ORIGINAL SCIENTIFIC PAPER

Analysis of the Impact of Public Education Expenditure on Economic Growth of European Union and BRICS

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ABSTRACT – *Knowledge is one of the key factors for the development and progress of each of the world economies. Starting with the industrial revolution, more attention and resources are invested in the development of the education system. Economies need to invest effort and resources in the education system that would allow for population to prepare for participation in the economic life of their country. This means that investing in youth education and training for work in the economy and development of young people in research, development and science would contribute to the development of new technologies and knowledge. Development of new technologies and knowledge contributes to increased competitiveness of country in the global market. This paper presents a comparative analysis of investment funds in the education systems of the European Union and BRICS, and it is shown that there is a positive correlation between public expenditure on education and the value of GDP of the country.*

KEY WORDS: education, economic growth, regression analysis, European Union, BRICS

Introduction

Education is the process of personality change in the desired direction by adopting different content depending on the age and needs of individuals. Education includes teaching, in addition to educational facilities, depending on the age and needs of individuals. Education is the process by which society transmits accumulated knowledge, skills and values from generation to generation. In the old societies, only a small number of people, especially those who had the money or the time, were educated. Then the religious dignitaries were often the only literate group, who used the knowledge to read and interpret religious texts.

Education in its modern form involves teaching in specially constructed buildings. This form of teaching began to grow gradually, especially after the Industrial Revolution. The process of industrialization and urban expansion has caused the need for special education. People today are working in many professions and use a variety of expertise, so it is not possible to transfer knowledge from parent to child, as it was in old times.

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Knowledge is now the main source of long-term economic growth of each of the world economies. Modern tendencies of development in market economies show that education and investment in human resources are among the priorities of the national strategy and national policy, economic and technological progress. Trends in investment in human capital and knowledge lead to a revision of economic theory and models. Economists are still looking for the basics of economic growth. The traditional "production function" focused on labor, material, capital and energy as the main factors. Knowledge and technology are external factors that impact on production. Now analytical approaches have been developed so that knowledge can be included directly in the production function. Investment in knowledge may increase the production capacity more than any other factor of production and to transform them into new products and processes. Because these investments in knowledge characterized by an increase (rather than decrease) in rate of return on investment, they are the key to long-term economic growth.

The state plays a very important role in the field of education. Education is a big item in the expenditure budget of modern states. Jadranka Đurović-Todorović and Marina Đorđević (2010) note that in some countries even though the state is able to provide funds for educational institutions, most of the education is provided by private schools, especially those belonging to churches.

Education is subject to permanent change. The sudden change of paradigm leaves little time to adjust. However, there are a few problems in education changes, mostly relating to how to preserve the good values from the previous education system and how to align the education system with the needs of the modern economy and society. Today in Serbian education system a major challenge by Đurović-Todorović and Đorđević (2010) is harmonizing the educational profiles curricula with labor market needs.

The aim of this paper is to find an empirical relationship between the values of GDP and public expenditure on education and to what extent public spending on education to economic growth in the example of the European Union and BRICS and to compare.

Education as an important factor for economic growth and development of countries

The importance of education for economic development was first spotted by father of economics, Adam Smith. Adam Smith represented the idea of specialization of labor. According to Smith, the amount of annual products of a nation depends on two factors: the amount of labor employed in the production and productivity of labor. According to Smith, the first factor is of lesser importance than the other factors, as can be seen from the fact that people in earlier times lived much poorer than modern people, even though the percentage of the employed labor was much higher. Smith primarily indicates the importance of the division of labor, as well as first-rate factor increase in national wealth. Obrad Blagojević and Marko Sekulić (1990) note that many economists believe that the idea of division of labor is one of his greatest contributions to economic science.

From the above it can be concluded that it is necessary to invest resources to people who are employed to train and educate to work in certain professions. Therefore, it is very important to invest in education. Even in some texts, lectures or videos on the internet we

can hear that the modern school was specifically made for the needs of industrialization. In fact, if you compare schools have classrooms that are like production facilities in the factories, the bell that marks the beginning and end of classes, such as in factories that marks the beginning and end of the work shift, the students are divided by grade, as in factories for the production facilities, and students in schools are doing exactly what their task is, as in factories where each plant has a specific role in the production process.

Adolph Wagner was probably the first economist to recognize the positive correlation between economic growth and the growth of government activity. As Magnus Henrekson (1993) pointed out, Wagner saw three major reasons for the increasing role of the state. First, industrialization and modernization would lead to an increase in private activity. Expenditures for law and order, as well as contractual enforcement should be increased. Second, the increase in real income will lead to the expansion of income elastic of "cultural and social welfare" expenses. Wagner said that the education and culture are two areas in which the government is a better controller and executor than the private sector. Dipendra Sinha (1998) note that natural monopolies like railroads must be controlled by the government, because private companies are not able to run these monopolies effectively. For private companies it is impossible to raise huge finances that are necessary for the development of natural monopolies.

Problem of the impact of public expenditure in education many theorists have dealt with, and this topic now occupies one of the main topics in economic research. A lot of empirical studies have attempted to examine the relationship between human capital investment and economic growth. Sayantan Ghosh Dastidar, Sushil Mohan and Monojit Chatterji (2013) in their work present that relationship is tested in countries such as the United States (Jorgenson and Fraumeni), and Pakistan (Aziz Khan and Aziz), Tanzania and Zambia (Jung and Thorbecke), Nigeria (Ogujiuba and Adeniii) and India (Chandra) and that results from these papers suggest that expenditure on education affects economy growth positively. Fiszbein and Psacharopoulos conducted a study to assess the effects of educational investment in Venezuela and found that investments in primary education had the largest impact on growth and investment in higher education yields the lowest among the three levels of education. Distidar,Mohan and Chatterji (2013) found in India that investing in education is a necessary but not a significant condition for achieving economic growth. Other factors have a significant impact on economic growth in addition to education. Oluwatobi Stephen and Ogunrinola Oluranti (2011) for Nigeria found that there is a positive relationship between the growth of expenditures for education and economic growth using an expanded model of economic reproduction, where they add to the analysis impact of costs of education and health care. Dipendra Sinha (1998) found in Malaysia that there is a long-term relationship between the cost of education and economic growth, but that there is no mutual relationship between the increase in the cost of education and economic growth. Avina Sabah Idrees and Muhammad Wasif Siddiqi (2013) based on panel analysis found that there is a positive relationship between the rising cost of education and economic growth, and there is the effect of reaching the developed economies based on the investment in education. In their analysis they observed countries UK, USA, Canada, Germany, France, Italy and Japan, on the one hand, and Pakistan, India, China, Turkey, Russia, Poland and South Africa, on the other hand. Abhijeet Chandra (2010) found that India's boom in software industry experienced probably due to the huge investments in the 1950s and 1960s

in education, particularly in technical sciences. There are also works like and Nurudeen Usman and Belgrave and Craigvell, which found that the impact of education expenditures on growth is negative.

In addition to studying the impact of the increase in public expenditure of education to economic growth, there are works such as Michel Beine et.al. (2001) dealing with the problem of brain drain and its impact on economic growth. This is one of the big problems for the growth of the economy of countries like Serbia.

Theories of economic growth and Lucas' model

Dragan Kitanović and Nataša Golubović (2006) define economic growth as the increase of the potential products of an economy, and moving to the right of its production possibilities curve. Economic growth can be quantified, primarily by calculating the growth rate of gross domestic product, growth rate of GDP per capita, national income per capita and etc. The theory of economic growth has occupied an important place in classical economic theory. Within the classical aproach there are three main factors of economic growth: labor, land and capital. Economists of classical school did not take in account technological progress, as well as the development of human capital, which is one of the main objections to their theory. According to Marxist school on economic growth was influenced by a number of variables, but chief among them was the rate of profit. For Marx it was the constant tendency of capital accumulation and a steady increase in the organic composition of capital, which is not accompanied by a corresponding increase of workers income.

Neoclassical growth model is based on the model of the economy in which production is carried out with the use of capital and labor. Also taking into account the progress of technology, but which has been conditioned by exogenously. This theory has experienced criticism primarily by post-Keynesians, but the biggest criticism was the observation of technological progress as exogenous factors of economic growth. Schumpeter was particularly emphasized the importance of investments to improve the quality of capital goods, ie. innovation. The implementation of "new combinations" of resources is the primary force that encourages economic growth.

Keynes represented the view that public expenditure as an exogenous factor can be used as a policy tool to promote economic growth. Public expenditure can positively contribute to economic growth. Thus, the increase in government spending is likely to lead to increased employment, profitability and investment through multiple effects on aggregate demand. As a result, government spending increases aggregate demand, which causes increased production depending on the expenditure multiplier.

The new theory is "endogenous growth theory" which differs from the neoclassical theory, because assuming that the technological change endogenously conditioned, able to explain the continued growth of per capita income in some countries, on the one hand, and persistent survival disparity in the level of pre capita income among countries, on the other hand. The basic model of "endogenous growth" according to Kitanović and Golubović (2006) includes human capital as a separate factor in the production function. Investment in education by the state, participating in the creation of an adequate educational program surely is a key factor for improving human capital, which leads to increased productivity and getting the necessary technological innovation to further economic growth.

Lucas, along with Romero, is one of the creators of the theory of endogenous growth. In Lucas' model, human capital is seen as a factor of production and knowledge is central to accelerating economic growth. According to Lucas' model engine of economic growth is human capital. People can use their time for work and training (i.e., research and practice). The relationship between these activities to individuals in an economy to make depends on the institutional structure and characteristics of the labor market and the economy.

In this paper we performed a quantitative analysis of the impact of public spending on education in the economic growth of the economy in the example of the European Union, USA and Japan, as the largest economies in the world.

Model

In research is used a model that is derived from the classical production function. In this case, the movement of the value of production in the economy depending on the cost of public education is observed.

$$Y = f(EDU) \tag{1}$$

where Y is a production function of one of the country, and EDU represents public expenditure on education in the country. When this model is transformed into logarithmic from (1):

$$\log(GDP) = \beta_0 + \beta_1 \log(EDU) + \mu \tag{2}$$

where β_0 is constant intercept term, β_1 slope coefficient and μ is error. Slope coefficient tells us how much it will increase the value of GDP if we increase the value of public spending on education. This paper uses costs of the public sector, because the private sector costs difficult to measure and obtain the necessary data, and because in most countries the greatest interest in investing in education is the state, and it bears most of the costs.

In this paper, the analysis is performed on the European Union and 28 member states, for BRICS countries and Serbia. It also provides an overview of information on investing countries in different levels of education. The regression analysis was applied, which was made in the program ORIGIN 9.

Analysis of the model

The analysis of public expenditure on education in the EU Member States and the European Union as a whole

In the countries of the European Union knowledge-based economy is a strategic task. The Bologna declaration on higher education from June 1999 marked the beginning of a new enhanced European cooperation. Đurović-Todorović and Đorđević (2010) say that educational system of each country can be divided into three main sectors:

- public education
- private education in which the state participates with 50% and
- private education (independent schools)

In the European Union education is the responsibility of the Member States. EU institutions have importance in supporting of education. According to Article 165 of the Treaty on the Functioning of the European Union, the Community will contribute to the development of quality education by encouraging cooperation between Member States, through activities such as promoting the mobility of citizens, designing joint study programs, establishing networks, exchanging information or teaching languages of the European Union. The contract includes a commitment to promote lifelong learning for all citizens of EU.

The EU funds educational, professional and public construction programs that encourage EU citizens to seize the opportunities offered by the EU to its residents to live, learn and work in other countries. The most famous of these is the Erasmus program, under which more than two million students have participated in the inter-university exchanges and mobility in the last 20 years. Since 2000, awareness of the importance of education and training in order to exercise economic and social objectives, the EU member states have started to work together to achieve a series of 13 specific objectives in the field of education. This is called the Education and Training 2010 program. Sharing good practices by participating in peer education activities, by setting benchmarks and monitoring progress of key indicators, the 28 member countries aim to respond to coherent common challenges, while retaining their individual sovereignty in the area of educational policy. The European Union is also a partner in a variety of intergovernmental projects, including the Bologna process which aims to create a European Higher Education Area by harmonizing academic degree standards and structures, as well as academic quality assurance standards across the EU Member States and in other European Countries[3].

Main education priorities of the EU countries are:

- strengthening vocational education and training,
- increase transparency of professional education and training through the implementation and rationalization of information networks,
- improving policies, systems and practices in the approach to learning, the professional education and training,
- promote cooperation in assurance of quality in education,
- supporting the professional development of staff, etc.

For the analysis of the European Union we used the data obtained from Euro Stat of the GDP values for the period from 2002 to 2011, as well as the amount of public expenditure on education for the period 2002 - 2011 expressed as a percentage of GDP. The used data are shown in table 1.


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Table 1.GDP and public expenditure on education for EU, 2002 - 2011

Year	GDP (in mil €)	Public expenditure on education (% GDP)	Public expenditure on primary education (% GDP)	Public expenditure on secondary education (% GDP)	Public expenditure on higher education (% GDP)
2002	9,983,702.30	5.00	1.13	2.27	1.12
2003	10,151,451.90	5.03	1.15	2.29	1.11
2004	10,658,018.60	4.95	1.14	2.23	1.10
2005	11,128,703.00	4.92	1.13	2.20	1.12
2006	11,764,657.30	4.91	1.15	2.17	1.10
2007	12,473,648.90	4.92	1.15	2.17	1.11
2008	12,548,545.70	5.04	1.17	2.22	1.14
2009	11,815,746.60	5.38	1.24	2.39	1.21
2010	12,337,150.70	5.41	1.23	2.37	1.25
2011	12,711,206.20	5.25	1.19	2.23	1.27

Source: Euro Stat http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/, data processed by author (accessed October 1, 2014)

Based on the obtained data it can be concluded that by 2008 the average of 5% of GDP for education was used to finance in 28 countries members of the European Union. Since 2009, after the economic crisis, EU has increased the allocation of funds for education, which may be related to the importance of education to obtain the competitive advantage of the EU Member States in relation to the rest of the world economy to recover from the economic crisis. In addition that is the period when there was an increase in the unemployment rate in all EU member states. Most of the funds were allocated for secondary education (2.17 to 2.39%), which indicates the importance of this level of education. At the secondary level of education young people gain expertise in areas that will be in their professional career to deal with, but also in that period they become capable of working. For basic and higher education almost the same amount of fund is used. The largest expenditure on secondary education can be explained by the fact that the present system of private financing of education of young people and that higher education is not compulsory. EU aims to reach by 2020 40% of the population are higher educated, and therefore should not be surprising that there is a growing trend when it comes to public funding of higher education.

Figure 1. Graphic of GDP amount and cost of education in the EU 28 per year
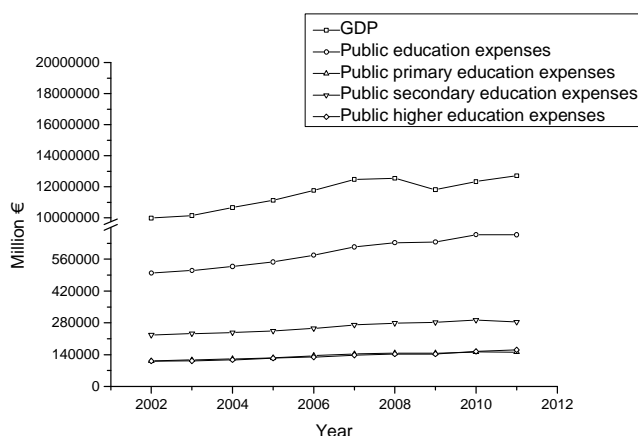
Application of the model in case of the European Union and the member states of the European Union

The analysis starts from the null hypothesis, which states that the total value of public education spending does not significantly affect the value of the observed GDP of the country. The analysis used the logarithmic values of the GDP of the European Union and the logarithm of the absolute value of the principal amount of expenditure for the period 2002 - 2011. By applying multiple regression analysis of the model (2) we obtained the following values of the parameters:

Table 2. The parameter values of the regression analysis for EU 28

Parameter	Value	Error	t-statistics	Probability
β_0	2.58353	0.52380	4.93232	0.0012
β_1	0.77645	0.09082	8.54894	0.0000
R	0.94939			

Source: Data processed by author from
EuroStathttp://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/, (accessed October 1, 2014)

The obtained values tell us that there is a positive correlation between the observed value and the value of investments in education significantly affects the value of GDP for the EU28. The probability of t-value of the regression coefficient is 0.0000, which is less than the significance level of 0.05, which confirms that the costs of education significantly affect the value of the observed GDP of the country; in this case we reject the null hypothesis. The value of the parameter tells us that if there is an increase in expenditure on education by 1% would be an increase in log (GDP) of the EU 28 to 0.77%. The coefficient of determination further confirms the high correlation between the observed size and degree of correlation observed data.

The following table gives a presentation of the obtained values of parameters for each member country of the European Union observed individually. We apply the same method

and logarithmic values for the amount of the GDP of the public expenditure on education. Analysis was carried out in the program ORIGIN 9.

Table 3. The values of the parameters of the regression analysis for the member states of the European Union

Country/period	Parameter	Value	Error	t-statistics	Probability
Austria (1995-2011)	β_0	2.42007	0.59208	4.08741	0.0001
	β_1	1.04697	0.06244	16.76707	0.0000
	R	0.97260			
Belgium (2001 - 2011)	β_0	5.17062	0.48839	10.58709	0.0000
	β_1	0.75814	0.04947	15.32444	0.0000
	R	0.95899			
Bulgaria (1992 - 2011)	β_0	3.81162	0.38295	9.9532	0.0000
	β_1	0.91115	0.05495	16.58232	0.0000
	R	0.98403			
Czech Republic (1996 - 2011)	β_0	3.41425	0.31093	10.98091	0.0000
	β_1	0.97075	0.03766	25.77397	0.0000
	R	0.98963			
Denmark (1995 - 2011)	β_0	3.60350	0.44676	8.06584	0.0000
	β_1	0.88539	0.04627	19.13432	0.0000
	R	0.98012			
Estonia (1993 - 2011)	β_0	2.57688	0.18457	13.96168	0.0000
	β_1	1.05423	0.03076	34.27395	0.0000
	R	0.99284			
Finland (1991 - 2011)	β_0	2.02215	0.49168	4.11274	0.0006
	β_1	1.07870	0.05435	19.84583	0.0000
	R	0.97672			
France (1991 - 2011)	β_0	2.63329	0.39265	6.70644	0.0000
	β_1	1.01830	0.03456	29.46617	0.0000
	R	0.98923			
Greece (1995 - 2005)	β_0	5.53809	0.28939	19.1369	0.0000
	β_1	0.74186	0.03426	21.65679	0.0000
	R	0.99054			
Netherland (1991 - 2011)	β_0	4.41575	0.29019	15.21652	0.0000
	β_1	0.85233	0.02900	29.38867	0.0000
	R	0.98918			
Croatia (2002 - 2011)	β_0	4.83044	0.21221	22.76285	0.0000
	β_1	0.77851	0.02882	27.01407	0.0000
	R	0.99456			

Country/period	Parameter	Value	Error	t-statistics	Probability
Ireland (1995 - 2011)	β_0	4.67164	0.66186	7.05836	0.0000
	β_1	0.80914	0.07614	10.62638	0.0000
	R	0.93954			
Italy (1991 - 2011)	β_0	0.91832	0.90234	1.01771	0.3216
	β_1	1.19519	0.08236	14.51145	0.0000
	R	0.95773			
Cyprus (1995 - 2011)	β_0	5.05524	0.13218	38.24534	0.0000
	β_1	0.65173	0.01991	32.72912	0.0000
	R	0.99307			
Latvia (1992 - 2011)	β_0	2.90361	0.19899	14.59143	0.0000
	β_1	0.99763	0.03223	30.95326	0.0000
	R	0.99074			
Lithuania (1993 - 2011)	β_0	2.95616	0.18844	15.68783	0.0000
	β_1	0.99680	0.02856	34.90756	0.0000
	R	0.99310			
Luxembourg (1995 - 2011)	β_0	0.99767	0.46843	2.12981	0.0546
	β_1	1.33602	0.06783	19.69685	0.0000
	R	0.98488			
Hungary (1992 - 2011)	β_0	2.70274	0.42606	6.34349	0.0000
	β_1	1.02995	0.05301	19.42903	0.0000
	R	0.97698			
Malta (1998 - 2011)	β_0	5.83850	0.30448	19.17522	0.0000
	β_1	0.47900	0.05441	8.80325	0.0000
	R	0.93055			
Germany (1999 - 2011)	β_0	6.89314	0.86364	7.98151	0.0000
	β_1	0.66907	0.07465	8.96261	0.0000
	R	0.93785			
Poland (1995 - 2011)	β_0	3.42800	0.27239	12.58510	0.0000
	β_1	0.95149	0.02926	32.51554	0.0000
	R	0.99298			
Portugal (1995 - 2011)	β_0	2.29273	0.42223	6.93282	0.0000
	β_1	1.00085	0.04746	21.08611	0.0000
	R	0.98355			
Romania (1999 - 2011)	β_0	4.40787	0.39950	11.03346	0.0000
	β_1	0.86593	0.05117	16.92169	0.0000
	R	0.98465			
Slovakia (1993 - 2011)	β_0	2.57600	0.25723	10.01422	0.0000
	β_1	1.08452	0.03613	30.01596	0.0000

Country/period	Parameter	Value	Error	t-statistics	Probability
Slovenia (2001 - 2011)	R	0.99070			
	β_0	1.94547	0.63310	3.07294	0.0133
	β_1	1.12505	0.08501	13.23465	0.0000
Spain (1992 - 2011)	R	0.97526			
	β_0	3.21737	0.41869	7.68433	0.0000
	β_1	0.98837	0.04041	24.46054	0.0000
Sweden (1991 - 2011)	R	0.96917			
	β_0	1.56319	0.42933	3.64099	0.0017
	β_1	1.10939	0.04369	25.38963	0.0000
United Kingdom (1991 - 2011)	R	0.98558			
	β_0	3.80688	0.57116	6.66518	0.0000
	β_1	0.92427	0.05102	18.11455	0.0000
	R	0.97225			

Source: Data processed by author from
EuroStathttp://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/ (accessed October 1, 2014)

Based on the analysis, it can be concluded that the conclusions that are valid for the European Union apply to the EU's member states. The correlation coefficients (R) range in values of 0.95 to finding indicating a high correlation observed data and the positive value of correlation suggests that changes in the value of public expenditure on education has a positive impact on the change in GDP observed countries. The values for all the countries under consideration are statistically significant because the probability of t-value is less than 0.05.For countries such as Italy, Luxembourg probability value of t-value for the parameter β_0 is greater than 0.05.

Analysis of public spending on education and model in the BRICS countries

BRICS is the English abbreviation and economic term that refers to the growing development of the economic potential of Brazil, Russia, India, China and South Africa. Implicitly, concerns the economic alliance of these complementary economies. The term was introduced by Jim O'Neill of the Corporation for the global financial research Goldman Sachs, and was quickly accepted by the public, especially the media, to the extent that the majority of news sources from global finance used without much explanation. The meeting of officials of these countries, held in the summer of 2008 in Yekaterinburg, called the BRIC summit. The group originally consisted of Brazil, Russia, India and China. South Africa is a member of this group of 13 April 2011.

Below will be analyzed for each country individually.

In the analysis of the contribution of public expenditure in the case of Brazil was observed period from 2004 - 2011.

Economic Analysis (2015, Vol. 48, No. 1-2, 19-38)

Table 4. GDP and public expenditure on education in Brazil, 2004 - 2011

Year	GDP (in mill. $)	Public expenditure on education (% GDP)
2004	663,760.34	4.0
2005	882,185.70	4.5
2006	1,088,916.82	5.0
2007	1,366,824.00	5.1
2008	1,653,508.56	5.4
2009	1,620,188.06	5.6
2010	2,143,067.87	5.8

Source: The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

Figure 2. Graphic of GDP amount and cost of education in Brazil by year
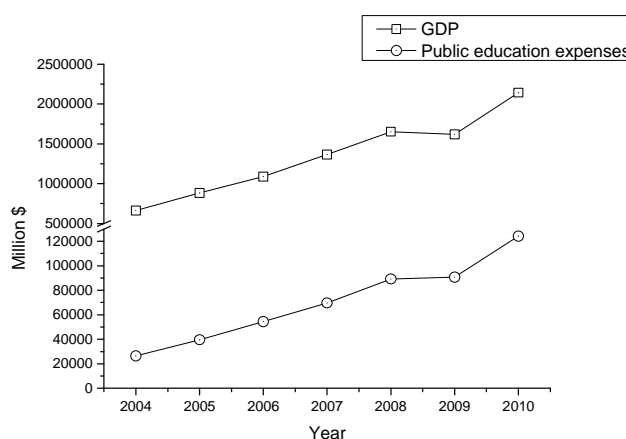
In percentage terms, Brazil set aside 5.06% of GDP for education, which is the average of the European Union. In the reporting period it can be observed upward trend in expenditures for education, both in absolute terms and in percentage values of the GDP of Brazil. It can be said that investment in education is certainly one of the key factors that led Brazil to the sixth position in the development of economy in the world.

The analysis used the logarithmic values of the GDP of Brazil and the logarithmic values of absolute principal amount of expenditure for the period 1995 - 2010. By applying multiple regression analysis and the model (2) in the above examples are obtained the following values of the parameters.

Table 5. The values of the parameters of the regression analysis for Brazil

Parameter	Value	Error	t-statistics	Probability
β_0	5.61954	0.15202	36.96493	0.0000
β_1	0.76147	0.01425	53.46357	0.0000
R	0.99808			

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

The obtained values tell us that there is a positive correlation between the observed value and the value of his investments in education significantly affects the value of GDP for Brazil. The probability of t-value of the regression coefficient is 0.0000, which is less than the significance level of 0.05, which confirms that the costs of education significantly affect the value of the observed GDP of the country. The value of the parameter tells us that if there is an increase in expenditure on education by 1% would be an increase in log (GDP) of Brazil by 0.76%. The coefficient of determination confirms that there is a positive correlation between the observed data.

In the analysis of the contribution of public expenditure in the case of India was observed period from 2003 - 2006.

Table 6. GDP and public expenditure on education in India, 2003 - 2006

Year	GDP (in mill. $)	Public expenditure on education (% GDP)
2003	618,356.47	3.6
2004	721,585.61	3.3
2005	834,215.01	3.1
2006	949,116.77	3.1

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

Figure 3. Graphic of GDP amount and cost of education in India by year
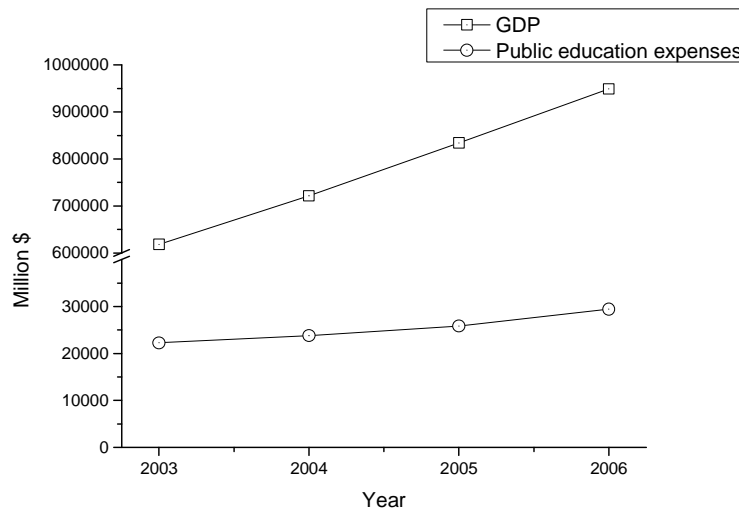
In percentage terms, India set aside of 3.3% of GDP for education, which is below the average of the European Union and Brazil. In the reporting period it can be observed upward trend in the expenditures for education in absolute terms. In the analysis of the applicability of the model were used logarithmic values of GDP India and logarithmic values of absolute principal amount of expenditure for the period 1997 - 2011. By applying multiple regression analysis and the model is presented by (2) in the above examples are obtained the following values of the parameters.

Table 6. The values of the parameters of the regression analysis for India

Parameter	Value	Error	t-statistics	Probability
β_0	3.18113	0.85151	3.73588	0.0047
β_1	1.01915	0.08348	12.20772	0.0000
R	0.97111			

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

The obtained values tell us that there is a positive correlation between the observed value and the value of his investments in education significantly affects the value of the GDP of India. The probability of t-value of the regression coefficient is 0.0000, which is less than the significance level of 0.05, which confirms that the costs of education significantly affect the value of the observed GDP of the country. The value of the parameter tells us that if there is an increase in expenditure on education by 1% would be an increase in log (GDP) of India for 1.02%. The coefficient of determination confirms that there is a positive correlation between the observed data.

In the analysis of the contribution of public expenditure in the case of South Africa was observed period from 1999 - 2011.

Table 7. GDP and public expenditure on education in South Africa, 1999-2011

Year	GDP (in mill. $)	Public expenditure on education (% GDP)
1999	133,183.58	6.0
2000	132,877.64	5.6
2000	118,478.99	5.3
2001	111,100.86	5.2
2002	168,219.32	5.1
2003	219,092.94	5.3
2004	247,051.56	5.3
2005	261,007.04	5.3
2006	286,171.83	5.2
2007	273,141.75	5.1
2008	284,183.10	5.5
2009	365,208.43	6.0
2010	403,894.32	6.2
2011	133,183.58	6.0

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

Figure 4. Graphic of GDP amount and cost of education in South Africa by years
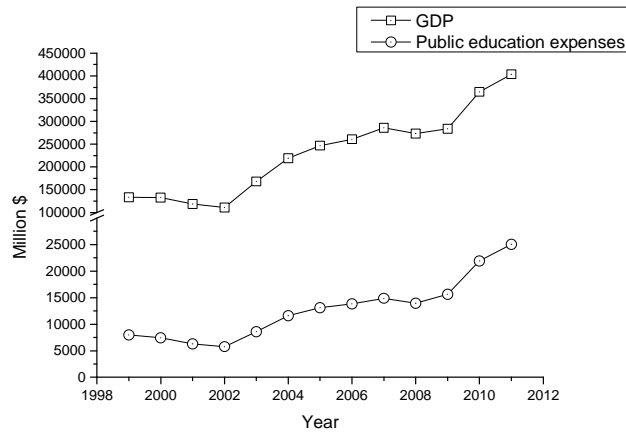
In percentage terms, South Africa invests 5.5% of GDP for education, which is the average of the European Union. In the reporting period it can be observed upward trend in the expenditures for education in absolute terms. In the analysis of the applicability of the model were used logarithmic values of the GDP of South Africa and the logarithmic values of absolute principal amount of expenditure for the period 1991 - 2011. By applying multiple regression analysis and the model (2) in the above examples are obtained the following values of the parameters.

Table 8. The values of the parameters of the regression analysis for South Africa

Parameter	Value	Error	t-statistics	Probability
β_0	3.04033	0.25257	12.03774	0.0000
β_1	0.98389	0.02680	36.70966	0.0000
R	0.99448			

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

The obtained values tell us that there is a positive correlation between the observed value and the value of his investments in education significantly affects the value of GDP for South Africa. The probability of t-value of the regression coefficient is 0.0000, which is less than the significance level of 0.05, which confirms that the costs of education significantly affect the value of the observed GDP of the country. The value of the parameter tells us that if there is an increase in expenditure on education by 1% would be an increase in log (GDP) of South Africa by 0.98%. The coefficient of determination confirms that there is a positive correlation between the observed data.

In the analysis of the contribution of public expenditure in the case of Russia was observed period from 2000 - 2006.

Table 9. GDP and public expenditure on education in Russia, 2000 - 2006

Year	GDP (in mill. $)	Public expenditure on education (% GDP)
2000	259.708,50	2.9
2000	306,602.67	3.3
2001	345,110.44	3.5
2002	430,347.77	3.4
2003	591,016.69	3.5
2004	764,000.90	3.8
2005	989,930.54	3.9
2006	259,708.50	2.9

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed
October 1, 2014)

Figure 5. Graphic of GDP amount and cost of education in Russia by years
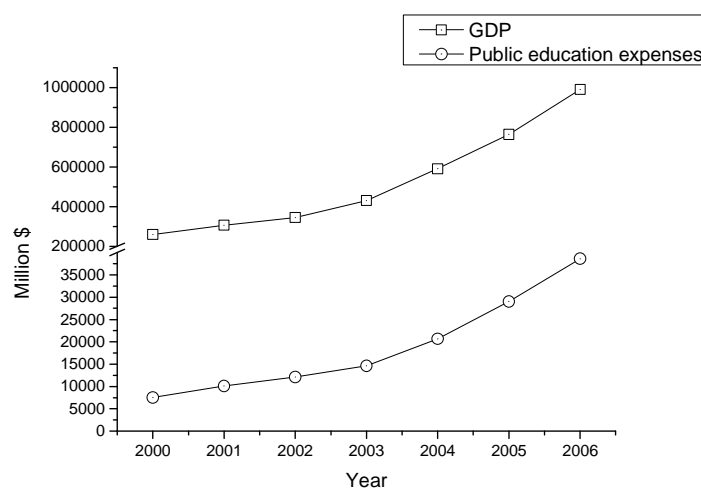
In percentage terms in Russia 3.4% of GDP is allocated for education, which is well below
the EU average. In the observed period upward trend in the allocation of funds for education
in absolute terms can be seen. In the analysis of the applicability of the model were used
logarithmic values of GDP of Russia and the logarithmic values of absolute principal amount
of expenditure for the period 2000 - 2008. By applying multiple regression analysis and the
model (2) in the above examples are obtained the following values of the parameters.

Table 10. The values of the parameters of the regression analysis for Russia

Parameter	Value	Error	t-statistics	Probability
β_0	4.70764	0.19903	23.65263	0.0000
β_1	0.86191	0.02010	42.89189	0.0000
R	0.99837			

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October
1, 2014)

The obtained values tell us that there is a positive correlation between the observed value and the value of his investments in education significantly affects the value of GDP for Russia. The probability of t-value of the regression coefficient is 0.0000, which is less than the significance level of 0.05, which confirms that the costs of education significantly affect the value of the observed GDP of the country. The value of the parameter tells us that if there is an increase in expenditure on education by 1% would be an increase in log (GDP) of Russia by 0.86%. The coefficient of determination confirms that there is a positive correlation between the observed data.

In the analysis of the contribution of public expenditure in the case of China was observed period from 1992 - 1996.

Table 11.GDP and public expenditure on education in China, 1992 - 1996

Year	GDP (in mill. $)	Public expenditure on education (% GDP)
1992	422,660.55	1.7
1993	440,501.21	1.7
1994	559,224.20	2.0
1995	728,007.55	1.9
1996	856,084.63	1.9

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

Figure6.Graphic of GDP amount and cost of education in China by years
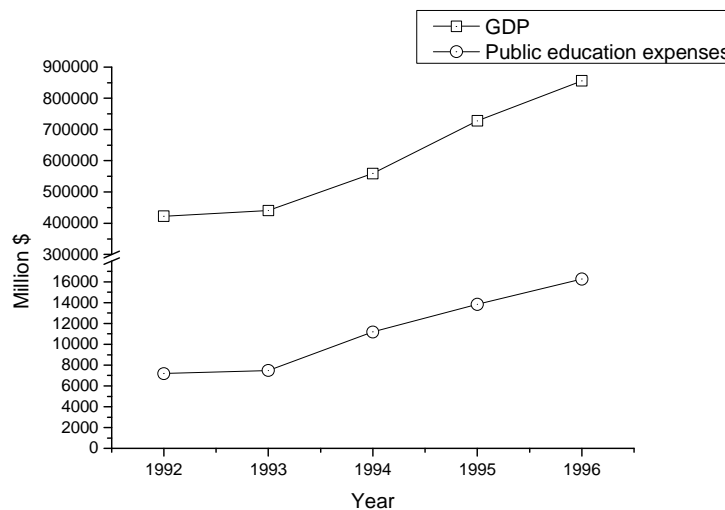
In percentage terms in China allocates an average of 1.84% of GDP for education. In the observed period can be observed upward trend in the allocation of funds for education in absolute terms. In the analysis of the applicability of the model were used logarithmic values of the GDP of China and the logarithmic values of absolute principal amount of expenditure for the period 1992 - 1999. By applying multiple regression analysis and the model (2) in the above examples are obtained the following values of the parameters.

Table12. The values of the parameters of the regression analysis for China

Parameter	Value	Error	t-statistics	Probability
β_0	4.98414	0.42257	11.79476	0.0000
β_1	0.89458	0.04467	20.02555	0.0000
R	0.99382			

Source: Data processed by author from The World Bank
http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default (accessed October 1, 2014)

The obtained values tell us that there is a positive correlation between the observed value and the value of his investments in education significantly affects the value of GDP for China. The probability of t-value of the regression coefficient is 0.0000, which is less than the significance level of 0.05, which confirms that the costs of education significantly affect the value of the observed GDP of the country. The value of the parameter tells us that if there is an increase in expenditure on education by 1% would be an increase in log (GDP) of Russia by 0.89%. The coefficient of determination confirms that there is a positive correlation between the observed data. It is necessary to get to the more recent data and do further analysis to confirm the existing result.

In a previous paper Zoran Tomic (2014) found for USA and Japan that null hypothesis is rejected, i.e. there is a positive correlation between public expenditure on education and GDP growth. In the case of the US 1% increase in the cost of education is achieved GDP growth of 0.78% and Japan with increasing the amount of expenditures of 1% leads to an increase in GDP by 0.81%. Based on this, we can see that the highest growth has India (1.02%). If we take into account the individual EU member Luxembourg has the highest growth of 1.33% to 1% of the additional costs in education. Brazil has the smallest growth with 0.77%, and from the EU is Malta with 0.47% growth.

Conclusion

Knowledge is a key factor for the improvement and development of each of the world economy. The significance of knowledge and education was spoken by Adam Smith, who represented need to divide the work among the people. Today, an important question arises about all these activities, education and the education system to economic growth and development of each country. Education and the education system helps and contributes to empower people to work in the economy, but also with the knowledge that they have and the resources contribute to the technological development that will allow the country's economy to develop and to have competitive an advantage. Also a big problem today is the problem of brain drain which is also a challenge for new research in this area.

Based on the analysis for European Union, USA, Japan and BRIKS, it was found that there is a positive correlation between the amount of public expenditure on education and economic growth in these countries. It was found that among India in BRIKS group, Italy, Luxembourg and Slovenia within the EU, achieved the highest economic growth, because a 1% increase in public expenditure on education comes up more than 1% growth in the value

of log (GDP). Observed between groups of the European Union, USA and Japan, the largest growth is achieved in Japan with 0.87% growth in log (GDP), while the lowest growth is achieved in EU (as a group), where the increase in expenditure on education by 1%, the growth of log (GDP) for the 0.77%. In subsequent research should expand the number of countries that will be covered by the panel and perform analysis among the countries themselves on the contribution of public expenditure on education to economic growth. It was also found that most funds allocated for secondary education, which can be explained by the fact that post-secondary education young people are trained to work in the economy or for further education.

Among the surveyed countries Malta achieved the lowest growth which can be best explained by the very size of economy, the structure of the economy, population size and so on. To further confirm the above results it is necessary to include additional information in the analysis (the period after 2011 and the period before 1991), which will provide direction for further research into this issue, as well as the inclusion of other factors that lead to economic growth of countries (health care costs, the costs of Science, etc.) and thus further develop the model.

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Analiza uticaja javnih troškova obrazovanja na privredni rast u Evropske unije i BRIKS zemalja

REZIME – *Znanje je jedan od ključnih faktora za razvoj i napredak svake odsvetskih ekonomija. Počevši sa industrijskom revolucijom, više pažnje i sredstava ulaže se u razvoj obrazovnog sistema. Ekonomije trebaju da ulože napor i sredstva u obrazovni sistemu koji bi omogućio stanovništvu da se što bolje pripremi za učešće u ekonomskom životu svoje zemlje. To znači da će ulaganje u obrazovanje i obuku za rad u privredi i razvoj mladih ljudiza istraživanja, razvoj i bavljenje naukom doprineti razvoju novih tehnologija i znanja. Razvoj novih tehnologija i znanja doprinosi povećanju konkurentnosti zemlje na globalnom tržištu. Ovaj rad predstavlja uporednu analizu ulaganja u obrazovnim sistemima Evropske unije i BRIKS-a, i takođe je pokazano da postoji pozitivna korelacija između javne potrošnje za obrazovanje i vrednost BDP-a zemlje primenom regresione analize.*

KLJUČNE REČI: *obrazovanje, ekonomski rast, regresiona analiza, Evropska unija, BRIKS*