Theses of doctoral (PhD) dissertation

Studying the Significance and the Rate of Returns to Education, as Human Capital Investment

in particular in Consideration of the Fiscal Returns to Education

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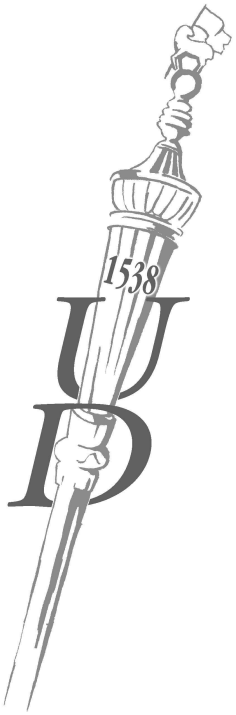

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1. The background and the goals of the doctoral dissertation

The main area of my research was given by the theory of the human capital which means that knowledge and skills incorporated in the individual can be referred to as capital and all activities which with present input make future yields while the productivity of the individual grows can be interpreted as an investment. In reality the heydays and beginning of the theory of human capital started in the ’60s because there are outstanding writings and studies from that period and in this area from Schultz (1960, 1961 a, b), Mincer (1958, 1970, 1974) and Becker (1962, 1964). We take the ’60s as the beginning of the theory of human capital but decades before they spread and applied the capital idea on humans (among others by William Petty (ref. Varga 1998), Adam Smith (1776), Jean Baptiste Say (1821), Johann H. von Thünen (1875), Irving Fisher (1897), Friedrich List (1928)).

With the evolution of the human capital aspect the significance of the human capital and human capital investments have been widely researched. We can make a distinction among a wide spectrum of studies whether they do a micro- or macro-level analysis or whether they focus on the monetary yields of the human capital or on the yields which are hard to define. An important area of the macro level examinations is the analysis of the significance and role of the human capital in the economic growth of the countries or a single country. It includes the establishment of growth models which include the human capital, its theoretical establishment and last but not least, the examination of how the data fit. In the micro-level examinations the decisions of the utility-maximizing individual and their effects are put in the centre of research. The main area of the research is given by the theory of human capital, meaning that education, training, the health service related expenditures and migration can be interpreted as human capital investments. It is realised in the higher productivity and consequently a higher future earnings for the individual. If we can name the investment related costs and the future yields and if we can measure them, then the returns of these investments can be defined or at least estimated. The analysis of the return to education is a much researched area of education economics because several studies have been made in relation to the examination of education yields. Not only foreign, but several Hungarian studies dealt with the individual or social returns of the extra year or a higher educational level. The state also invests in the human capital of her citizens or the human capital of her own employees, whose return can be examined in the same way as the individual or social return. Since there are very few studies which deal with the state return to education, it made

us examine how lucrative it is for the state only from a monetary aspect to spend money on education.

To sum up and in short, our basic goal on the one hand is the examination of the significance of the human capital. How and how much does human capital count? It is a simple, solid question but the answer is more complex. Human capital has a multidisciplinary aspect which comes up in many fields of science and it not just comes up but it connects them. On the other hand our goal was to examine who benefits and how much from the human capital investment in Hungary which is significant in many areas.

2. The structure of the doctoral dissertation and the applied methodology

The dissertation basically consists of eight chapters which summarize the five main lines of our way of thinking. In the structure of our dissertation the separable five main parts are the following:

- the presentation of human capital theory;
- the examination of the significance of human capital – macro-level analysis;
- micro-level examination of the human capital;
- new developments in the aspect of human capital (how to interpret and measure human capital, the risk and optional value of human capital investments);
- the examination of the returns of the human capital investments in Hungary between 1999-2008.

After the first chapter, the introduction, we discussed the backgrounds, establishment and completion of human capital theory, which means the first main part of our dissertation. We looked at modelling of life-cycles earnings and the merits of the representatives of Columbia and Chicago schools Becker, Mincer and Schultz. We tried to review and show those models and ideas which had a great significance in our opinion in the evolution of human capital theory.

In the second part we reflected on the significance of macro-level analysis of the human capital. One group of studies includes those which are researches about the human capital and about the economic growth and within those they examine the level of contributions of the human capital and its effect on the economic growth. In the third chapter, we gave review of those growth models which include human capital and the empirical examinations attached to them. During the discussion of the models we tried to achieve a comparative analysis because

we were curious to know that in the examination of such outstanding ideas as economic growth, what significance is attached to human capital, where we can realise similarities and differences between the different models. Finally, we wanted to put emphasis on discussing how human capital is measured in the different models and examinations.

In the fourth chapter we covered the examinations of the external effects of education which cannot be measured directly and it cannot be measured in money or just very difficult, but we did not deal with the difficulty of measurement because the realisation of effects and their identification with the human capital is more important.

In chapter fifth we dealt with the interpretation and measurement possibilities of human capital and also its problems. We analysed how to measure human capital, which received an important role in the growth models, and how to quantify those factors which cannot be measured. The thoughts can arise why we did not put the discussion of the definition and measurement of human capital to the beginning of the dissertation. On the one hand, we think that the chapter is a feedback to growth models where is appears that how important human capital is and how we can quantify and measure human capital. On the other hand, the attempts for the definition and measurement of human capital depend greatly that what examination, theoretical environment it appears and in what models they were put into. Thus the reviews of earlier studies are inseparable basis to define human capital. After the macro-level examinations we continued with the micro-level examinations and in the chapter six we presented the uncertainties of the human capital investments and the risks concerning its parts, also the modelling possibilities. There can be uncertainty and risk concerning the financing of the investment or the existing skills before the investment or uncertainty concerning information about the success of the investment. A lot but still a few talk about the risk of human capital and the option of elaboration and approach. In this chapter we would like to give a synthesis of models and line of thoughts present in the specialized literature.

In the seven chapter we dealt with examination possibilities of how education as a human capital investment pays off. We also looked at methodological review of the definition of the rate of returns. With the comparative analysis of the studies covering the rate of returns we tried to summarize the main national and international conclusions and statements concerning the benefits of education.

In chapter eight we analysed the change of the individual, social and fiscal rates of returns to education. We presented the chosen methodological methods for the measurement and the used data which formed the basis of measurement. We shed light on the goal of our measurements, which it being able to compare with later studies. We took data from data

basis, which can be accessed in the future, so the right data is provided for similar researches. We avoided the data from singular examinations and relied on data of official examinations which have become common for the given authorities and institute in recent years. Among others we worked with data from the publications of the Ministry of Education and Culture, Central Statistical Office and Education at a Glance, Eurostat. We presented the trend of the defining relevant factors of the individual, social and fiscal rates of returns. We covered the comparison and the analysis of gender specific point of view. We examined how to describe the effect of work related income taxes and tax-like charges and the state support of education concerning the human capital investments.

3. The research questions, hypothesis and new scientific results of the doctoral thesis

The profitability of education, which means the returns of education as a human capital investment can be examined from the individual's, the society's and the state's point of view. The individual rates of returns show how profitable for an individual to finish another level of education and social (and fiscal) rates of returns give the answer how profitable it is for the social (state) to spend money on education, on different levels of education and educational programmes (Varga, 1999:6). The rates of returns, defined from the perspective of the individual, society and state, can be examined according to the order compared to each other and also their change in time. We can examine the outcome of the rates of returns in terms of the gender differences.

We wanted to get to know and study the examinations and empirical results in the Hungarian and foreign literature. During the processing of the specialised literature we met the individual examinations of Psacharopoulos (1981, 1993) and his later works (Psacharopoluos and Patrinos, 2002.) with his colleague (Harry Anthony Patrinos). The authors collected the calculations concerning the returns of education and tried to establish some conclusions. As a many times actualised result of their comparative work, which includes several countries of the world (Hungary as well), they drew the following conclusions among others (Psacharopoulos 1981, 1985, 1993, Psacharopoulos – Patrinos 2002):

- The values of individual and social rates of returns are the highest for elementary education.

- The value of the individual rate of returns exceeds that of the social especially within the area of higher education partly because of the considerable state support of education and partly because at the calculation of the social returns we do not count in the external returns of education.
- In developing countries usually the education's rates of returns are higher than that that of the developed countries
- The rates of returns in all levels of education decrease with the increase of per capita income. "The classic pattern of falling returns to education by level of economic development and the level of education maintained".
- "Overall, women receive higher returns to their schooling investments".

Doubts have been raised with us in relation to the appreciation of knowledge, the return to the primary education can exceed the return to higher education in Hungary. We assumed that the individual returns to education can lag behind the social returns of education. We thought that in Hungary, because of the increasing value of knowledge, there is a serious advantage in earnings for those with higher education over those with secondary-level education, compared to previous years and other countries. It means that those with higher education must have a higher value of rates of returns. Still in contrast with the advantage in earnings for those of higher education there is a high level of tax burden on the labour incomes. With these in mind we cannot expect very high individual rates of returns. Consequently we assumed that the returns of higher education can be displayed with high values but the individual rates of returns do not exceed the social rates of return by many percentage points but they fall behind.

The two ideas are embodied in a further question, because if our line of thought is right then the fiscal rates of returns to education must also have a high value. Nothing left but to make the calculations and the examination of the intervening factors.

Our research questions included:

Whether within the field of education economics the explored empirical conclusions concerning the rates of returns are properly established. How correct they are for Hungary?

After covering the literature, mainly on the basis of our examinations we can say that:

Thesis 1: On the basis of empirical results of the education, such as human capital investment it can not be given a clear order between the individual and social (and fiscal) rates of return to education. The outcome of the education rates of returns depends on the taxation of the earned income (the level and structure of tax and para-

fiscal charges), the difference between the mentioned incomes of the given and the lower education level, the country-specific characteristics of the state support of education and their weighs between them.

In our opinion the order concerning the individual, social and fiscal rates of returns to education ($r_{individual} > r_{social} > r_{fiscal}$) changes only in extreme cases, which is proven by the mutual occurrence of the high rate of abstraction on the earned incomes in the percentage of the labour cost and the social and fiscal rates of returns, exceeding that of the individual's in Belgium, Hungary or Germany. We can mention the example of USA or Korea, which are not outstanding in the extent of taxes on labour, in fact, they spend a lot on education but their extreme signs are shown because the state support of education in their expenses on education is very low. It means that the individual rates of returns have the lowest value in these countries, too (in a few known years).

To prove that in the state support for education and taxation as well as among the different level of education of individuals' level of income to an extreme magnitude happen only in countries with the reverse order needs further examinations and comparative analysis. We say that a general order and general statements cannot be established on countries.

We can make general statements on rates of returns for those groups of countries which show similar signs. It is very important to consider the temporal data of the countries in the comparative analysis as well as what economic, social and technological changes characterize the examined periods and countries.

Since the examinations, concerning the returns of education in Hungary, are related to only a few but not consecutive years and to our knowledge after 2005 no further examinations were made the question comes up:

How did the returns changed and what kind of characteristics can be explored concerning the education in Hungary with the new data in mind, especially as a result of the calculation of the consecutive years?

After examining the methodological and empirical literature, related to the calculation of rates of returns, we tried to make own calculations about the individual, social and fiscal rates of returns of education. By having the values of the individual, social and fiscal rates of returns and the surplus in the income before tax between those with secondary and higher level education, we can say that:

Thesis 2: Besides the expansion of higher education, the rates of returns of higher education did not decrease considerably in Hungary between 1999 and 2008. The long term process of the increasing value of knowledge was not followed by a bigger change and the appreciation of knowledge remained at a high level.

In Hungary the pre-tax earnings advantage of those with higher education are quite high compared to those with secondary education. The pre-tax earnings for those with higher education was 132% more than that of men with secondary education in 2001 (aged 25-64) and 64% more among women, while the two sexes combined was 94% higher earnings of graduates (OECD, 2002:132; 1. table). The income advantage of those with higher education was more than 110% (119% to be precise) in 2003 which after a smaller decrease and increase remained constantly above 110% until 2007 (OECD, 2009). According to the data of Education at a Glance, and compare it with other countries, we cannot find another country from 1997 to 2007 where the income advantage would be so high for people with higher education compared with those with secondary education as in Hungary (OECD, 2009).

1. table Relative earnings of the population with income from employment
By level of educational attainment and gender for 25-64 year-olds, (upper secondary and post-secondary non-tertiary education = 100)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Men	213	218	238	232	232	245	255	253	253	259	247	248
Women	154	159	167	164	164	176	192	190	188	189	185	183
All	179	184	200	194	194	205	219	217	215	219	211	210

Source: Education at a Glance 2009 (OECD, 2009: A7.2a-c. table)

Besides the rise of income for those with higher education, compared to those with secondary education, the number of students in higher education has increased considerably. The mentioned increase in the students' number started in the beginning of the nineties, when compared to the previous year; the increase shows 10 percent yearly until 2000. The increase in the number of students in higher education did not stop later neither it just shows a smaller increase (below 10% compared to previous years). The first decrease in students' number started in the school year of 2006/07. The number decreased by 4-5 % each year compared to the previous year in 2008 and 2009. As a result of this process, within the age group of 25-64 the rate of those with higher education increased by 6 percent between 1997-2007 (OECD, 2009). Though we notice this process is not unique in Europe and outside of it. Besides the high increase of students' number in higher education the human capital profitability of higher

education did not decrease during the examined period. It is proven by the constant high level of income advantage of those with higher education and the high values of the rates of returns of those with higher education compared to other levels of education.

The state strongly intervenes in the education through the financing, supporting and regulation of education in almost all countries of the world. There is a direct effect of the relation between the state role and education, which is a result of the direct state interventions like the financing of education, the state regulation of public education, the definition of those receiving state support and the maximum number of students who can be accepted for higher education. There is also an indirect effect, which is the result of the presence and activity of the state, whose primary aim cannot be related to education but the effects can still be felt because they can influence the decisions of the individuals concerning the human capital investment. This kind of influence is the nature of tax system, the peculiarities and changeability of the structure of the income tax and the main factors of the support system of those with smaller income.

The extent of taxes on labour income and the para-fiscal charges (and tax wedges) are very high in international comparison in Hungary. The Hungarian, however, by international standards very high taxes on labour income is less known and discussed in the territory, to study the effects of taxes in return for education, which is a first approximation we raised the important question:

How lucrative is the financing of the education for the state? How big are the expenses on education and the fiscal revenues related to education as a human capital investment? What is the ratio of the incomes and expenses?

Thesis 3: The education is an investment which has great returns not just for the individual and for the society but also for the state. Higher education as a human capital investment brings great returns for the individual in Hungary but it is less lucrative, compared to the state, which is due to the significant taxes and para-fiscal charges on labour.

All this proven by the rates of returns, which are above 10%, and the social and the fiscal rates of return are higher than for the individual.

On the basis of our calculations, the values of the fiscal and social rates of returns exceed the individual rates of returns in Hungary (applied to college graduates from 2003 and university graduates from 2002 until the end of the examined period), which can be explained by the high rate of taxes and para-fiscal charges on the work-related incomes. The taxes and

para-fiscal charges, compared to the gross income is the highest among university graduates. It is above 75% which means that from the work-related income of the university graduates more than 75% of the gross income comes up as revenue for the state.

The individual, social and fiscal rates of returns of the university graduates, after an interim period of increase between 1999-2003, show a slight decrease. The individual rates of returns reached the highest value in 2003, which rates have decreased by 1.49 and 1.15 percentage points by 2008 among people who continue their education after grammar school and vocational school. The social and fiscal rates of returns of university graduates started from a lower value compared to the individual rates of returns in 1999. However until 2003 the increase of rates exceeded that of the individual rates of returns and because of that even from 2002 the individual returns of education proved to be the smallest and remained so until 2008. The rates of returns of the college graduates are characterized by bigger variability in change, a slight increase and decrease in the years of the examined period. As a result during the examined period, depending on the preliminary training and the length of education, the individual rates grew by 2.3 – 2.59 percentage point while the social and fiscal rates of returns increased by 2.92-3.19 and 3.13-3.63 percentage points.

With the human capital investment in education, the possibility of the individual becoming unemployed decreases, this has a clear return for the state. It can be pointed out especially in the higher education that after the human capital investment, with the improving situation of employment, the state wins more compared to the individual.

As we have mentioned to answer the previous research questions we calculated the individual, social and fiscal rates of returns of education for the period 1999-2008. In the Hungarian empirical literature we did not find the examination of the fiscal returns of education nor the definition and analysis of the full method concerning the examination of returns for both genders. Consequently further questions emerged in us, which were related to the gender differences in the education returns:

What kind of differences and peculiarities can be revealed in the education returns by gender? Whether profitability of education is really gender specific and if yes which are those elements and factors which cause the smaller or bigger differences?

On the basis of the results of the education profitability, according to genders, we can say the following:

Thesis 4: Education, as an investment in human capital irrespectively of educational attainment (from the point of view of the individual, the society and the state) means higher profitability for men than for women. The levels of rates of returns of women,

mainly of those who have vocational and tertiary qualification, especially of those with college degree, lies behind the adequate values of men. The reason for this fact is that the distribution of those who are employed with college degree greatly differs in the public and private sector between the two genders.

The individual, social and fiscal rates of returns of men exceed that of women, which reason is partly because of the income differences between the people with given or one level lower education. The highest difference for the individual rates of returns we obtained for the college graduates where the difference between the rates of returns of the two genders is between 3.08 and 9.57 percentage points, depending on the previous education, length of education and the year examined. The result is not surprising because college education means one of the highest rates of return of investment for men, compared to women, where the returns of college graduate sometimes did not reach the returns of the secondary education. This whole thing is partly due to the fact that there are more college graduate women, working in the lower income level of the pubic sector than men.

The reason of the higher level of fiscal rates of returns for men than women lies in the fact that the gap between the income taxes is bigger between the individuals of the given or lower level of education. It is caused by the bigger difference in gross earnings according to qualification for men.

Basically in the examinations of the rates of returns we examine the effects of three main factors. One is the analysis of the change of incomes and income differences among the individual of the given or one level lower education. The second factor is closely related to incomes and that is the analysis of the effect of taxation, the analysis of tax differences among people with different education. The third is the tracking of the change of direct and indirect costs of education. The exploration of the changes of all directions are essential in all three aspects of the rates of returns however while making the conclusions we have to face two problems. Collins and Davies (2004) applied first the effective tax rate and the effective subsidy rate and the net effective tax rate as the difference of the two, to examine the degree of taxation and the state support of education (separately and together) related to the human capital investments. Similarly to the authors we tried to analyse with using of the mentioned measures, the disincentive effect of taxation and incentive effect of state support on education, and of which has a larger effect on the human capital investments connected to education.

Thesis 5: Education as a human capital investment is affected among others by two contradictory forces. There is a disincentive effect of the high rate of taxes and para-fiscal charges on labour earnings, and the state support of education has an incentive effect. The effect of taxes and the para-fiscal payment obligations on labour income, which is related to the incomes from the human capital investment, and the effect of the state support of education, prevails more strongly in the return to the education human capital investments for the women, than for the men.

The yield, which can be realised from education, is defined by the change and difference of the future incomes according to education level, age and the measure of direct and indirect costs related to achieve the given level of education and their rate. The change of tax burden on work-related income and the progressivity of the tax system have an outstanding role to define the change of net incomes among people with different qualification and also in the change of direct costs, which can be identified with the foregone income when they choose further education instead of participating in the labour market. The direct costs, which are directly involved in the course of education, are affected by the tuition fee, the other payable fees, the books, the school equipment and the level of support given to the students. When we examined the changes in the rates of returns of education, to separate the effect of taxation and support, we put in the front the analysis of effective tax rate and effective subsidy rate.

The women's effective tax rate (ETR), except those with secondary education, exceeds the effective tax rates of men in every year of the examined period. The explanation must be sought in interpreting investment of education, which means that we do not measure directly the tax burden of the income, but we explored the effect of the extra tax related to the surplus earnings of the investment taking into account unemployment as well. If the definition of the gross and net individual rates of returns in the ETR calculation is laid out with a shortened method then the effective tax rate can be laid out in the following form:

$$ETR = 1 - \frac{r_n}{r_g} = 1 - [(1 - \frac{(1-\mu_j)\cdot T_j - (1-\mu_{j-1})\cdot T_{j-1}}{(1-\mu_j)\cdot W_j^B - (1-\mu_{j-1})\cdot W_{j-1}^B}) \cdot (1 + \frac{T_{j-1}}{(W_{j-1}^B - T_{j-1})\cdot(1-\mu_{j-1}) + C_j^e})].$$

From the equation above we can see that the effective tax rate is higher for those individuals, whose tax surplus rate, corrected with unemployment, is higher and the individuals with a level lower qualification whose the ratio of tax burden and individual cost

of education is lower. The ratio of tax surplus and gross income surplus applied for women, who have got higher than secondary level education, is higher than for men in most age groups in each of the year examined. It is those qualifications where the effective tax rates are higher for women than for men. Considering the employment possibilities of the individual's career and qualification, the income surplus for women is met with higher tax burden, which means that the profitability of education is lower so the incentive to continue their studies at higher education can be lower compared to men.

The values of effective subsidy rate (ESR), defined separately for men and women, differ from each other despite the fact that the level of state support for education is the same for both genders. Despite the gender neutral education support system we need to put the emphasis on the examination of the relative rate of support to interpret the differences. Not the absolute sum of financing but the amount compared to the individual costs that is dominant. The more support the state provides compared to the individual education costs of a student for one school year, the higher the value of the effective subsidy rate will be.

The ESR value is higher for women because though from education costs the direct costs are the same for men and women but the indirect costs, which are the foregone earnings corrected with unemployment, are not. The foregone earnings corrected with unemployment are lower because of two factors. On the one hand, the probability of becoming unemployed is higher for women which decrease the costs and on the other hand, women's earnings, which can be realised with the given qualification, are significantly lower than men's earnings.

By and large the level of state support for education compared, to the total education costs, is higher for women than for men. We can observe that the effective subsidy rate for both genders have decreased at more educational level during the examined period. It can be explained by the fact that the foregone earnings adjusted unemployment increased by more than the direct state spending, which changed the distribution ratio of direct and indirect costs within the total cost.

We could observe further characteristics of the women's subsidy rate, which is a significant difference not only when compared with men but by itself also in the sense that the value of effective subsidy rate most often take the value between zero and one so the subsidy rate higher than one (which we received to those with vocational education in 2004 and 2005) needs an explanation. The rates higher than one received for those with vocational education can be explained by the fact that from a social point of view, education does not show a return for those with vocational qualification, which means that the social rates of returns are negative because in the years 2004 and 2005 the incomes of those with vocational

qualification, even in the youngest age group, (to which the rates of returns are very sensitive) lagged behind to the incomes of those with elementary education. Consequently we cannot talk about profit in the preliminary period spent on the labour market and also in the latter stages of the individual's career the income surplus is small which cannot produce returns in a way that it cannot compensate the really high education costs compared to wages in the labour market.

Thesis 6: Individuals with a tertiary education have a high share of the tax burden following the completion of their studies in Hungary, i.e. following their human capital investment, and at the same time the scale of state expenditure for one student of tertiary education is significant too, compared to the expenditure for one student of other educational level. In case of individuals with higher education, we can state on the basis of repayment of educational expenses of the state and on the basis of obtainable revenue surplus of the state as well as on the fiscal rates of returns, that in case of the state subvention of higher education, the state gains significant yields.

The scale of state subvention of vocational education, as human capital investment, and the volume of revenues from this investment as well as the rates of returns of vocational education prove unequivocally that the state subvention of education is ruled by different points of views, which differ from investment profitability.

The rate of individual, social and fiscal profitability is the lowest for ones with a vocational training certificate, its values are especially lower (for vocational schools) in the case of social and fiscal returns than the values for secondary and secondary vocational schools.

According to our calculations (for women and collectively), only vocational training proved to be fiscally unprofitable for the state. The discounted value of tax surpluses from earnings deriving from work of individuals with a vocational training certificate does not reach the current value of expenditures connected to the investment by the state when compared to individuals with an elementary education, while direct expenditures are fully cleared, only a part of the indirect costs are reimbursed for the state following the human capital investment. The occurrences of negative fiscal reimbursement typical for women are not unique, as the negative values of social profitability have also appeared. It is not only the occurrence of negative values that reflects a profitability differing from usual among individuals with a vocational training, as the individual, social and consequently the fiscal

profitability rates are unusually low, reflecting values below 1.5% for most years. The low fiscal yield for vocational training can also be detected from the surprisingly high effective subsidy rates, as the lowest value (29.54% year 1999) is slightly below 30%, the highest value has already exceeded the 40%, reaching precisely 42.12% in 2003, as a matter of fact the values of effective subsidy rate were the highest for vocational training between 2003 and 2007. Consequently, vocational training has been characterised by high degree of state funding compared to other qualifications and foregone earnings, while the fiscal revenues of human capital investment have been low for vocational training which can be explained by low earning surpluses and lower incomes compared to other school qualifications.

The period of reimbursing the state for funding education is the shortest in the case of individuals with a tertiary education. Ones with a university degree are in a leading position in this regard, in 2008 these individuals have paid direct costs of their education back to the state by the age of 31. Individuals with a university degree are followed by ones with college degrees (age of 36 for the three-year education), secondary vocational school (age of 39) and secondary school qualifications (age of 38). Only individuals with a vocational training were not able to repay state expenditures, except for the years 1999 and 2000. Of course, it is important in the comparison that individuals with a different qualification enter the labour market at different ages, i.e. in contrast with the data above, individuals with a university degree pay a tax surplus in 8 years while ones with a secondary vocational qualification pay a tax surplus in 21 years that equals the degree of direct state expenditure per student. The age that results in a positive yield for individuals with a tertiary education decreased from 1999 until 2003, and then increased until 2008. If we examine overall deductions from earnings (and not the previously examined tax surpluses) to find out when it breaks even with state expenditures on education, then the period is significantly shortened. In the cumulated sum of deductions on labour has reached the amount of expenditures on a university student by the state in 5 years, in 5 or 6 years for students with a college degree depending on the length of studies, in 8 years for students with a secondary school qualification and in 9 years for students with a vocational training certificate.

Direction for further research

Two opposing forces influence secondary school education as a human capital investment with a disincentive effect due to significant deductions of earnings from labour following the investment. The degree of this effect is rather high on individuals with a secondary school

qualification, as the tax burden is the highest on the earning surplus that they can realise following their human capital investment in the labour market, which also reflects that earning surpluses achieved with the investment are not subject to progressive type taxes. At the same time, state funding of education has an incentive effect on continuing education in secondary schools providing a GCSE as this is an option for the individual to achieve a higher qualification.

Statement: Investment in secondary school education is influenced by a stronger incentive force, than the disincentive force of taxation and the incentive force of funding; the optional value of the GCSE, which provides an opportunity for the individual to achieve a higher qualification.

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