HUMAN CAPITAL DEVELOPMENT AND ECONOMIC GROWTH IN LATVIA

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Abstract

Common opinion exists about positive relationship between human capital development and economic growth. However during last decade more people acquire higher level of education despite social economic recession. There are several methods how to measure human capital. The author chooses two methods and estimates average years of schooling during 2000 – 2010 and human capital stock. For second the Mincer rate of return is estimated which shows the average rate of return from one additional year of schooling. Finally the author uses simple production function to estimate the human capital impact on labour productivity. The author finds that women human capital has positive impact on labour productivity during the period 2000 – 2010.

Keywords: Human capital, education, economic growth

Introduction

At the end of the 20th century and the beginning of the 21st century, very dynamic development of technologies took place in the world and also in Latvia. Investments in human capital, especially in a highly qualified work force, play a major role in this development. Human capital is the totality of knowledge and skills which have been accumulated during life through education, training, and work experience and which influence labour productivity. Acquiring new skills is only one of the ways of investing in human capital. Investments in health can also influence human capital. Employers can invest in buildings, techniques, etc. in order to measure the rate of return from investments; human capital has to be measurable and comparable to other investments. Consequently, education and training are investments in human capital which are undertaken in order to receive as high a return as possible.

Theoretical view on human capital development and measurement

Back in 1776 Adam Smith pointed out the similarity between education and investments in technique (Smith, 1904, p. 13). A. Smith acknowledged that investments in human capital should be comparable to investments in physical capital or technique. It should be taken into account that in Smith's time the life expectancy of workers was much shorter than it is nowadays; thus, return of investments in human capital should increase investments in physical capital or technique. Investigations on earnings distribution among workers and capital started with the Nobel prize laureate Vasily Leontiev (1946, Nobel prize laureate Roberts Solovs was V. Leontiev's student in Ph.D. studies) and Theodore Schultz **(**Schultz, 1961).

Publications by G. Becker (1962) and J. Mincer (1958) in the *Journal of Political Economy* could be considered as the beginning of a revolution in the theory of human capital in labour economics. They sought explanations for why incomes differ, and education as an investment in human capital was the centre of attention (Deere & Vesovic, 2006, p. 262). Previously, at the beginning of the 20th century, scant information about the relationship between education and income was available because of the lack of data. The return from investments in education depending on the years of schooling was investigated by G. Becker and B. R. Chiswick (Becker & Chiswik, 1966). Subsequently, J. Mincer developed a model which is known as *Mincer's earnings function* (Mincer, 1974). Mincer's return indicator is based on a comparison of individuals with different levels of education. J. Mincer was of the opinion that work experience and training in the work place increase productivity and future income; thus, they should be included in the income function. Social inequality has been increased by the demand for an educated, highly qualified work force; that, in turn, has been facilitated by the development of technologies. However, it is difficult to say which was first – a highly qualified work force or technologies, because indisputably the development of technologies has taken place thanks to highly qualified people; that is, a more educated work force implements newer and more innovative technologies. There exists the assumption that investments in education could reduce inequality of incomes (Deere & Vesovic, 2006, p. 269).

J. Mincer has pointed out that „growth of human capital is both a condition and a consequence of economic growth" (Mincer, 1981, abstract). Moreover, accumulation of human capital ensures economic growth and growth in income. In this article, accumulation of human capital and its influence on the growth of the economy in the period from 2000 to 2010 will be analysed.

Traditionally, human capital is considered as the totality of knowledge and skills by which productivity of a worker's labour is

increased. Human capital combines different skills which are necessary for particular work and which ensure capacity. Human capital has to be maintained throughout one's life in order not to lose skills. Human capital is accumulated by the family, school and enterprises (Heckman & Jacobs, 2011, p. 4). The author adds that the state also accumulates human capital by implementing particular education and social economic policy.

Depending on the source of financing, investments in human capital can come either from individuals or the state. According to the EC guidelines, "Investments in education and training produce high returns which substantially outweigh the costs and reach far beyond 2010. They should be targeted on areas where economic returns and social outcomes are high." (European Commission, 2006, p. 7). Investigations show that these fields are at the beginning of the cycle of lifelong learning – fundamental knowledge and skills. They also influence the ability to acquire knowledge at a later period of life and to take advantage of lifelong learning opportunities. At the same time, researchers point out that investments in education at the beginning of life are not productive if investments later in life do not follow, a fact which underscores the importance of lifelong learning even more (Cuncha, Heckman, Lochner & Masterov, 2006).

Acquisition of skills' early in life facilitates acquisition of skills later in life. However, investments in human capital later in life are necessary in order to maintain and improve knowledge and skills. American economist, associated professor F. Cuncha confirms the thesis that parents increase investments in an earlier period of life if investments later in life are subsidized (provided that investments in the earlier and later period of life supplement each other) (Cuncha, Heckman, Lochner & Masterov, 2006, p. 799). Investigations reveal that those who have been involved in pre-school education show better results in tests (OECD, 2012).

In practice, in order to compare human capital, the following indicators are used:

1. The population's or labour force's average number of years of schooling (the author uses this method);
2. The amount of investments – private and the state's whereby the amount of investments in one individual during a fixed period of time is multiplied by the number of years the individual has spent in school;
3. Results of quality tests.

In 1992 Professor G. Mankiw of Harvard University used the percentage of the working-age population what is in secondary school in order to measure human capital, and he proved its close correlation with a person's income (Mankiw, Romer & Weil, 1992, p. 419).

Professor R. J. Barro of Harvard University and Professor Jong-Wha Lee of Korean University (Jong-Wha Lee has been Senior Advisor for International Economy to the President of the Republic of Korea) consider that men aged 25 years or older and with secondary or higher education can serve as an indicator for determining human capital in the corresponding age group of employees; they point out that with regard to the growth of GDP, the education level of men is more relevant than the education level of women because of greater labour-force role of men in most developing countries. Increasing the average number of years of secondary schooling for men by 0.68 years would increase the average yearly growth of GDP by 1.1 percentage points (Barro & Lee, 1993). However, other investigators stress that one of the indicators which characterises the quality of human capital is the education of girls (Thomas et al., 2000). An unequivocal and objective indicator characterizing human capital is not available. In the labour market, human capital is measured mainly by the education level of the labour force, and that, in turn, is connected with definite education costs.

To measure investments in human capital, there should be a methodology for doing so (costs approach/John W. Kendrick; income approach/ Dale W. Jorgenson, B. M. Fraumeni, 1989; Mireille Laroche, Marcel Merette, 2000; Barro, Lee, 1993, Jones, 2002).

In research literature, mainly the average number of years of schooling is measured to calculate the influence of education on the growth of the economy and income, as well as the influence of education on other social processes in a country, such as birth rate and death rate. Using the average number of schooling years enables one to compare educational processes and trends among countries, but it has to be mentioned that every year of schooling involves an equal amount of education and does not directly indicate a more or less qualitative education. Therefore, in investigations the average number of years of schooling is often compared with the criteria of education quality – for example, results of tests of students' knowledge. At the same time, the average number of schooling years can be analysed in dynamics by pointing to trends in the learning process and how much time people spend learning. In this case, an increase or decrease in the average number of years of schooling should also be considered in relation to improvements in the quality of education.

If the number of years of schooling increases, the speed of accumulation of human capital decreases. That can be explained by the fact that it is more difficult to create additional human capital if the level of human capital is high (in the United States and Germany the time spent in education is increasing, but the speed of human capital accumulation is decreasing – Gong, Greiner & Semmler, 2002, author's calculations). Moreover, the level of education should be sufficient to cover the

depreciation of human capital in a longer period of time. Andrew Swiston and Luis-Diego Barrot, economists of the International Monetary Fund, calculated that by increasing advanced educational attainment in the countries of Central America by one year, economic growth will increase by 0.3% (Swiston & Barrot, 2011).

The number of years of schooling in the territory of Latvia in the 20th century, when the respondents of the investigation acquired an education on a different level, has changed significantly. In the 1960s in the USSR educational reform took place. That meant a change in primary education from 7 years to 8 years and, correspondingly, in secondary education to 11 years. In the 1980s another educational reform was started – a gradual change to 9 years of primary education with the aim to improve the quality of education, to ensure a sufficiently high academic level in every subject, to increase responsibility for the quality of teaching, to strengthen the polytechnical, practical part of pedagogics, to effect a transition to general vocational education of young people, to increase the status of teachers and masters, to strengthen the material and technical basis of educational establishments. The reform called for 12 years of school in the Latvian SSR (a one-year increase over the previous number of years of secondary education). The additional year was planned for primary education, which would consist of Grades 1 to 4 (previously, Grades 1 to 3) so as to ensure a more comprehensive education in reading, writing and arithmetic.

The reform also called for starting school at the age of 6. The changes were planned to begin with the 1986/1987 school year. Reforms were also implemented in higher education. There were 4-, 5-, and 6-year study programs, but the duration of most was 5 years. Gradually, 4-year bachelor's studies were implemented. However, in the 21st century, changes in the education system made it possible to acquire a bachelor's degree in 3 years and a master's degree, together with a bachelor's degree, in not more than 5 years. In general, it should be noted that the time spent in studying at higher education establishments is decreasing, and, of course, that affects the quality of the results.

To calculate the number of years of schooling, the author uses the approach of Barro and Lee (Barro & Lee, 1993, 2010**).** This method, however, has several drawbacks. First, the years of part-time studies are not counted, and thus the indicator of education return could be too high. But the author is of the opinion that the content of full-time studies and part-time studies is equal – the programmes of full-time and part-time studies have an equal number of credit points; thus, the number of years of schooling for part-time studies can be placed on the same level as full-time studies by calculating the average number of years of schooling. Second, different study programs require a different number of years of study.

The indicator is calculated by taking into account the level of education – primary education, secondary education and higher education – according to age groups and the proportion of the age group from the total number of the population over 25 years of age. The indicator reflects the average number of years that a grown-up individual spends in acquiring an education. It directly influences the return from education because higher education correlates with higher income. The average number of years of schooling does not take into account knowledge gained from non-formal education nor work experience and skills acquired in the labour market after formal education.

The author adjusted the methodology of calculation by multiplying the average number of years of schooling between 2000 and 2010 by the average share of employment in the age group of 25–64-year-olds. Corrections are necessary for the data to be comparable with GDP and employment trends in the market. The corrected indicator shows the increase of the average number of years of schooling corresponding to the increase of the proportion of employment in the period from 2000 to 2010. R. J. Barro and Jong-Wha Lee calculate the average number of years of schooling by using four levels of education as the basis – without formal education, with primary education, with secondary education and with higher education. In the case of Latvia, the author does not take into account workers who have no formal education – first, there are no statistics on such cases; second, the proportion of the workers without formal education is not high and does not significantly influence the result. Using the data of the Labour Force Survey for 2011, the author calculated that the proportion of the workers with an education level lower than primary is 0.03%. There are no workers without formal education.

Estimation of human capital and economic growth

In order to estimate the increase of labour productivity from one additional year of schooling, the Cobb-Douglas function usually is applied (for example, Fuente, 2003; Lange & Topel; 2006, Barro 2010). The Cobb-Douglas production function is used mainly to analyze two factors of production rate of return. The production function unites all factors of production (labour, capital and land) and produces finished products and services. These factors are the main factors of economic growth. The quality of the labour force is connected with the average years of schooling. Theoretically, education and professional training affect labour productivity.

$$Y_t = A_t K_t^{\alpha k} S_t^{\alpha s} L_t^{\alpha l}, \qquad (1)$$

where

Y_t – GDP in volumes (2000)

A_t – total factors productivity (TFP) of technological progress

K_t – physical capital
L_t – employment
S_t – human capital
αl – labour elasticity
αk – capital elasticity
αs – human capital elasticity

In this function, technological progress is determined by the level of use of production factors – physical capital and labour. The author estimated the production function during the period from 2000 to 2010. The average increase of labour productivity during this period was 4.39%. The 10-year period is known as the Clement Juglar cycle introduced by Joseph Schumpeter. It is equal to 7 – 11 years and is related to investments in new technologies and real estate properties. Since during the last 10 years the Latvian market was characterized by large investments in real estate property, the author assumes that the 10-year period is sufficient for research as research cycle. Moreover, during these 10 years the national economy was impacted by several significant events – Latvia's accession to the EU, migration of the labour force, the growth and recession of the economy; these factors, in turn, had an impact on employment, education, work salary and labour productivity.

The author will use function dividing both sides by labor force.

$$\frac{Y_t}{L_t} = \mathrm{A_t}\left(\frac{K_t}{L_t}\right)^{\alpha k} S_t^{\alpha s} \qquad (2)$$

In logaritms the function is following

$$\ln\frac{Y_t}{L_t} = ln\ \mathrm{A_t} + \ \alpha\mathrm{k}\, ln\left(\frac{K_t}{L_t}\right) + \alpha s\ S_t\ , \qquad (3)$$

where $0<\alpha k+\alpha s<1$

One of the main challenges is to choose the right indicator to represent human capital. The most common approach is to use average years of schooling as the human capital indicator (see above). However, the author estimated that the average years of schooling have increased by almost one year during the period from 2000 to 2010 (from 11.55 to 12.40 years); this change is not significant enough to serve as a factor in the production function. Therefore, the author used a formula by Jones to measure the human capital of employees with higher education (Jones, 2002)

$$H = e^{\psi s}L, \qquad (4)$$

where

H – human capital
ψ – average influence of one year of schooling on labour productivity (work salary)
s – number of years of schooling

L – number of employees

The author estimated the number of the years of schooling by using the formula by Barro and Lee for 2000 – 2010 (see above). During this period, the average years of schooling (higher education) did not change significantly (from 15.74 in 2000 to 15.78 in 2010). Data on the number of employees were obtained from the Statistical Bureau of Latvia. The author estimated the average rate of return from one additional year of schooling in higher education by using the Mincer earnings function (Mincer, 1974). As a data source for the Mincer earnings function, the author used Labour Force Surveys 2000 – 2010 in which the independent variables are age, age squared and education level; the dependent variable is work salary in natural logarithm.

The rate of return from higher education is estimated as the difference coefficient of higher education and secondary education.

Table 1 Rate of return from higher education, Latvia 2000 – 2010, ln

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Men	0.28	0.23	0.46	0.49	0.53	0.50	0.31	0.22	0.31	0.36	0.44
Women	0.35	0.33	0.43	0.48	0.55	0.55	0.47	0.47	0.47	0.44	0.40

Source: Central Statistical Bureau of Latvia, Labour Force Survey 2000 – 2010
Estimated by author

The rate of return for women in higher education is higher than the rate of return for men except in 2010. However, in previous research, the author estimated that, on average, for all levels of education the rate of return for women in 2010 was higher (Romele, 2013). That can be explained by the fact that at all levels of education, women, on average, spend one year longer than men in acquiring an education, and that decreases the rate of return. Smaller differences in the average years of schooling between men and women are observed at the level of higher education.

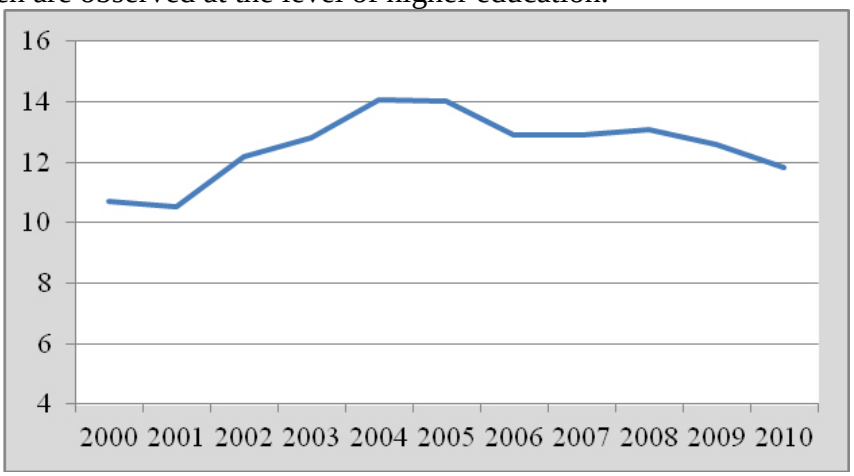

Figure 1. Human capital of women with higher education in Latvia 2000 – 2010, ln
Source: Central Statistical Bureau of Latvia, estimated by author

The results show that for men the rate of return from higher education significantly decreased during 2006 – 2008 but increased in 2009 – 2010; that confirms the thesis that the social-economic recession increased the differences in work salary between men with basic and secondary education and men with higher education. Smaller differences are observed between women. Estimating the education impact on labour productivity the men human capital has positive impact on labour productivity; however, regression coefficients are not statistically significant.

2010 Number of observations: 11

	Coefficients	Std. Error	t	Significance
$\ln Y_0$	3.128	0.797	3.922	0.004
$ß_1$	0.586	0.088	6.676	0.000
$ß_2$	0.043	0.017	2.539	0.035
R squared	0.890			
Adjusted R square	0.862			
Durbin-Watson	1.191			
Std. error of the estimate	0.05746			
F	32.229			
Significance	0.000			

Estimating the impact of education on labour productivity, in which human capital is equated with female human capital (Equation 4), the impact is positive, and regression coefficients are statistically significant with a probability of 95%. It follows from the equation that the human capital of women positively influences labour productivity, a fact that can be explained mainly by a higher rate of return for women with higher education. In turn, as the work salary of women with higher education is increased, labour productivity will also increase. Therefore, we can assume that rate of return of education on work salary could be the same as the rate of return from education on labour productivity. This assumption is based on results of research (for example, Lange, Topel, 2006) in which employers gathered information about the actual labour productivity of employees during a short time period; the "signalizing effect" of education is small (for the signalizing effect, see Schultz, 1975). Moreover, in a longer growth period the impact of education on labour productivity is higher than in a short period (Lange, Topel, 2006). During 1950-1993 a positive increase in labour productivity from one year of schooling was estimated in the United States, where the mean educational attainment rose by about 4 years, and each year of education led to a 7% rise in output per worker (Jones, 2002). Research proved that "more than 80 percent of growth in the United States during this period is attributed to the transition dynamics associated with educational attainment and the stock of ideas" (Jones, 2002). Another study proved that during the 5-year growth interval in the United States, the estimated impact

on labour productivity of one year of schooling was 5.8% (Lange, Topel, 2006). Angel de la Fuente estimated that an additional year of average school attainment raises productivity in the average EU country by 6.2% immediately and by 3.1% in the long term (Fuente, 2003).

Conclusion

During a socio-economic recession, the impact of education on work salary and labour productivity can be reduced by the impact of external factors on economic growth. However, investments in education are long-term investments, and they can repay costs in a longer time period as, for example, physical capital. Human capital is more productive if other members of society are more educated.

The main conclusion of the paper is that the human capital of women with higher education increases labour productivity, and that is one of the main conditions for economic growth during the period from 2000 to 2010. However, increasing the return from investments in education is a political decision because it is connected to education and tax policy, employment rate, state subsidies in education and the labour market.

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