UDC: 330.341:331.101.26]:330.43(497.7)"2000/2016"
330.55:331.101.26]:330.43(497.7)"2000/2016"
Conference paper

# THE IMPACT OF HUMAN CAPITAL ON THE ECONOMIC GROWTH IN MACEDONIA

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***Abstract***

*The role of human capital in a country's growth process is of great importance. As a separate factor of production, it contributes to solving key economic problems in the process of globalization, especially in economies based on knowledge. The aim of this paper is to illustrate the impact of human capital on the economic growth of Macedonia in the period from 2000 to 2016 through the usage of an econometric analysis of time series of human capital indicators which are widely accepted in theory and empirical research. It is about education and health, i.e. the educational qualifications of employees and their life expectancy. For that purpose, a regression analysis followed by an examination of stationarity of time series is used, as well as the necessary conditions for selecting the best model from all of the available alternatives. The results show that there is a positive link between human capital and economic growth in Macedonia. Also, educational qualifications and life expectancy have a positive effect on GDP per capita in Macedonia for the analyzed period. All of the variables show statistical significance, but higher education qualifications have proved to be an indicator of human capital with the greatest impact on the economic growth in Macedonia. Therefore, the economic policy-makers should accept and promote education and health as healthy economic investments which raise not only the quality of life, but also increase the productivity of the market and thus the output in the country.*

***Keywords:*** *economic growth, education, GDP per capita, health, Macedonia*

***JEL Classification:*** *I15, I25, J21, O11, O40*

## Introduction

The growth economics literature consists of numerous growth theories that recognize several determinants of economic growth. The importance of human capital as a source of progress and economic development has been recognized in economic literature long time ago. Adam Smith is the first classical economist who in 1776 included human capital in his definition of capital. He included people's acquired and beneficial

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talents in the total capital of the country, because human skills have increased the wealth for society as well as for the individual. Alfred Marshal, in his research from 1890, “Principles of Economics”, argues that the most valuable capital is the one invested in a human being and one that fosters development in every nation. Adam Smith and Shultz cited in Jaiyeoba (2015) also confirmed the importance of education for national development. Later in the sixties, the development of neoclassical growth theory failed to provide a framework for the inclusion of human capital as a growth engine.

The expanded Solow model, Mankiw - Romer and Weil model, is based on the assumption that labor in different economies can accumulate a different level of human capital and thus, it is the most successful attempt to improve the performance of the Solow model. Wilson and Briscoe (2003) in the study on the impact of education and training have found that increased investment in education leads to higher productivity and earnings for the individual and that such investments result in significant social rates of return. They also found that there is a spillover of gains from investing in education in other sectors of the economy.

Human capital as the driving force of economic growth has been identified and included in growth accounting from the development of the theory of endogenous growth. Endogenous growth models, developed by Romer and Lucas, believe that human capital promotes endogenous technical progress and accelerates long-term sustained economic growth. In some of these models, human capital stimulates growth by stimulating technological progress or by increasing labor productivity (Eftimoski, 2009). Recent empirical studies of economic growth also suggest that skills and knowledge of the population are important in determining the economic performance of a country. For example, a higher amount of human capital may allow the less developed country to move faster to the developed country’s income levels through increased absorption of international technologies or imitation capacity (Laroche et al., 1999).

The contribution of education as a human capital to the process of economic growth is not contested, but it is important to know the level of education that is most relevant in terms of contribution and statistical significance (Qadri and Waheed, 2017). Jenkins (1995) has shown that higher education qualifications contribute to a rise in productivity and attitudes roughly twice compared to workers without qualifications. A similar analysis of Canning et al., cited in Eftimoski (2009) made on OECD member countries, identified that the increase in education per worker contributes to an increase in output per worker by about 1/3 of the increase caused by physical capital. Given the level of GDP, the higher initial state of human capital means a higher ratio of human and physical capital. This higher ratio tends to generate higher growth through two channels at least. First, more human capital facilitates the absorption of superior technologies from leading countries. This channel is likely to be particularly important for secondary and tertiary education. Second, human capital is more difficult to accommodate than physical capital. Therefore, a country that starts with a high ratio of human and physical capital (as a result of the consequences of a war that destroys mostly physical capital) tends to grow rapidly by adjusting the amount of physical capital (Barro, 2001).

Investing in human capital is one of the main sources of economic growth, especially in developed countries. Negligible amounts of human investment in underdeveloped

countries contribute little to expanding the capacity of people to face the challenge of accelerated growth and development. The additional role of human capital can be an engine to attract other factors, such as physical investment, which also significantly contribute to the growth of per capita income. If there is insufficient investment in human capital, the rate of application of additional physical capital is limited, as technical, professional and administrative people are needed for the effective use of physical capital. Lucas (1990) points out that physical capital fails to spill over into poor countries because of their relatively poor subsidies to additional investment in human capital. Natural resources, physical capital and raw materials are not enough to develop a highly productive economy. A wide range of human skills is essential in fostering the dynamics of development.

In a research on the US economy, Edward F. Denison cited in Eftomoski (2003) found that if labor productivity is maintained at the same level, then only 31% of the changes in the total output can be explained. 15% of it he assigned to the increase in the quantity and quality of the country and physical capital, and 16% to the increase in the quantity of labor. Hence, there are many ways to explain the residual of 69%. Denison explained it such that he assigns 38% to the improvement of the quality of labor (human capital). This means that the increase in the production capabilities of the individual has a major impact on the economic growth. Therefore, it can be said that human capital opens new dimensions in economic analyses for development.

Human capital is mostly acquired through education and training at the workplace, as well as by improving the health care of workers. There is no dilemma in the conclusion that better educated and healthy people contribute more to the growth of gross domestic product, i.e. economic growth. The increase in the amount of human capital embodied in people means improving the level of human development and increasing the level of gross domestic product. If GDP growth per capita is a result of the increase in physical, natural capital and unskilled labor, then this economic growth is not sustainable due to the declining yields from additional physical and natural capital and unskilled labor at the same technological level. It is clear that countries with continuous growth are characterized by a large increase in the educational and well-trained workforce (Eftimoski, 2003).

There is no doubt that investing in human capital is seen as the main requirement for successful economic policies. Individuals cannot be well qualified in their workplace without the accumulation of appropriate education and health. Therefore, investments in human capital are of particular importance for the growth of human capital, and thus, for economic growth. Hence, the aim of this paper is to understand the level and impact of human capital on the economic growth in Macedonia. The hypotheses resulting from the objective and theoretical and empirical economic research listed above are:

*H1: Human capital (education and health) has a positive impact on the economic growth in Macedonia*
*H1a: Education has a positive impact on the economic growth in Macedonia*
*H1b: Health has a positive impact on the economic growth in Macedonia*

## RESEARCH METHODOLOGY

In studying the relationship between human capital and economic growth, the choice of models, instruments and indicators for human capital is crucial because different models, instruments and indicators represent different aspects of human capital. For the purposes of this paper, the expanded Augmented Solow model, the Mankiw - Romer and Weil model will be used.

It is normal for any economic growth analysis to begin with the Solow model. This model is widely used because of its simplicity, but also its power in describing and explaining the main principles of economic growth. Improving Solow's performance is a challenge for many economists. One of the most successful attempts to expand it with the human capital component is the Mankiw-Romer and Weil model. This model, as previously emphasized, is based on the assumption that labor in different economies can accumulate a different level of human capital. Like the Solow model, the extended Solow model also starts from the Cobb - Douglas production function $Y = K\alpha\ (AH)\ 1\text{-}\alpha$, where the production of output Y is a result of combining the two factors of production (physical capital K and human capital H). Technological progress in the expanded model is labor-intensive and exogenous (available to all economies). In Romer's model, human capital is not just a redefinition of labor L, but is described as a new type of capital beside labor L and physical capital K. In order to accumulate an appropriate amount of human capital, the individual needs to invest in his/her own education and/or training at the workplace. Human capital is also accumulated through improving health. Hence, the Mankiw - Romer and Weil models redefine the production function as follows:

$$Y_t = K_t^{\alpha}\ H_t^{\beta}\ (A_t\ L_t)^{1-\alpha-\beta},$$

where Y is output, K is capital, H is human capital, A is the level of technological progress and L is "unskilled" labor. The coefficients α, β and 1 - α - β measure the elasticity of the output of each of the inputs. In the Romer model, human capital is an independent form of capital that interacts with physical capital, labor, and technology, while contributing to the creation of the output.

As in the Solow model, part of output $sY_T$ is saved every time, but in this case, it is partly invested in physical capital and partly in human capital, so S = Sq + Sh.

$$K_t = S\kappa\ Y_t;\ H_t = S_h\ Y_t;\ L_t = n\ L_t;\ A_t = g\ A_{t,}$$

where, Sq and Sh are the rates of investment in physical and human capital, n is the population growth rate and g the growth rate of technological progress. If we define k = K / AL, h = H / AL and y = Y / AL, then $y_t = k_t^{\alpha}\ h_t^{\beta}$.

The Solow model, as stated in Mankiw et al., (1992), can be used to establish a linear regression of the impact of human capital, or, education and health on economic growth. In this sense, the model is used in an effort to determine the impact of investment in education and health on the economic growth in Macedonia. In order to determine the impact of investments in education and health on economic growth, we start with the following product function:

$$Y = f\,(K, L, H, E) \qquad (1)$$

where the nonlinear model:

$$Y_t = \beta_0 * K_t^{\beta_1} * L_t^{\beta_2} * H_t^{\beta_3} * E_t^{\beta_4} * U_t \quad (2)$$

can be transformed in the following model using logarithms:

$$\ln Y_t = \beta_0 + \beta_1 \ln K_t + \beta_2 \ln L_t + \beta_3 \ln H_t + \beta_4 \ln E_t + U_t \quad (3)$$

The number of employees with an appropriate level of education and the expected life expectancy will be taken as indicators of investments in education and health, respectively. There is a minor modification in the education indicator in the regression model in terms of measuring the education investments. Therefore, the output measures (employed people with specific educational qualifications) are taken instead of input measures based on the enrollment rates in education or the number of years for completing education. On one hand, primary and secondary education is part of the regular compulsory education in Macedonia, and on the other hand, the effectiveness of educational process participants is perceived only after they participate in the production process. Educational qualifications of employees in Macedonia will be taken into account, i.e. the knowledge embodied in workers as a result of past investments in education. The same indicator and procedure were also made in Jenkins (1995) research, as well as in research on the impact of human capital in the United States and Sweden. Furthermore, as an indicator of the economic growth, gross domestic product per capita expressed in MKD is used, while gross investments in fixed assets and labor force are used as indicators for capital and labor. Econometric analysis will be used to determine the relationship between human capital through education and health, taking into account gross investments in fixed assets, and labor force on the one hand, and economic growth in Macedonia on the other hand. The research is based on time series because they are more significant in identifying the sources of economic growth when it comes to individual countries. The data on empirical analysis refer to the period 2000-2016 on a quarterly basis and it is taken from the State Statistical Office of the Republic of Macedonia and the World Bank.

**Table 1.** Results from ADF Unit - Root test

| Series | t - statistic | Prob. | Level of differencing |
|---|---|---|---|
| D (Gross fixed capital | -3.554808 | 0.0094 | 1 |
| D (Labor force) | -4.967375 | 0.0001 | 2 |
| D (life expectancy) | -4.01768 | 0.0025 | 1 |
| D (Employees with primary education) | -4.85319 | 0.0002 | 1 |
| D (Employees with secondary education) | -4.190926 | 0.0014 | 1 |
| D (Employees with higher education) | -6.904144 | 0.0000 | 2 |

*Source: Authors' calculations*

## EMPIRICAL RESULTS AND DISCUSSION

First of all, standard econometric methodologies of time series analysis examine whether a particular time series is stationary or non-stationary. In the case of non-stationarity, usual statistical tests will be inadequate in drawing out conclusions; they are likely to be incorrect and will be misinterpreted (Dauda, 2010). The basic assumption for a sound econometric analysis is the stationarity of data time series.

Therefore, before the regression analysis is done, the stationarity of the variables involved in the regression model is checked. Time series have stationarity if the change in time does not cause changes in the shape of the distribution. Testing is done by applying the Unit Root test using the Augmented Dickey - Fuller test. The ADF test showed that the variables are non-stationary at the basic level, so that the first and second level differentials are made and the results of the test are shown in Table 1 as follows: gross fixed capital, life expectancy, employees with primary and secondary education are stationary after the first level of differencing, while GDP per capita, labor force and employees with higher education are stationary at the second differential. After the differentiations, all variables are stationary.

After the stationarity of the time series has been tested, the multicollinearity between the variables has been examined, and due to the high correlation between labor force and employees with primary education, they have been eliminated and hence the regression model has received the following form[3]:

$$\ln Y_t = \beta_0 + \beta_1 \ln K_t + \beta_2 \ln H_t + \beta_3 \ln E_{1t} + \beta_4 \ln E_{2t} + U_t \quad (4)$$

The choice of this model was also confirmed by the lower values of Akaike and Schwarz, as well as the higher determination coefficient, which are indicators for choosing a better alternative specification (Bucevska, 2016).

Table 2 shows the results of the conducted regression analysis, in which the estimated coefficients before the independent variables are statistically significant:

**Table 2.** Relationship between GDP per capita and human capital in Macedonia for the period 2000 – 2016 (quarterly)

| Independent variable | Coefficient | Std. Error | t - statistic | Prob. |
|---|---|---|---|---|
| β0 | -6.322902 | 2.214225 | -2.855583 | 0.0059 |
| $\ln K_t$ | 0.204734 | 0.026238 | 7.803006 | 0.0000* |
| $\ln H_t$ | 0.232253 | 0.102790 | 2.259486 | 0.0274* |
| $\ln E1t_{\text{(secondary education)}}$ | 0.107538 | 0.045405 | 2.368407 | 0.0210* |
| $\ln E2t_{\text{(higher education)}}$ | 2.878334 | 1.083108 | 2.657476 | 0.0100* |
| $R^2$ | 0.973643 | | | |
| Adjusted $R^2$ | 0.971915 | | | |
| F - statistic | 563.3544 (0.000000) | | | |

*Dependent variable: GDP per capita*
*Note: p < 0.05**
*Source: Authors' calculations*

The results show that the formation of gross fixed capital, life expectancy, employees with secondary education and employees with higher education have a positive

3 Kt - Gross fixed capital; Ht - life expectancy; E1t - employees with secondary education; E2t - employees with higher education

impact on economic growth, i.e. GDP per capita, which is consistent with most of the theoretical and empirical researches on the relationship between the mentioned variables. The adjusted $R^2$ is 97%. This shows that over 97% of variations in real GDP growth can be explained by independent variables. Also, this coefficient shows the good state of regression. F-statistic of 563.35 shows that explanatory variables are important factors that determine the GDP growth rate in Macedonia, i.e. that the model is good. While testing the significance, the effects of all independent variables on economic growth are statistically significant, as evidenced by t-statistical values and their respective probabilities which are lower than the level of significance of 5%. Fixed capital has the greatest statistical significance, but according to the model, a rise in gross fixed capital by one unit increases the economic growth by 0.20%. From the aspect of health as one of the indicators for human capital, if life expectancy rises by 1 year, gross domestic product per capita will increase by 0.23%. One possible explanation for this consequence is that the increase in life expectancy has a positive contribution to the economy due to the long-term employment of individuals in the country. An increase in the number of employees with completed secondary and tertiary education (such as output measures/indicators of education) by one unit contributes to the increase of GDP per capita by 0.11% and 2.88%, respectively. It can be concluded from the estimated coefficients that higher education qualifications contribute more to the growth of gross domestic product per capita in Macedonia, hence the investments in education represented through secondary and higher education qualifications together contribute to greater economic growth than gross fixed capital formation in Macedonia. The results of this research reflect health as an indicator and factor contributing to economic growth caused by its positive and significant impact, but the importance of education for economic growth is greater and more important for a developing country like Macedonia.

## CONCLUSIONS

Economists and policy-makers often promote increased investment in human capital. The emergence of exogenous literature with included human capital and endogenous growth literature occurred at a time when technological change continually modified production operations, which today put up with modern modifications and innovations. These changes, together with market globalization, have transformed industrialized countries into knowledge-based economies. Such a shift from a resource-based to a knowledge-based economy made human capital one of the leading topics in economic growth. However, the existing investment measures in Macedonia do not allow policy-makers to fully understand the implications of human capital on economic performance and technological advancement. Because human capital covers knowledge and skills, and economic development depends on advances in technological and scientific knowledge, growth and development also depend on the accumulation of human capital.

The economic concept of human capital is closely linked to investment in human capital, mostly received through education and on-the-job training. Hence, the future production capacity of individuals and their contribution to economic growth depend on the possession of human capital. Research in Macedonia has shown that the main shortcomings in terms of investing in human capital are generally related to the increase of inequality in the country, lack of economic policies, lack of a link between GDP growth per capita and life quality and difficulties to access the capital market and

information. Namely, most of the investments in Macedonia are capital investments. A number of empirical studies have analyzed the sources of economic growth in Macedonia at the national and sectoral level, emphasizing the factors of production and, in particular, the overall factor productivity. The role of human capital investment in the economic growth of Macedonia has not been sufficiently tested. Several studies document the process of forming human capital in promoting the economic growth of Macedonia, but the econometric analysis in this respect is poorly documented.

Health and education are two closely related indicators of human capital that work together to make the individual more productive. The United Nations recommends developing countries to invest at least 26% in education, and the World Health Organization requires at least 5% for health. National reports in Macedonia show that only 11% of investments are directed towards education, and 14% in health care. This conclusion is contrary to the results obtained in the model of this paper where education contributes to a 2.88% growth in the economic growth, a growth that is greater than that caused by health and gross fixed capital.

Human capital participates in the production process, increases productivity and therefore, causes income growth in the country. The study found that higher education is the most important level of education in terms of its contribution to the growth process. It is not controversial that the costs of education should be increased at all levels of education in order to ensure individual, social and economic development of Macedonia, whereby it is recommended to give priority to the tertiary level of education in terms of allocation of resources for ensuring greater and more sustainable economic growth. A body of research evidence suggests that the impact on economic growth is more significant when governments manage to increase the level of educated workforce through additional years of secondary or higher education, rather than simply increasing educational attainment through the rates of enrolled or graduated students in any given year. Such a finding guides government policy towards changes to improve the quality of education, and not just increasing the number of students that go through the educational system in the short term. The increase in life expectancy makes a positive contribution to the economy due to the long-term employment of individuals in the country. In Macedonia, the hypothesis for the impact of health on economic growth also proved to be positive, that is, accepting the hypothesis that health has a positive impact on GDP growth.

This study provided evidence of the impact of human capital, i.e. education and health, and gross fixed capital (as a factor of production) on the economic growth in Macedonia, using regression techniques. The study showed that the impact of the two indicators of human capital (education and health) is statistically significant and has a positive effect on the economic growth in Macedonia. Therefore, the key hypothesis in this paper proved to be correct, agreeing with all the parameters and tests in the econometric analysis. Hence, the recommendation is that development perspectives should be searched out in real resources in the short term, while in the long run, economic growth and development aspects are directly related to investment in human capital.

## Acknowledgments

**Some parts of this paper have been presented at the International Scientific Jubilee Conference – MHR018:"Transforming the business for future: Building a modern HR organization" (https://mhro18.wordpress.com/).**

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