ECONOMICS OF EDUCATION: THE EXAMPLE OF THE BALKAN COUNTRIES

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ABSTRACT

Economic growth is an economic topic that attracts a lot of attention in science and research. This is a consequence of the emergence of increasingly frequent regional and global instabilities, which often develop into open economic crises of a larger scale. Therefore, today's economic stability is largely threatened due to the slowdown in GDP growth. Economic growth is influenced by various economic factors, with education being one of the most important, which undeniably boosts productivity, competitiveness, and growth. Among the first, this topic was elaborated by Solow. In this research, regression analysis was used to analyze the influence of several selected variables that determine the state of education. The research results are presented in two models. The dependent variable is Gross National Income per capita (GNIpc), and the independent variables in the first model are years of education, macroeconomic stability, and ability to accept information technologies. In the first model, none of the independent variables is individually significant for the movement of GNIpc. The continuation of the analysis (second model) excludes the variable of macroeconomic stability. The final results are significant for the movement of GNIpc and show that an increase of one year in education leads to an increase in GNIpc by 4408 units, while an increase in the speed of ICT adoption leads to an increase in GNIpc by 543 units. Thus, the research results show a positive and significant influence of the selected independent variables on the economic growth of the Balkan countries.

1. INTRODUCTION

A number of factors affect the rate of economic growth. In its general form, this regularity can also be seen in the structure of production which reads:

$$Y = f(Tp, K, L),$$

where the indicated symbols represent: Y – Gross domestic product (GDP), Tp – Technical progress, K – capital, and L – labour.

According to Solow (1956), technical progress expressed as the accumulation of knowledge and technological base development is the main factor of economic growth. Lucas (2015) also identifies the impact of human capital on economic growth, as a constituent of production function. Impact of education, science, technological development, research and innovation on GDP growth can be sublimated through the independent variable of technical progress. But the inverse dependence is also valid because the aforementioned areas have an impact on technical progress and GDP growth through the accumulation of knowledge. It is a direct consequence of the growth of productivity of labor and equipment (capital).

The era of globalization is accompanied by intensive economic development, which has become a social paradigm in a way. Recent definitions, new development approaches and models emphasize multidisciplinarity ever more, given that social, structural and technological changes occurred in the observed period, along with GDP nominal growth (aggregate or per capita). Now, in addition to economic conditions, economic development has to meet natural sustainability requirements, which mainly include environmental, energy and other natural factors and standards. The phrase sustainable development for many means the care for the environment, although the term sustainability is much more meaningful and complex. It is easy to perceive that developed communities demand smart, inclusive and sustainable growth, which assumes that GDP (Y) growth takes place in a good (humane) social environment. But such an ambition can only be achieved by countries with developed institutions, including the system and policy implemented in the entire education system. For example, the term "smart" is characterized by processes of acquiring new knowledge, even at lower education levels, studying, lifelong learning, etc.

European Union (EU) member states adopted the EU 2020 Strategy to apply policy and standards of smart, sustainable and inclusive development. Smart growth is the privilege of countries with developed education system (Goldin & Katz, 2020; Hanushek & Woessmann, 2020a), the countries that invest in

research, development and innovation (Visvizi, Lytras & Daniela, 2018; Hanushek, 2016). Inclusive growth component depends on the quality and quantity of education system, especially in primary, secondary and tertiary education. It has been proved that compulsory and high-quality primary and secondary education are the condition for economic development and social inclusion of a country population. However, developed, quality and branched educational institutions present the conditions for smart and inclusive growth (Lilles & Rõigas, 2017; Nistor, Mera & Pop Silaghi, 2018). The new instrument of the European Union (the Next Generation EU, 2021-2027) puts considerable attention to education through various initiatives. The one that stands out is the Digital Education Action Plan (European Commission, 2023). It is a renewed European Union (EU) policy initiative that sets out a common vision of high-quality, inclusive and accessible digital education in Europe and aims to support the education systems of the Member States to adjust to the new, digital age. It can be concluded that the basic social systems of education are an important factor in economic growth, whereby they differ in the level of development, organization, distribution, but also in social awareness. Therefore, research on the impact of non-economic factors on GDP growth is particularly important, not only for developed countries, but also for developing countries.

It is an indisputable fact that the Balkan countries are situated in a geostrategic, but also economically unique area. Regardless of the differences, most of these countries are passing through important stages in their economic and overall social development. In this, transition processes, reforms, as well as the responses to the consequences of the 2008/2009 global economic crisis, the debt crisis in the Eurozone, and now the conflict in Ukraine, are highlighted. At the same time, the global economic order does not wait, but even faster imposes the strictest standards in competitiveness, exports, ICT development, etc. The countries of the region still suffer from "the post-transition syndrome", chronic unemployment and insufficiently high growth rates. Hence the question: how to achieve a long-term GDP growth of at least 4 to 6%, how to create conditions for greater investments in education system, scientific research, reforms and stabilization of institutions?

The subject of this paper is to determine the relationships between education systems, i.e. all levels of education, scientific and other institutions and the economic growth, i.e. their influence on GDP per capita growth rate. The observed region is homogeneous by most relevant indicators, economic and trade indicators, knowledge, culture and tradition. In the current conditions, the economic activity of the region is not possible without the necessary accumulation of knowledge as a production factor. Therefore, research on the

impact of education, scientific and technological research, innovation and other forms of knowledge on GDP growth are very useful.

The complex nature of economic growth and its interdependence with many factors has already been emphasized. Many factors "intertwine" with each other. Education system, science and research depend to a great extent on the economic and institutional capacity of a society. In this, the so-called other institutions that influence the balance of the budget and the fiscal system (they stabilize the debt and the budget), as well as institutions for the protection of property and intellectual property. And finally, it is important to reduce corruption, which is one of the conditions for efficient work of institutions, and faster growth of the well-being in this Euro-region.

Therefore, the main hypothesis is that GDP per capita growth is in positive correlation with quantitative and qualitative indicators of education system for the entire Balkan region. That is, their influence on economic growth is significant and positive. The results depend on the institutions and policies responsible for creating and planning education system development as well as the scientific research base (Saviotti, Pyka & Jun, 2016; Astakhova et al., 2016).

In addition to education institutions, other social and economic indicators are also important, given that education and science depend on them, i.e.: budget balance and structure of budget and fiscal system, attitude towards corruption, protection of intellectual property, as well as the protection of property in general. These social areas are in strong interaction. The second aim of the paper is to prove the hypothesis that education and these factors are in positive correlation with the growth of GDP per capita, and that the relationship between the observed variables is significant.

As stated, theoretical economic progress depends on the available labor and capital factor, but also on the influence of technical and technological progress. It seems that the last factor is getting more important and is becoming a condition for faster GDP growth. The global market is characterized by rapid changes and new technical-technological and organizational innovations. Now digitization sets standards in all social spheres. In terms of the sector, the following are increasingly significant: technological readiness, adoption of leading technologies, especially in IT, artificial intelligence (AI), robotics, biotechnologies, microelectronics, new materials, etc.

In order to check the hypotheses about GNI per capita, the following variables are used in the analysis: years of education, macroeconomic stability, and ability to accept information technologies. Different methods are used in the research, primarily econometric methods.

The analysis includes the following countries: Bulgaria, Romania, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Albania, Slovenia and Greece.

2. PREVIOUS RESEARCH

Economic implications of education in the Balkans countries are de facto the subject of research into technical progress, i.e. the impact of education, science, technological changes and innovations on GDP growth, i.e. on economic development. They mean proving the relationship between the factors of technical progress and GDP growth, that is, GDP per capita.

Unlike the neoclassical theory, the new theory of endogenous growth treats the issues of economic growth differently. Robert Lucas (1988), Grossman & Helpman (1991), Aghion & Howitt (1992), as well as Romer (1994), who is one of the founders of the endogenous growth theory, confirmed the importance of knowledge, education and technical-technological progress for economic growth.

Education, scientific research and technical-technological progress affect the economic development and social well-being of post-transition countries (Popović, Erić, Stanić & Krajišnik, 2019). Even though most of the countries in the Balkan region have completed reforms in the education systems, developed and strengthened institutions (including education institutions), harmonized policies and legislation with the EU, there are still no major effects on GDP per capita growth (Popović, Erić & Bjelić, 2020). Previous research and practice have shown that developed economies or economies in developing countries have more efficient systems of education, science and research. It is also true that there is no economic well-being without continuous accumulation of knowledge arising from education and scientific system (Benos, 2008). It has been proven that economic progress depends on education and scientific basis, and the synergy of institutions and numerous other factors (Hanushek & Woessmann, 2020b). Woessmann (2015) proved the importance of education for the prosperity of an individual and the community, whereby he sees education as the leading factor in economic growth and thus employment. The research is related to knowledge-based economies.

The research conducted by Wang and Liu (2016) proves that education and human capital significantly boost GDP growth, emphasizing the role of higher education, while Grant (2017) believes that the lack of education can threaten economic progress in the future, which can result in poverty and social exclusion.

According to Saviotti, Pyka & Jun (2016), education leads to greater social mobility and increased participation of higher social class population, while Hanushek (2016) observes differences in cognitive skills that affect GDP growth rates among countries. More years of schooling without increasing cognitive skills have systemically accelerated rates of economic growth.

Wider Balkan region is still lagging behind the European Union, although funds are invested in research and education in pre-accession countries (Popović & Erić, 2018). The European Union supports modernization of public institutions, including various levels of education, research and development. Together with member states and candidate members, it makes efforts to modernize the education system, introduce modern methods and contents in the teaching process, as well as optimize the duration of schooling.

In the previous context, the European Union as a global regional integration makes great efforts to maintain external competitiveness. In addition to traditional branches (automotive, electrical, mechanical and chemical industries), the European Union is pushing new high technologies, innovations, development of ICT, artificial intelligence, biotechnology, optics, new materials, sustainable energy, etc. It allocates significant funds to education, research, development and innovation (Erić, 2018). Investments made for these purposes contribute to technical-technological progress and positive tendencies in high technologies. This is best seen in the aims and implementation of the EU Strategy 2020 program, as a model of smart, sustainable and inclusive growth (Popović, 2016; Popović & Erić, 2021). In their research, Hanushek & Woessmann (2020a) quantify the economic benefits from improving education covered by the European Union education aims. In the research, they present disaggregated projections for each of the EU countries and comparative economic results for alternative goals of member policies. By applying certain techniques, they have estimated that an increase in student achievement by 25 PISA points in the EU will, in the long term, contribute to an increase in GDP by 3.4 times. Furthermore, Hanushek & Woessmann (2020b) in their paper from the period of the COVID-19 pandemic, assess the economic implications of school closures around the world in 2020. They believe that the losses from school closures will have lasting economic effects unless they are effectively remedied. According to them, students affected by school closures could expect about a 3 percent lower lifetime income. On the macro-economic level, according to their estimation, closing schools would lead to 1.5% lower GDP by the end of this century at the global level.

Škare & Tomić (2014) proved that education and innovation influenced the economic growth in OECD countries in the period 1950-2013. Through

productivity growth, they proved that GDP depends on technological changes (which depend on education system). Kesici Çalışkan (2015) explores the correlation between education and economic growth and the role of scientific research institutions. Economic growth as a function of technological progress is also investigated by Tomić (2012). Further, Freeman (2013) explores global change and economic growth and innovation, while Malerba & Cantner (2006) explore the industrial structure. Freeman & Soete (2009) conditioned economic progress and changes by changes in technologies and increasingly pronounced motives for public and private investments in education, science and technology. And finally, Pecea, Ecaterina, Oros & Salisteanu, (2015) proved a positive correlation between GDP growth and innovation, while Aghion & Antonin (2018) proved a positive impact of innovation on social mobility.

3. MATERIALS AND METHODS

Material. In this paper, database for analysis is primarily the database from the World Development Indicators (WDI), and the World Economic Forum on Global Competitiveness (WEF), from which the data on the dependent and explanatory variables were taken. Description of variables and numerical values by country are given in the following table.

Table 1. Data on variables in the model and statistical sources

Country	Gross National Income per capita	Years of education (Avg.)	Macroeconomic stability	Ability to accept information technologies ICT
	Dependent variable	Explanatory variables		
Notation in the model	GNIpc	Ed.years	Macr.ec.stab.	ICT.accep
Albania	6.110	10.1	70	53
Bulgaria	11.200	9.8	90	73
BiH	6.810	11.4	75	52
Greece	20.000	11.4	75	65
Croatia	17.630	10.6	90	61
N. Macedonia	6.190	11.6	75	58
Montenegro	9,340	9.8	70	63
Romania	14.160	11.1	90	72
Serbia	8.460	11.2	75	53
Slovenia	28.280	12.7	100	69

Source: World economic forum, 2022; World Bank, 2023.

Methodology. In this paper, an attempt is made to verify the hypotheses about the relationship between education and economic growth by applying a multiple linear regression model (Anderson, 2003). An extended multiple linear regression model was applied by means of backward method and regression procedures, as well as residual analysis (Hwang & Yoon, 2006; Kollo & Rosen, 2005).

As an approximation of the Gross Domestic Product, Gross National Income per capita (GNI per capita, dependent variable) was analyzed, which is in the function of the variables: average number of years of schooling (independent variable) and some control variables that are closely related to education and economic growth (acceptance of information-communication technologies, capacity for innovation and macroeconomic stability taken from the World Economic Forum data).

In particular, the method of including independent variables in the regression model, the so-called backward elimination procedure, was used. Analysis and comparison of models is performed by the IBM SPSS Statistics 23 program.

The backward method gradually excludes independent variables. The order of exclusion of independent variables from the model is determined by the contribution of each specific independent variable in explaining the variability of the dependent variable. The contribution is measured by defined statistical criteria (value of F statistic for inclusion – F, i.e. probability p).

The initial assumption is that all independent variables are included in the model, and then variables are excluded from the model (according to pre-set criteria).

The defined problem is determined by the specification of the model in general form:

$$Y = b_0 + b_1 X_1 + b_2 X_2 + \cdots + b_n X_n \qquad (1)$$

The model is set to take into account the aims to be achieved. Marginal change is difficult to estimate because the independent variables are related not only to the dependent variable, but also to each other.

4. RESULTS AND DISCUSSIONS

The regression shows 2 models, described in the table below. It has already been mentioned that we used the backward procedure method. This means that the first model represents the results of all included variables while in the second iteration (2nd model) the results without the weakest variable in the previous model are simulated.

Table 2. Backward procedure overview, Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	Ability to accept information technologies, macroeconomic stability, years of education		Enter
2		Macroeconomic stability	Backward (criterion: Probability of F-to-remove >=, 100).

Source: Authors' calculation

The summary statistics in the table below show determination coefficients (R square) over 0.6, which means that more than 60% of the variations in Gross National Income are determined by the joint movement of independent variables in both models. Based on these results, it can be said that it is a well-established model and we proceeded to further analyses. That is, the econometric analysis shows that there is a relevant influence of the number of years of schooling, the ability to accept information technologies, as well as macroeconomic stability on the movement of the Gross National Income of the selected countries. It is obvious that education and scientific research, the results of which to the greatest extent represent new information technologies, have direct impact on income and economic well-being. This is confirmed by the research of Solow (1956), or the research conducted by Saviotti, Pyka & Jun (2016), and Astakhova et al. (2016).

Table 3. Summary statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.828[a]	.686	.529	4984.174	.686	4.365	3
2	.801[b]	.642	.540	4925.958	-.044	.837	1

a. Predictors: (Constant), ICT.accep, ed.years, macr.ec.stab.
b. Predictors: (Constant), ICT.accep, ed.years
c. Dependent Variable: GNIpc

Source: Authors' calculation

Analysis of variance (ANOVA) in both models shows that the variables have sufficient freedom of variation (levels of freedom) for statistical inference, the F test result of 4.365 in the first model and 6.274 in the second model confirm statistical significance of the defined models.

Table 4. Variance analysis

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	325289220	3	108429740	4.365	.059[b]
	Residual	149051939	6	24841989		
	Total	474341160	9			
2	Regression	304485708	2	152242854	6.274	.027[c]
	Residual	169855451	7	24265064		
	Total	474341160	9			

a. Dependent Variable: GNIpc
b. Predictors: (Constant), ICT.accep, ed.years, eacr.ec.stab
c. Predictors: (Constant), ICT.accep, ed.years

Source: Authors' calculation

Results of the regression analysis in terms of individual significance of variables and the intensity of their coefficients are given in the table below. Also, the results are presented in two models. The dependent variable is Gross National Income per capita (GNI per capita) while independent variables in the first model are: years of schooling, macroeconomic stability, and ability to accept information technologies. None of the independent variables is individually significant for the movement of GNI per capita.

However, in the second model, the macroeconomic stability variable was excluded, and then both retained independent variables (years of schooling and acceptance of ICT) were significant for the movement of GNI per capita. In addition, an increase in one average year of schooling leads to an increase in GNI per capita by 4408 units, while an increase in the acceptance of ICT leads to an increase in GNI per capita by 543 units.

Table 5. Analysis of the coefficients significance

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Std. Error	Beta			
1	(Constant)	-63698.1	24985.9		-2.549	.044
	Ed.years	3410.7	2154.1	.420	1.583	.164
	Macr.ec.stab.	235.5	257.3	.340	.915	.395
	ICT.accept	323.8	319.5	.351	1.013	.350
2	(Constant)	-69164.1	23978.1		-2.884	.024
	Ed.years	4408.5	1836.1	.543	2.401	.047
	ICT.accept	543.5	208.3	.590	2.608	.035

Source: Authors' calculation

The results obtained in the second model show that the research hypothesis of this paper is correctly set, that is, that education, innovation and scientific research stimulate economic growth in terms of GNI per capita increase. This confirms the Solow's theory to a great extent, who proved that the accumulation of knowledge through technical progress affects economic growth. In this part of the paper, these independent variables were retained: years of schooling and acceptance of IT, which proved to be significant for the movement of GNI per capita. And the course of the variables is correct, since it was proved that an increase in the average number of years of schooling affects the growth of GNI per capita, as well as that an increase in ICT acceptance rate has a positive effect on GNI per capita. These results conform to the paper published by Goldin & Katz (2020), Hanushek, & Woessmann (2020a), Visvizi, Lytras & Daniela (2018), as well as Hanushek (2016). The obtained results are compatible with conclusions reached by Hanushek & Woessmann (2020 b), as well as those by Woessmann (2015).

5. CONCLUSIONS

The countries of the Balkans are featured by the unique geographical and economic space. Bulgaria, Romania, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, Albania, Slovenia and Greece are included in this research. Although there are certain differences in the level of economic development, this region is still a homogeneous and relatively uniform area in terms of development (except Greece and Slovenia). The Balkan countries are close culturally, educationally, historically, linguistically, etc. Today, they are unique in the processes of transition from socialism to capitalism, although with different results and different speeds of these changes. Education systems, and especially institutions, have certain similarities. In the institutional sense, science, research, development, innovation and acceptance of new technologies are close to education.

The key aim of these countries is rapid and long-term economic growth in order to cancel the "gap" in relation to developed countries, reduce the unemployment rate, increase investments, etc. Some researchers agree that the desirable and possible long-term GDP growth rate for this region is at least 4 - 6%. An important prerequisite for faster economic growth is greater investment in education, science, research and development, and above all necessary reforms and institutional stabilization. Thus, the subject of this paper is to determine the nature and degree of relationships between the education system and economic growth, i.e. impact on the growth of GNI per capita. Therefore, the accumulation of knowledge as a production factor is extremely important for economic

development (Solow, 1956), hence the impact of education and innovation on economic growth was investigated. The economic growth depends on several factors, where the system of education, innovations, science and research largely depends on the macroeconomic and institutional capacity of the society.

The results of the research have confirmed the hypothesis that economic growth is positively correlated with the years of schooling in the education system, as well as the acceptance of ICT, for the entire Balkan region. Therefore, the influence of these independent variables on GNIpc is significant and positive. Statistically, the research results were obtained by means of two models. In both models, the dependent variable is GNI per capita, while the independent variables in the first model are years of schooling, macroeconomic stability and the ability to accept information technologies. These variables are individually insignificant, but the summary statistics of the first model show coefficients of determination (R square) over 0.6, which means that the model is well set. Therefore, the second model excludes the variable that treats macroeconomic stability. The independent variables, years of schooling and acceptance of ICT are significant for the movement of GNI per capita, where an increase in one year of schooling leads to an increase in GNI per capita by 4408 units while an increase in the acceptance of ICT leads to an increase in GNI per capita by 543 units. In the second model, the statistical analysis shows a significant and positive influence of selected variables on the economic growth of the Western Balkans countries. The results of this research comply with the results of most previous research works, namely with Saviotti, Pyka & Jun (2016), Astakhova et al. (2016), Goldin & Katz (2020), Hanushek & Woessmann (2020a), Visvizi, Lytras & Daniela (2018), Hanushek (2016), Lilles & Rõigas (2017), Nistor, Mera & Pop Silaghi (2018), et al.

Conflict of interests

The authors declare there is no conflict of interest.

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ЕКОНОМСКИ АСПЕКТИ ОБРАЗОВАЊА: ПРИМЈЕР ЗЕМАЉА БАЛКАНА

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САЖЕТАК

Економски раст је економска тема која заокупља велику пажњу у науци и истраживањима. То је посљедица појава све чешћих регионалних и глобалних нестабилности, које неријетко прерастају у отворене економске кризе већих размјера. Стога је данас економска стабилност у великој мјери угрожена због успоравања раста БДП-а. На економски раст утичу различити економски фактори, при чему је образовање један од најважнијих, који неоспорно подстиче продуктивност, конкурентност и раст. Међу првима, ову тему је разрадио Роберт Солоу. У овом истраживању путем регресионе анализе анализирани су утицаји неколико изабраних варијабли које детерминишу стање у области образовања. Резултати истраживања приказани су у два модела. Зависна варијабла је бруто национални доходак по становнику (GNIpc), а независне варијабле у првом моделу су:

године школовања, макроекономска стабилност, способност прихватања информационих технологија. У првом моделу ниједна од независних варијабли појединачно није сигнификантна за кретање GNIpc, при чему сумарна статистика показује коефицијенте детерминације (R square) преко 0,6 што указује на добро постављен модел. Наставак анализе (други модел) искључује варијаблу макроекономска стабилност, а задржава независне варијабле године школовања и прихватање ICT-а. Коначни резултати су сигнификантни за кретање GNIpc, и показују да повећање једне године школовања доводи до повећања GNIpc за 4408 јединица, док повећање брзине прихватања ICT-а доводи до повећања GNIpc за 543 јединице. Дакле, резултати истраживања показују позитиван и сигнификантан утицај изабраних независних варијабли на економски раст земаља Балкана.

Кључне ријечи: *образовање, инфомационо-комуникациона технологија (ICT), економски раст, Балкан.*