regression coefficients and standard errors estimated for years of schooling.

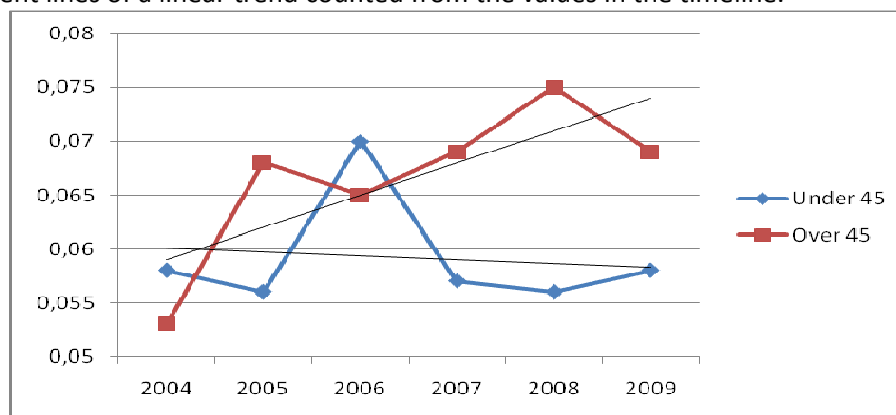
			2004	2005	2006	2007	2008	2009
Years of schooling	Under 45	B	0.058	0.056	0.070	0.057	0.056	0.058
		S.E.	0.003	0.008	0.005	0.003	0.005	0.,005
	R-squared		0.157	0.116	0.123	0.149	0.116	0.142
	N		3741	3501	3477	3922	3767	3770
	45 and over	B	0.053	0.068	0.065	0.069	0.075	0.069
		S.E.	0.004	0.005	0.006	0.004	0.005	0.005
	R-squared		0.151	0.146	0.102	0.164	0.141	0.,101
N		2176	2206	2369	2658	2580	2651	

All reported coefficients are statistically significant at the 0.001 level

Source: Author's calculations using EU-SILC data

Fig. 5: Coefficients for years of schooling estimated for the whole working population split into 2 age groups²

The reported coefficients can be interpreted as the contribution of one year of education to the salary of an individual. For this reason, they present one measure of returns to education. As can be observed from the table, in 2004 the returns to education of individuals under 45 were slightly higher (0,058) than those over 45 (0.053). In 2004 one year of schooling increased the salary of a son by 5.8 percent, while one year of schooling of a father increased his salary only by 5.3 percent. The returns to education of sons have shown a stagnating trend in the following 5 years. Numbers for the year 2006 present an exception, when the figure jumped steeply above other figures from the same time series. Data for the year 2006 need further inquiry, but the stagnating trend of sons' returns to education is confirmed by all other values of the time series. The following graph shows the development of returns to education of sons and fathers. The slight black lines present lines of a linear trend counted from the values in the timeline.



Source: Author's calculations using EU-SILC data

Fig. 6: Coefficients for years of schooling estimated for the whole working population split into 2 age groups

² Detailed results of the regression, together with SPSS commands can be found online: http://www.ekonom.sav.sk/uploads/journals/Stefanik/annex1/index_1.htm

The graph shows the stagnating trend of returns to education of sons, which can be observed from 2004 to 2009. On the contrary, the development of returns to education of fathers shows a clear increase. Thanks to this development the returns to one year of schooling of fathers have jumped above the returns of sons. At the end of the reference period the values were 5.8 percent in the case of sons and 6.9 percent in the case of fathers. Returns to education counted using years of schooling are showing a clear diverging trend with stagnation in returns to education and growth in returns to education of fathers.

This article is linking returns to education with tertiary education expansion. Therefore we will look more closely on the returns to education of tertiary educated. The following table reports estimated coefficients of a regression with tertiary education indicated with a dummy variable. These are the coefficients estimated for the tertiary education dummy variable. Primary together with lower secondary education was set as the reference category. The values of the reported coefficients are referring to the difference in the value of tertiary and primary education.

			2004	2005	2006	2007	2008	2009
Tertiary education (Primary set as reference)	Under 45	B	0.494	0.54	0.847	0.496	0.594	0.701
		S.E.	0.06	0.073	0.101	0.059	0.102	0.098
	R-squared		0.157	0.116	0.126	0.147	0.117	0.144
	N		3741	3504	3477	3929	3769	3770
	45 and over	B	0.538	0.647	0.676	0.648	0.812	0.613
		S.E.	0.047	0.041	0.074	0.05	0.066	0.067
	R-squared		0.155	0.147	0.104	0.164	0.147	0.100
N		2177	2208	2369	2664	2581	2653	

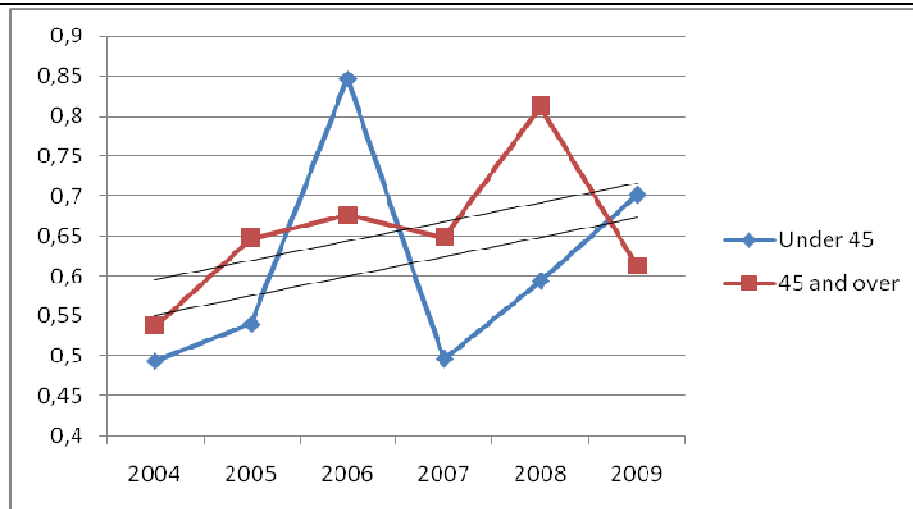
All reported coefficients are statistically significant at the 0,001 level

Source: Author's calculations using EU-SILC data

Fig.7: Coefficients for tertiary education (primary and lower secondary education set as the reference category), estimated for the whole working population split into 2 age groups³

The difference in the value of tertiary education between fathers and sons is not as clear as when looking at the returns to years of schooling. The value of tertiary education of fathers is slightly above the value of tertiary education of sons when looking at the whole reference period, but these changes in particular years. The numbers measures for 2006 are also here above the rest of the time series. The following graph shows the development graphically.

³ Detailed results of the regression, together with SPSS commands can be found online: http://www.ekonom.sav.sk/uploads/journals/Stefanik/annex1/index_2.htm



Source: Author's calculations using EU-SILC data

Fig. 8: Coefficients for tertiary education (primary and lower secondary education set as the reference category), estimated for the whole working population split into 2 age groups

With reference to primary education both the value of tertiary education of sons as well as fathers, are growing steadily. The trend of this growth does not differ between generations.

The following table shows the development of returns to tertiary education, with the reference category set as upper secondary.

			2004	2005	2006	2007	2008	2009
Tertiary education (Upper secondary set as reference)	Under 45	B	0.347	0.334	0.41	0.337	0.336	0.331
		S.E.	0.021	0.023	0.033	0.02	0.029	0.032
	R-squared		0.157	0.117	0.126	0.147	0.117	0.144
	N		3741	3504	3477	3929	3769	3770
	45 and over	B	0.296	0.398	0.368	0.4	0.437	0.405
		S.E.	0.028	0.029	0.039	0.026	0.03	0.033
	R-squared		0.155	0.145	0.104	0.164	0.148	0.1
	N		2177	2208	2369	2664	2581	2653

All reported coefficients are statistically significant at the 0,001 level

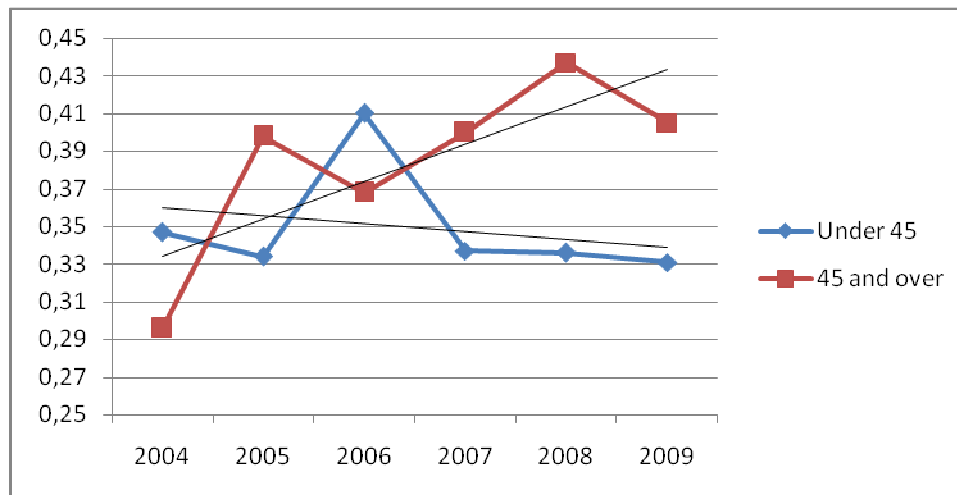
Source: Author's calculations using EU-SILC data

Fig. 9: Coefficients for tertiary education (upper secondary education set as the reference category), estimated for the whole working population split into 2 age groups⁴

Looking at returns to tertiary education with upper secondary education set as reference category unveils a diverging trend again. The pattern is very similar to the one observed when looking at the returns to years of schooling. The value of son's tertiary education is above the value the value of father's tertiary education at the beginning of the reference period. This changes during the rest of the reference period, with the

⁴ Detailed results of the regression, together with SPSS commands can be found online: http://www.ekonom.sav.sk/uploads/journals/Stefanik/annex1/index_3.htm

value of tertiary education acquired by fathers rising and the value of tertiary education acquired by sons slightly decreases. Data for 2006 remain problematic. This pattern is clearly visible in the following graph.



Source: Author's calculations using EU-SILC data

Fig. 10: Coefficients for tertiary education (upper secondary education set as the reference category), estimated for the whole working population split into 2 age groups

The fact, that the diverging trend is visible when looking at the relation between tertiary and upper secondary education, but reveals hidden when looking at the relation of tertiary referring to primary and lower secondary may be basically suggesting two things.

One is that the value of primary and lower secondary education is developing at the same pace between generations as tertiary education. In other words, the intergenerational changes in the development of the value of education are the same for the highest as well as for the lowest level of education. This may be explained by the fact that TE expansion is happening together with the expansion of higher secondary education. Further inquiry is needed to support such explanation.

The second conclusion to be drawn is that on the contemporary Slovak labour market a competition of individuals over 45, with secondary education, competing with individuals under 45, with tertiary education, becomes fairly common. In such environment the value of tertiary education of individuals over 45 is rising. The value of tertiary education of individuals under 45 is stagnating or slightly decreasing, which may be a consequence of the TE expansion. Due to the TE expansion the signalling function of TE becomes weaker. Employers distinguish between TE acquired before, after the expansion has begun. As a consequence, private returns to tertiary education differ between individuals under and over 45. The value of tertiary education of fathers and sons is different and the trend is its further divergence.

6. Discussion

Main conclusion of this article is that the value of tertiary education acquired by persons under and over 45 is different and its further development shows a diverging trend. There are reasons to believe that this may be linked with the weakening of the signalling function of tertiary education caused by the TE expansion. Slovak employers, when deciding between a tertiary educated individual under 45 and an individual over 45 with secondary education, often choose the second option in contradiction to the number of years spent in education. This is decreasing private returns to tertiary education of persons under 45 and on the other side increases the private returns to tertiary education of persons 45 and over.

To support this conclusion the data from EU-SILC were used. Unfortunately, these data offer an overview only on a restricted time period. To support such statement 6 years present only a short period. On the

other hand, EU-SILC data are gathered in line with a refined and strict methodology, which makes this survey a unique source of information on the population income. Thanks to this we were able to draw a relatively reliable description of private returns to education patterns in the period from 2004 and 2009. Another aspect of the conclusion presents the possible link between the TE expansion and the described changes in personal returns to education. To defend this link a longer time series data, with evidence from the Nineties would be more appropriate. Another problem in defending this link is a possible time lag of the TE expansion effect on the returns to education.

7. Acknowledgements

The author would like to thank Dr. Martina Lubyova, Dr. Zuzana Siebertova and Dr. Martin Guzi for their consultations and comments.

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