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THE CORRELATION BETWEEN EDUCATION AND HUMAN CAPITAL AND THEIR IMPACT ON THE CREATION OF A KNOWLEDGE-BASED ECONOMY¹

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Abstract

Education and scientific research are the main channels through which human capital and knowledge are generated. Human capital and knowledge are thus the basic determinants of economic growth and development in modern knowledge-based economies and are recognized as the key factor inputs which increase the assets of the entire economy. Nowadays, world economies are rapidly restructuring to be knowledge-based, and investment in human capital is a significant contributor to the economic growth. Competitiveness between knowledge-based economies conditions that comparative advantage of any economy be the cumulative human capital, knowledge and innovation. This paper, using the scientific methods of historical comparative analysis, trend linear analysis and the method of induction and deduction, explores the transmission channels of the impact of education on economic growth and development in N. Macedonia, draws comparisons with countries in the region and proposes measures for improvement.

Key words: knowledge-based economy, education, scientific research, innovation, economic growth and development.

¹ review scientific paper

INTRODUCTION

Unlike the traditional perception of economics as a study of how to properly allocate scarce and limited resources, the new knowledge-based economy focuses on the knowledge and the abundance of information and ideas shared and accumulated which require a certain initial pool of knowledge in order to be used selectively and purposefully. The main driver of growth in the economy is knowledge and human capital, and they are a sublime of all technological and scientific knowledge generated through education and scientific research.

EDUCATION AS THE MAIN PILLAR OF KNOWLEDGE-BASED ECONOMY AND HUMAN CAPITAL GENERATOR

Knowledge-based economy includes three structural components: educated and skilled workforce, incentive and innovation. It is built on four pillars (Chen and Dahlman, 2005):

- Economic and institutional regime that provides incentives for the efficient creation, sharing and use of knowledge supportive of economic growth and increase of welfare;
- Education, and educated and qualified workers that can create knowledge and use it;
- Innovation systems that can engage into the growing global knowledge fund, adapt it to local needs, and transform it into products valued in the market;
- A dynamic information infrastructure that can facilitate effective communication and processing of information.

Education and scientific research and development are the primary institutional social channels through which human capital is generated as the main determinant of a knowledge-based economy. Human capital is defined as a series of production capabilities, skills, knowledge and talents of the individual acquired through the educational process (in the broader context of understanding: formal and non-formal education), scientific research work, training and experience. Education (especially higher education), research and development as a subset of human capital are necessary to ensure a high rate of

economic growth. These are activities through which knowledge and innovations of the individual and the society as a whole are acquired and are proportionally related to the growth of productivity in the economy: through the creation of human capital and better workers, as well as through the creation of scientists and researchers as instruments of innovation, new technical and technological inventions.

ECONOMIC REFLECTION ON THE CORELATION BETWEEN EDUCATION, HUMAN CAPITAL AND ECONOMIC GROWTH

There are two types of economic growth models that explore the intensity and channels of impact of human capital on economic growth. The *first* classical and neoclassical *models* (Solow 1956) are exogenous growth models and are usually based on the production function of Cobb-Douglas, on a case-by-case basis or:

$$Y = K^\alpha X \quad (1)$$

where Y is GDP per capita, K is the physical capital per capita, X is growth per capita, and α is the production parameter. King and Levine (1993) believe that the rise of X is dependent upon exogenous innovations and technological development that is, upon accumulated knowledge, skills, innovation and creativity as the main prerequisite for technological growth and development. The *other models* include technological development as an endogenous variable of growth (mostly impacted by the human capital) while the premise of perfect competition has been replaced with imperfect competition and constant returns to scale. This growth model (Lucas, 1988) is presented as

$$Y = AKa(uhL)^{1-a} \quad (2)$$

where Y denotes the total income in the economy, A is the physical resources, K is the capital, L is the workforce, u is defined as the ratio between the total hours of labour, and the variable h denotes the stock of human capital. Romer (1990) proposes a model underlining that economic growth, above all, requires the accumulation of knowledge at all levels. He holds as elements of his model of endogenous growth capital, labour, human capital and the technology level

index. Investments in education, innovation and new propulsive techniques and technology are factors that increase human capital. Romer concludes as prerequisite for higher economic growth that instead of investing in the accumulation of physical capital, states should subsidize education, new ideas and the accumulation of total human capital at the state level. Seen through the prism of contribution to GDP growth, the accumulation of human capital is three to four times more significant than the accumulation of unskilled labour, while the growth of total factor productivity (labour, capital and natural resources) is significantly determined by the initial level of human capital. (Hanushek, Woessmann and Zhang, 1999). Higher investments in education and technology are associated with consistently higher growth rates (Guellec and De La Potterie, 2002). On average, a 10% increase in knowledge-based capital investment per employee is associated with a 3% productivity growth (Ubaldo, Siedschlag, 2020). Human capital and research are leading factors in increasing productivity because they facilitate knowledge spillover and the adaptation of new technologies to economic growth (Carlsson et al 2009). Technological development allows more value to be extracted from limited resources to sustain economic growth (Romer 1990; Lucas 1988). Katz et al (1999) showed that the number of jobs and wage rates of the better educated workers grew faster than those of unskilled workers. Fleisher et al (2010) find a strong positive correlation between human capital and economic growth. In many regions and countries (OECD, 2013) investments in knowledge-based capital are on the rise and in some countries they are larger than investments in physical capital. Different investment rates in knowledge and human capital entail divergence in levels of economic growth and development. The United States invest more in knowledge, research, and development than any other G7-countries combined.

EDUCATION AND INNOVATION EXPENDITURES AS HUMAN CAPITAL INVESTMENTS

Collective knowledge is capital or wealth which has its price and which can recreate ie. produce additional, new wealth which in turn justifies expenditures, that is investing in human capital or in other words, investing in education, scientific research, training and experience as the main contributors to the creation of such capital. Therefore, the costs of education and research become investments in human capital and are a significant factor of impact on

productivity, and economic growth and development in the country. Human capital in terms of physical and material resources (whose value declines over time in addition to their depreciation) has a growing value. Knowledge (albeit outdated) is never wasted, ie. the same knowledge or inventions or ideas can be used many times over, upgraded and even turned into a public good. The price of human capital is determined indirectly and is equivalent to meeting the supply and demand for human capital. Econometric analysis can be reduced to a micro level - when measuring the ratio of human capital, earnings and productivity at the enterprise level; and macroeconomic analysis - which focuses on aggregate human capital as a factor for national and international economic growth and development. As long as the present value (and/or productivity) of human capital exceeds the costs of creating it, investing in human capital is economically viable. The benefits of such investments come with a time lag, indirectly affect productivity and are difficult to measure. The most commonly used method for estimating the value of available intangible capital at the enterprise level is the ratio between the market and the book value of a company. The difference in values is made by human capital, which in successful companies participates with an average of about 80% in their total assets (Vrateovska, Mojsoska, Dujovski and Tikveshanska, 2014).

EDUCATION AS CONTRIBUTOR TO THE ECONOMIC GROWTH IN THE REPUBLIC OF NORTH MACEDONIA

In order to examine the degree of total government expenditures, ie. investments in education and research, for the purposes of this paper an analysis was conducted in the period between 2010 and 2020 on the percentage share of budget expenditures for education in GDP, budget expenditures for higher education in GDP, the share of budget expenditures for science in GDP and expenditures on research and innovation in GDP. As illustrated on Chart 1, there's a downward trend in budget expenditures for education in GDP from 4,58% in 2010 to 3,37% in 2018 with an average of 3,95% in GDP (less than average in OECD countries where it is 5% (OECD, 2016)).

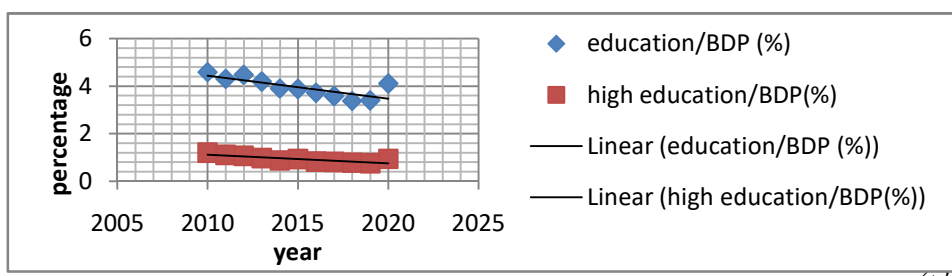


Chart 1 The share of budget expenditures for education in GDP (%) and budget expenditures for higher education in GDP (%), 2010-2020, source: Final budgetary accounts in RNM PCM 2010-2020 – MoF, SSO, authors' elaboration

The percentage share of budget expenditures for higher education decreases from 1,2% in 2010 to 0,75% in 2019 with an average of 0,94% in GDP. These are also in a downward trend.

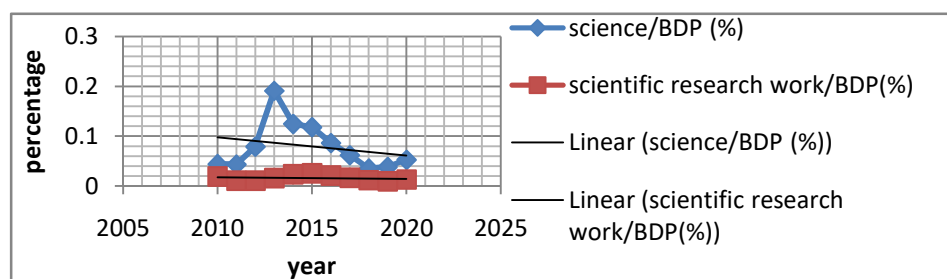


Chart. 2 The share of budget expenditures for science in the GDP (%) and budget expenditures for scientific research in the GDP (%), 2010-2020, source: Final budgetary accounts in RNM PCM 2010-2020 – MoF, SSO, authors' elaboration

The linear presentation of budget expenditures for science has a generally downward trend, reaching its maximum of 0.19% of GDP in 2013 with an average of 0.08% of GDP which is much lower than the EU average of 2.2 % of the GDP. Expenditures on scientific research and innovation average 0.02% of GDP with a maximum of 0.025% reached in 2015, and also have a downward linear trend. The eleven-year presentation of data, their downward trends and the comparison with the average values in the OECD and EU countries, show that the country inevitably needs a significant modification of public finance management policies in order to increase the budget allocations for education, science and scientific research. Moreover, there need to be created long-term and consistent policies to ensure the development of this sector, all with the purpose of ensuring structural improvement of the domestic potentials for a knowledge-based economy. Another country research conducted using the method of regression analysis for a series of data in the interval 2003-2012(Boglevska and Tasevska, 2012) underlines that unemployment is inversely

related to GDP per capita, that is if the unemployment rate increases by 1% then GDP per capita will decrease by 85.98 US Dollars. Numerous studies have shown that employment opportunity and earnings are directly proportional to education, skills, abilities and qualifications (Hannan, Smyth, 2013). The national analysis of the focus group of young people aged 15-24 notes that the higher the level of education, the higher the rate of their participation in the workforce. The average gross income of employees with elementary and three-year secondary education is 30% lower than the income of individuals with four-year secondary education. Higher education brings in 80% more income than the income of employees with four years of secondary education (MLSP, 2012). This is reflected in the distribution of data used in this paper against the number of unemployed persons by education in RNM in April, 2021. Out of the total 144,390 unemployed persons (ESA, 2021) only 8.5% falls to those who have obtained higher education, master's degree or doctorate while the remaining high 94.5% are in the labour force without any education or with primary, secondary and college education. This is presented in Chart 3.

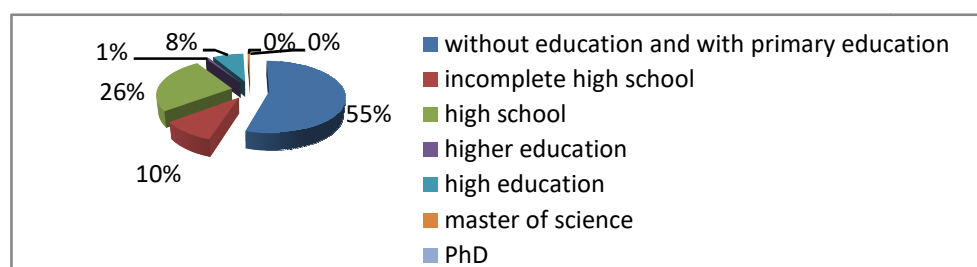


Chart 3: Number of unemployed persons in RNM according to degree of education, 04/2021, source: ESA, RNM, authors' review

The Global Innovation Index (GII, 2020) ranks the Republic of North Macedonia 57th out of 131 countries against the following criteria: institution - 50th, human capital and research - 72, infrastructure - 49, market sophistication - 17, knowledge and technology outputs - 58 and creative outputs-76. Bulgaria is ranked 37th, Montenegro 49th, and Serbia 53rd. Switzerland, Sweden and United States of America rank within the top three countries.

CONCLUSION

Human capital is a determinant with a large impact on economic growth and development in the Republic of North Macedonia. Econometrically, unemployment is inversely dependent on GDP per capita. The unemployment rate, as well as the structural analysis according to the education of the unemployed in the country, indicate insufficient use of available resources, insufficient utilisation of economic capacities and lost economic growth rates. Alongside increasing the budget expenditures for education, science and research and bringing them closer to the average in OECD and EU countries, we propose as main imperatives for creating a growing knowledge-based economy the following: transformation of the education system from repetitive into creative, cognitive and flexible enough to respond in a timely manner to rapid technical and technological changes, labour market needs and individual educational/developmental affinities of participants; implementation of the principles of entrepreneurial learning through the adoption of the knowledge-based economy approach; introduction of courses for development of innovation management into high school and university curriculum; drafting up-to-date public policies for research and innovation, providing incentives to increase research projects, and long-term and sustainable funding system for continuous improvement of workers' knowledge and skills.

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