



DE GRUYTER
OPEN

UDK: 330.322.4:303.04(497.16)
DOI: 10.1515/jcbtp-2016-0024

Journal of Central Banking Theory and Practice, 2016, 3, pp. 139-164
Received: 25 May 2016; accepted: 10 July 2016

Marko Tomljanović *
Zoran Grubišić **

** University of Rijeka, Faculty
of Economics Rijeka, Rijeka,
Croatia*

*E-mail:
mtomljanovic98@gmail.com
mtomljan@efri.hr*

*** Belgrade banking academy,
Belgrade, Serbia*

*E-mail:
zoran.grubisic@bba.edu.rs*

Investment in Research and Development - A Factor of Adjustment of Montenegro to the EU Economy

Abstract: Montenegro and other Western Balkan countries are characterized by historical mortgages, political instability, commenced but uncompleted structural reforms and unfavourable economic situation, which all contributed to their lagging behind other EU member states. In addition to this, these countries have been faced with a low level of investment in research and development, unfavourable educational structure, low level of innovation and a lack of awareness about the importance of research and development in modern economies.

The economic and political situation led to their determination to become a full EU member, which requires the fulfilment of specified criteria, implementation of structural reforms and “catching up” with other EU member states. Investment into research and development are found to be the key factor for fulfilling their objective – EU membership.

Keywords: economic growth, EU, expenditure, Montenegro, research and development

Jel Classification: F15, O32

1. Introduction

Western Balkan countries¹, including Montenegro, experienced severe consequences of war and political turmoil in the previous period so it was particularly difficult to face economic and social transition, resulting in unfavourable economic and social conditions. The economic systems of these countries are characterized by high unemployment, low levels of GDP per capita and unfavourable educational structure, which resulted in large numbers of the poor and low standard of living. In order to improve such economic situation, it is necessary to engage all factors of social, political and economic life in preparation of development strategies and national strategic plans. Overcoming these problems involves the assistance of European and international institutions, particularly in education, research and acquiring new knowledge.

Full EU membership was highlighted as a key long-term goal of the Western Balkans in order to overcome the unfavourable economic situation and achieve competitiveness at the international level. The European Union has developed policies that support a gradual integration of the Western Balkans.

Currently, Montenegro, Serbia, Macedonia and Albania have the candidate status, while Bosnia and Herzegovina and Kosovo are potential candidate countries. The role of science as well as research and development have been emphasized on the way to achieving full membership, which characteristics and methods of implementation should be directed and adapted to the EU requirements. An important goal of the Western Balkans is to achieve high efficiency and innovation, optimal levels of investment in science and research increasing the level of education, and to achieve economic growth for the purpose of integration into the economic space of the European Union. Areas such as the development of innovation, human resources, science, research and research infrastructure, and the improvement of the education system are the fundamental determinants of the model of systematic development of the economy of Western Balkan countries as a basic requirement of effective integration of economy. Western Balkan countries, including Montenegro, are under the influence of major technological changes and the pressure of globalization and the resulting effects.

¹ As defined by the European Commission in 2003, a group of Western Balkan countries includes all countries of the former Yugoslavia, with the exception of Slovenia and the addition of Albania. Upon the declaration of independence, this group of countries involved Montenegro in 2006 and Kosovo in 2008. For the purpose of this research, the Republic of Croatia is excluded from this group of countries since it became an EU member state in 2013.

This situation results in problems and difficulties in the process of adjustment and management of occurring changes and the creation of conditions which will help in making progress and achieving well-being based on research and development and their widespread use. Modern business practice requires monitoring of discontinuous changes through a continuous process of learning and development of tools and techniques, in order to achieve the possibility of gaining competitive advantages. The degree of development of Montenegro's economy is a challenge to the application of modern solutions and those based on science and research.

The goal of the research conducted in this paper is to provide an overview of the theoretical aspects of investment in research and development as a factor of economic growth, analyse the economic situation in Montenegro and other Western Balkan countries, analyse the current situation when it comes to investment in research and development in Montenegro, and propose measures for the improvement of research and development activities in Montenegro. The purpose of the research conducted in this paper is to point out its importance for achieving economic growth in Montenegro by reviewing theoretical assumptions and analysis of investments in research and development in order to adapt to the EU economy.

Montenegro declared its independence in 2006 and signed the Stabilization and Association Agreement in 2007 which entered into force in 2010. Montenegro applied for the EU membership in 2008, but its official candidate status was confirmed in 2010. Official negotiations for membership in the EU began in 2012.

1.1. Review of previous research

The importance of investment in research and development for the achievement of economic growth has been recognized in the works of neoclassical economists, i.e. in the Solow – Swan's model (Solow, 1956), which along with the traditional factors of production (labour and capital), place great importance on technology. The neoclassical model differentiates situations in which there is technological progress (the level of technology is changeable), and situations where there is no technological progress (the level of technology is constant).

Research was continued with the development of endogenous growth model which rejected the presumption of knowledge as a public good and determined the accumulation of knowledge as a fundamental factor in economic growth. Romer (1986) points out that the overflow of knowledge leads to positive effects in the form of technological innovation and explains how increase in production

depends directly on the amount of the workforce involved in the processes of research and development (Romer, 1990). Important contribution to the development of endogenous model was given by Lucas (1988), Grossman and Helpman (1991) and Aghion and Howitt (1992). Grossman and Helpman (1991) have developed models in which technological development is explained with the growth of the number of products, which is simply equated with the process of innovation. Also, the authors point out that the company knowingly invests in research and development in order to 'create' new products.

The importance of education for the achievement of GDP growth, as the *product* of investment in research and development, is demonstrated in the work of Mincer (1974), Easterlin (1981) and Stevens and Weale (2003). Pereira and Auby (2009) and Solaki (2013), in the analysis of Portugal and Greece view education from a macroeconomic point of view, while Bouaissa (2009) and Ahmed (2009) did that from the microeconomic point of view.

Concepts developed after 2000 determine investment in research and development as a source of economic growth and emphasize the importance of the concentration of highly innovative companies which constantly invest in new technologies, while maintaining close interpersonal relationship and connection with other important actors in the region (educational institutions, local and regional authorities, etc.) (Cheshire and Malecki, 2005).

Aghion et al. (2005) point out that the application of research and development has become a key driver of socioeconomic changes where most developed countries respond to economic globalization as active creators in strengthening global economy by promoting scientific and technological policy for the purpose of securing competitive advantages and employment, and finding solutions to global issues.

Modern economic theory identifies investment in research and development as a key element of convergence, i.e. catching up or reducing development disparities between countries and regions. When considering investment in research and development as a factor of economic growth, it is necessary to pay special attention to the sources of funding, i.e. investment of public, private and business sector and higher education sector. According to general assumptions, Fagerberg et al. (1997) point out that investment in research and development does not contribute only to economic growth but also results in reducing inequalities within the EU and the whole region.

The authors point out that the effects of investment in research and development may not be manifested in the short term. The most important role is played by business sector investments, which is defined as a priority in the strategies of the EU. However, such investments are focused on creating innovation that must be confirmed at the market, thus directly contributing to national competitiveness and economic growth. Armstrong and Taylor (2000) report that the sources of differences in growth rates among countries arise from different levels of technological progress, different growth rates of physical capital, and different rates of growth of the labour force.

Analysing investment by public and business sector and higher education sector in research and development activities, Guelllec and Pottelsberghe (2001) emphasize the importance of business sector investment, which is manifested through spillover effects and the ability for absorption of technology from abroad, the public sector and universities as well as positive social impact. The authors point out that in order to achieve economic growth and encourage investments by business sector countries have to 'open' their borders and allow free access to foreign technologies. Their findings are confirmed by Damian et al. (2003) who point out that the importance of technology and technological progress can be shown by trends in the financing of research and development at the national level and at the enterprise level. Dabić (2007) continues by identifying a lack of business sector investment in research and development, focusing research activities on traditional industrial sectors, as the main key reason for the EU lagging behind major competitors.

Considerations of investment in research and development as a factor to achieve economic growth have been made by some authors in the region as well.

Bečić and Dabić (2008) analysed the business sector investment in research and development activities in the Republic of Croatia in the process of joining the EU. The research has found out the low level of business sector investment, the weak position of the Republic of Croatia in global science, technological backwardness compared to the EU member states and a weak link between science and industry, which can be applied to other countries in the region. These facts have been recognized as a limiting factor of adjustment of the Republic of Croatia to the EU economy. Their research was continued by Puljiz (2009), who examined the causality of education and levels of economic growth, stressing the importance of population who completed secondary education, which originates from the greater participation of highly educated workforce in sectors of low productivity (other services). Karaman Aksentijević and Ježić (2009) determined the importance of the effectiveness of technology and innovation and the ability to absorb

knowledge and technology in economic growth. The authors point out that Croatia needs to invest additional resources to increase human capital and productivity in order to reduce its lagging behind in development. Bezić and Karaničić (2014) identify foreign direct investment, investment in research and development and the number of granted patents as important factors in achieving economic growth in the Republic of Croatia. The authors point out that foreign direct investment is a necessary 'tool' in the transfer of modern technologies.

Unfavourable social, political and economic situation in the Western Balkans and their aspirations towards receiving full membership in the EU requires the creation of foundations for the implementation of deep structural reforms and orientation to modern growth factors.

Kandžija (2014) contained a comprehensive overview of the situation, along with the analysis of the problems and prospects of Western Balkan countries in the process of joining the EU. As the most recent works in which the emphasis is placed on the importance of investing in research and development as a factor in achieving economic growth, it is necessary to set aside those by Prodanović et al. (2013), Krstić and Đunić (2014) and Švarc (2014). In their research, the authors start from shortcomings of the system of research and development in the Western Balkans. The following are identified as the major weaknesses: low levels of investment in research and development (in particular by the business sector), poor connections and cooperation between universities and the economy, low productivity and mobility of researchers, and low level of commercialization of innovations. This situation has resulted in the emergence of two key processes - brain drain and brain waste (leaving jobs in the research sector and taking better paid jobs).

Švarc (2014) points out that the achievement of long-term growth and competitiveness in countries of the Western Balkans is not possible without strengthening the capacity for absorption and the creation of new technologies and radical innovations and warns that the existing measures to encourage economic growth based on the strengthening of entrepreneurship have not proved effective.

Also, the authors warn of the current marginal role of research and development in achieving economic growth in the Western Balkans, which slows down their integration into the EU, limits full adjustment of the economy, and has a negative effect on competitiveness of enterprises.

Focus of the EU on Western Balkan countries, burdened by historical and political mortgages, unfinished structural reforms, and unfavourable economic situ-

ation raises the question of the role of research and development as a factor of success of the integration process, catching up with the level of economic growth in developed countries and adapting to the EU economy in general. Although this topic increasingly attracts attention of economic theorists, there are still no structured economic models that would provide adequate answer to that question.

2. Results

Analysis of the economic situation in Montenegro will be presented in this part of the paper. The most important component of investment in research and development will be shown and an overview of national, regional, and European strategies will be provided necessary to improve investment in research and development in Montenegro.

2.1. Analysis of economic situation in Montenegro

The value of GDP per capita in Montenegro amounted to 5,436 euros in 2014, making it the leader among countries of the Western Balkans. After Montenegro, the highest GDP per capita had Serbia (4,635 euros) and Macedonia (3,930 euros), while the lowest level of GDP per capita was recorded in Albania (3,440 euros) and Bosnia and Herzegovina (3,641 euros). Although this indicator makes Montenegro the leader among countries of the Western Balkans, it is evident that it significantly lags behind (four times) the EU average (21,300 euros in 2014), standing at 25.5% of the average GDP per capita of the EU.

The GDP analysis needs to consider the sectoral structure of the economy, i.e. added value of the primary, secondary, and tertiary sectors. According to data from Table 1, it is clear that the primary sector accounted for 10% of total GDP in Montenegro. The level is slightly higher than in Serbia (9.7%), close to the level in Macedonia (10.5%) and 2.4 percentage points higher than the level in Bosnia and Herzegovina (7.6%), and that among countries with the lowest share of the primary sector in GDP (7.6%). On the other hand, Albania had the largest share of the primary sector in GDP (22.6%). If compared with the EU average (1.6 % in 2014), a relatively high importance of the primary sector in GDP is evident in Montenegro. In all Western Balkan countries (except Serbia) GDP growth was recorded above the EU average. The highest values of GDP growth in 2014 were recorded in Macedonia (3.8%) and Montenegro (3.3%), while the lowest levels were achieved in Bosnia and Herzegovina (1.1%) and Albania (2.1%).

Furthermore, the secondary sector in Montenegro occupies 17.7% of GDP, which is the lowest level among the observed countries. The highest values of the secondary sector were achieved in Serbia (29.8 %) and Bosnia and Herzegovina (26.8%), while the level of the secondary sector among the other Western Balkan countries, after Montenegro, was the lowest in Albania (22.3%). Data in Table 1 indicate that the level of the secondary sector in Montenegro is slightly lower than the EU average (19.1%).

Having analysed the share of the tertiary sector in GDP, it was noted that Montenegro has the highest representation of this sector among countries, up to 72.3%. Along with Montenegro, the highest share of the tertiary sector are notable in Bosnia and Herzegovina (65.7%) and Macedonia (65%), while the lowest level of the tertiary sector is present in Albania (54.2%). However, in comparison with the EU average (79.3%), it is evident that Montenegro is below this figure (-7.1 percentage points), but with reasonable possibilities to reach the EU average in the future.

The unemployment rate in Montenegro amounted to 18% in 2014, which is the lowest level after the one recorded in Albania (17.5%). Among countries of the Western Balkans, the highest levels of unemployment were recorded in Macedonia (28%) and Bosnia and Herzegovina (27.6%). In comparison with the EU average (10.2%), it is clear that unemployment is the biggest problem in all countries of the Western Balkans as they are well above the European average.

Similar situation was in terms of the employment rate of people at the age of 30-34, which in Montenegro amounted to 55.6% in 2014, being the highest level after Albania (56.6%). On the other hand, the lowest levels of employment of the population at the age of 30 to 34 years were recorded in Bosnia and Herzegovina (43.2%) and Macedonia (51.3%). In comparison with the EU average (64.9%), a considerable lagging behind the EU average of Montenegro and other Western Balkan countries was obvious.

Among the selected countries, the highest levels of the balance of payment deficit were recorded in Montenegro (15.2 % of GDP) and Albania (13.4 of GDP), followed by Bosnia and Herzegovina (7.7 % of GDP), Serbia (6.1% of GDP) and Macedonia (1.8% of GDP). High balance of payment deficits in the observed countries were a direct result of low competitiveness of national economies and domestic producers, resulting from the failure of the privatisation process carried out in the transition period and insufficient inflows of foreign direct investments. Long-term economic isolation of these former Yugoslavian countries resulted in reduced export competitiveness and a loss of share in the international market.

Montenegro mostly imports refined petroleum (9.2%) pork meat (3.8%) and cars (3.7%). On the other hand, in the structure of export of Montenegro, raw aluminium occupies the highest share (18.4%), followed by recreational boats (12.9%), cars (7.2%) and refined petroleum (6.5%).

Montenegro mostly exported to Malta, which accounted for 13% of total exports, followed by exports to Serbia with 11%, Italy with 8.6%, and Greece with 7.9%. The analysis of the most important partners in imports confirmed the position of Serbia as one of the most important trade partners of Montenegro. Namely, Serbian accounts for 27% of total imports of Montenegro. After Serbia, Montenegro mostly imported from Greece (7.4), Croatia (6.1%) and Italy (6%) (The Observatory of Economic Complexity, 2016).

Public debt in Montenegro was at the level of 56.7% of GDP in 2014, which is the highest value among the selected countries after Serbia (68.9%) and Albania (71.8%). The lowest value of public debt is recorded in Macedonia (38.2%) and Bosnia and Herzegovina (40.5%). Analysing indicators of public debt, it is clear that all Western Balkan countries recorded values lower than the EU average (86.8% of GDP).

Table 1: Key indicators of economic situation in Montenegro and other Western Balkan countries in 2014

Country/ indicator	GDP growth rate	GDP per capita	Primary sector (%)	Secondary sector (%)	Tertiary sector (%)	Unemployment (%)	Employment of people at the age of 20-64 (%)	Public debt (% GDP)	Payment balance deficit (% GDP)
Serbia	-1,8	4635	9,7	29,8	60,5	18,9	53,5	68,9	-6,1
Macedonia	3,8	3930	10,5	24,8	65	28	51,3	38,2	-1,8
B&H	1,1	3641	7,6	26,8	65,7	27,6	43,2	40,5	-7,7
Montenegro	3,3*	5436	10	17,7	72,3	18	55,6	56,7	-15,2
Albania	2,1	3440	22,6	22,3	54,2	17,5	56,6	71,8	-13,4
EU	1,4	21300	1,6	19,1	79,3	10,2	64,9	86,8	-

* 2013

Source: authors' calculations based on Eurostat (1) and World Bank (1,2,3,4)

The analysis of economic situation in Montenegro pointed out its leading role among countries of the Western Balkans, primarily by the level of GDP per capita, the share of the tertiary sector in GDP, unemployment rate, and the employment rate of the population at 30 to 34 years of age. However, in comparison of key economic indicators with the EU average, Montenegro and other countries in the region significantly lag behind.

The economic and social situation in Montenegro is a challenge to its process of accession to the EU and achievement of economic growth. Holders of economic and social activities have to form the basis for the implementation of effective structural reforms, which will enable the achievement of convergence² and the adjustment of the economy to a more developed EU countries. Accordingly, the convergence process of Montenegro and other Western Balkan countries in relation to EU member states puts major emphasis on investment in research and development, which generate new knowledge and represent crucial contemporary economic resource.

2.2. Analysis of investment in research and development in Montenegro

The research in this part of the paper focuses on the analysis of investments in research and development in Montenegro.

The key indicators of investment in research and development analysed here are as follows: investment in research and development as a percentage of GDP, gross domestic expenditure on research and development per capita (GERD per capita), gross domestic expenditure on research and development in business sector (GERD BS) and public sector (GERD PS), higher education sector (HEIS) and private non-profit sector (PNS), percentage of population 20-24 years of age with completed secondary education (MSBSE), percentage of population 30-34 years of age with completed tertiary education (HE); the number of new PhDs per 1000 inhabitants (PHD), the number of researchers per 1 mill inhabitants (RES), the number of patents approved by EPO (EPO) and the share of high technology products in total imports (HTI%). In order to provide a real insight into investments in research and development, indicators of Montenegro will be compared with indicators in other Western Balkan countries (Macedonia, Albania, Serbia and Bosnia and Herzegovina) and the EU average.

Investments in research and development expressed as a percentage of GDP in Montenegro in 2014 amounted to 0.36% of GDP, which after Serbia (0.77 % of GDP) and Macedonia (0.44% of GDP), is the highest value among the selected countries. The lowest levels of investment in research and development are realized in Albania (0.15 % of GDP) and Bosnia and Herzegovina (0.26 % of GDP). At the EU level, the average level of investment in research and development

² Generally, according to Kandžija and Cvečić (2010), convergence is the process of reducing developmental differences and it involves time dimension and conditions which determine the direction of its activity.

amounted to 2.01 % of GDP in 2014, which obviously indicates that Montenegro and other Western Balkan countries lag behind.

Lagging behind is visible if analysis of investments in research and development per capita is considered. In fact, in Montenegro they amounted to 20.2 euros per capita in 2014, which is the highest value among the selected countries after Serbia (35.9 euros). On the other hand, the lowest level of investment in research and development per capita has Macedonia (8.91 euros), followed by Bosnia and Herzegovina (9.47 euros), and Albania (10.1 euro). The comparison with the EU average (536 euros) shows that Montenegro and other Western Balkan countries lag behind it even more.

The EU activities in the field of investment in research and development are focused on increasing the share of the business sector in total investments. At the EU level, they amounted to an average of 61.5% of total investments in 2014. A similar trend is present in Montenegro, which among the observed countries has the largest share of business sector investment in research and development activities, which amounts to 49.6 %. Montenegro is followed by Serbia (25%) and Macedonia (22.2%) with significantly lower investments. In the other Western Balkan countries, the share of business sector investment is still lower in Bosnia and Herzegovina (9.5%), while according to the latest available data for 2013, the investment in Albania was slightly above than 0%.

As the investments of public sector are concerned, they were highest in Albania (52.1% in 2008), Bosnia and Herzegovina (39.3% in 2014) and Serbia (28.8% in 2014). Also, in 2014, public sector investments in research and development activities in Montenegro amounted to 22.1%, which is the lowest level after Macedonia (19.1%). In comparison with the EU average (13.3%), it is clear that research and development activities in the Western Balkans, in particular in Albania and Bosnia and Herzegovina are still largely dependent on the public sector.

The situation in 2014 is similar with investments made by the sector of higher education. However, among the selected countries, the highest investments of the higher education sector are in Macedonia (58.5 %) and Bosnia and Herzegovina (50.1 %), followed by Albania (47.9 %) and Serbia (46.2 %). The higher education sector in Montenegro participates in investments in research and development with 26.2 %, which is slightly lower than the EU average (24.2%). Montenegro has the highest levels of investment by the private non-profit sector (2.1%), whose values are at a very low level among countries of the Western Balkans: 0% in Albania (data for 2008) and Serbia (data for 2013), and 0.2% in Macedonia (data for 2014). A slightly greater value, along with that in Montenegro, was achieved in Bosnia

and Herzegovina (1.1%). Investment of the private non-profit sector in research and development at the EU level amounted to 1 % in 2014.

Table 2: Indicators of investment in research and development in Montenegro and other Western Balkan countries and the EU in 2014

Country /Indicator	GERD (%GDP)	GERD per capita	GERD BS (% GERD)	GERD PS (% GERD)	HEIS (% GERD)	PNS (% GERD)	MSBSE	HE	PHD	EPO ³	RES	HTI %
Albania	0,15*	10,1	0*	52,1*	47,9*	0*	80,9	22,7	0,2	1	157**	0,4
Bosnia and Herzegovina	0,26	9,47	9,5	39,3	50,1	1,1	92,4	15,7	0,3	4	216	2,2
Serbia	0,77	35,9	25	28,8	46,2	0***	83,2	25,3	0,8	28	1380	2,3
Montenegro	0,36	20,2	49,6	22,1	26,2	2,1	81	28	0,3	0	646	2,5
Macedonia	0,44***	8,19	22,2	19,1	58,5	0,2	88,2	22	0,7	0	425****	2,6
EU	2,01	536	61,5	13,3	24,2	1	80,5	36,3	1,8	-	3426	14,3

* 2008, ** 2007, *** 2013, **** 2009

Source: authors' calculation based on Eurostat (2), Unesco UNdata and EPO, 2016

In the analysis of the educational structure of Montenegro and other Western Balkan countries, data will be used on the share of young people with completed secondary education, the proportion of the population 30-34 years of age having completed tertiary education and the number of new PhDs per 1000 inhabitants. According to the indicator of the share of young people who have completed at least secondary education, it is clear that all Western Balkan countries achieve greater value than the EU average (80.5%).

The highest values were achieved in Bosnia and Herzegovina (92.4%) and Macedonia (88.2%), followed by Serbia (83.2%) and Montenegro (81%). As far as the share of population at the age 30-34 having completed tertiary education is concerned, among countries of the Western Balkans, Montenegro has the biggest share, which totals 28%, followed by Serbia (25.3%) and Albania (22.7%). In comparison with the EU average in 2014 (36.3%), Montenegro and other Western Balkans lag behind it.

The successfulness of the higher education systems in certain countries can be assessed based on the number of new PhDs per 1000 inhabitants. According to the data provided in Table 2, it is clear that the higher education system in Montenegro 'produces' 0.3 new PhDs per 1000 population, which, along with Bosnia and Herzegovina, which is at the same level, and Albania (0.2), is the lowest value among the observed countries. The highest values are realized in Serbia and Mac-

³ Author's calculation based on the EPO data for the period 2005-2014

edonia, whose higher education systems 'produce' 0.8 and 0.7 new PhDs per 1000 inhabitants, respectively. In comparison with the EU average (1.8) it is noticeable that countries in the Western Balkans lag behind significantly.

The important problem in the Western Balkan countries is the low level of patents granted by the EPO. However, the largest number of patents in the observed countries was granted to applicants from Serbia (28) and from Bosnia and Herzegovina (4). The lowest level of approved patent is realized in Albania whose applicants were granted a only 1 patent only in the observed period, while applicants from Montenegro and Macedonia were not granted a single patent.

The orientation of economy towards the achievement of knowledge economy can be assessed on the basis of the number of researchers per million inhabitants. According to this indicator, after Serbia (1380), Montenegro is also a leader among the selected countries (646). However, in comparison with the EU average (3426), it is obvious that Montenegro and other Western Balkan countries lag behind significantly.

Contemporary economic developments and orientation towards factors of production based on knowledge require reorientation of production and the greater focus on high-tech products. The competitiveness of the European market can be achieved by increasing exports of this type of product. However, high-technology products in Montenegro occupied 2.5% of total exports in 2014. Beside Montenegro, the largest share of high technology products in total exports generated Macedonia (2.6%) and Serbia (2.3%). However, in comparison with the EU average (14.3%), a considerable lagging behind of Western Balkan countries is noticeable when this indicator is concerned.

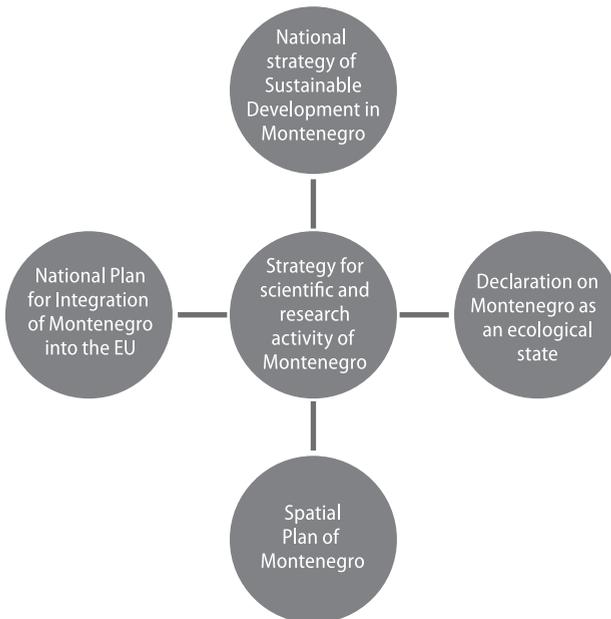
2.3. Measures for improving investments in research and development in Montenegro

Investment in research and development in Montenegro, as well as in other countries of the Western Balkans and the EU member states has been recognized as one of the crucial factors for achieving economic growth and competitiveness of national economies and the 'necessary' step in the transition to a 'society' of knowledge. The following are recognized as the biggest problems of investment in research and development in Montenegro: a weak link between science, education and economy, and insufficient involvement of small and medium-sized enterprises in scientific research projects because of their orientation to simple production and services. Also, the problem of SMEs arises from poor funding opportunities and bad transfer of research results to the market.

Considering the above problems, Strategy for scientific and research activities of Montenegro has been defined, which points out that knowledge-based society needs to recognize the importance of investing in research and development increasingly relying on scientific research institutions. The Strategy points out that the success of science in achieving economic growth in a country can be assessed only by observing its connection with education and the economy (Strategy for scientific-research activity of Montenegro 2008-2016, 2008)

The implementation of the Strategy for scientific and research activities of Montenegro is closely linked to the achievement of other development strategies (Declaration of Montenegro as an ecological state, National Strategy for Sustainable Development of Montenegro, the Spatial Plan of Montenegro, and the National Plan for Integration of Montenegro into the EU) which together form the strategic framework for the development of science and research in Montenegro (Figure 1).

Figure 1: Strategic framework of development of science and research in Montenegro



Source: Developed by authors based on the Strategy of scientific and research activities in Montenegro 2008-2016

Declaration of Montenegro as an Ecological State emphasizes research and science as basic prerequisites for achieving sustainable developments well as social,

economic and cultural development of Montenegro (Government of Montenegro- National Council For Sustainable Development, 2011)

National strategy of sustainable development of Montenegro stresses the need to accelerate economic growth and the transition to a market economy through stimulating innovation and productivity, boosting entrepreneurship, and preventing 'brain drain'. Also, the strategy emphasizes the integration of environmental policy and economic policy, and mitigates the effects of economic growth on the environment (National strategy of sustainable development of Montenegro, 2007).

The National strategy of sustainable development of Montenegro is followed by the Spatial Plan of Montenegro, which determines the prospects of future development of Montenegro, which are based on knowledge, innovation and entrepreneurship. This strategic document highlights the key role of science in overcoming low levels of economic and social development, restoring economic activity and creating conditions for achieving sustainable development and raising living standards (Spatial plan of Montenegro until 2020, 2008).

The National Program for Integration of Montenegro into the EU was a cornerstone of future development of scientific research activities in Montenegro. The following were identified as the most important short-term priorities: the reform of the statistical system in the field of science and research, encouraging the mobility of researchers and strengthening the connection between the research sector and the economy National program for integration of Montenegro into the EU (NPI) for the period 2008 – 2012, 2008).

The institutional framework for research and development in Montenegro is based on the interaction between the University, the Academy of Sciences and Arts of Montenegro, scientific research institutes, libraries and academic network. The institutional components are characterized by obsolete programs, non-systematic approach, lack of financial resources, and insufficient orientation towards the implementation and further exploitation of scientific research results.

However, programs at all levels of study are inconsistent with the needs of the labour market. Montenegro's Strategy for the development of science and research defines the key areas of improving the individual components of the institutional system. The internationalization of teaching and research process is specified as a priority in improving activities at the university, primarily through the reorganisation of doctoral studies and the provision of funds to finance scientific activities. Furthermore, the internationalization can be achieved through financing education of scientific staff at prestigious foreign institutions, increasing mobility of researchers and creating 'knowledge networks'.

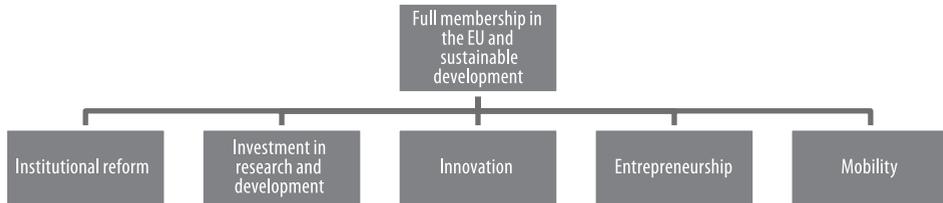
The strategy requires the establishment of the Fund for financing scientific research activities, allowing scientists to participate in national and international research projects, facilitate the accreditation of institutions, and provide funds for the mobility of scientific and other personnel. The following are determined as other key items: defining the rules of evaluation and selection of research projects, creation of database of scientific researchers, and further improvement of research infrastructure.

The following key areas of change in the functioning of the National Academy of Sciences and Arts have been identified: intensification of its advisory role, coordination of multidisciplinary projects of national importance and establishment of a special fund to encourage activity of young researchers and rewarding field of science and research. Given the role of the Academy of Science and Arts (CANU) in the dissemination of scientific results, it is necessary to develop a reference library as a centre of scientific and technological information.

In case of scientific research institutes, emphasis is placed on three segments, such as organization, financing, and accreditation. Scientific institutes can operate independently or as part of other institutes, which is mainly conditioned by the market needs. Accreditation has been recognized as the most important priority, i.e. fulfilment of conditions by which institutes would be recognized as scientific research institutions or centres of excellence, thus obtaining the right to use program funds earmarked for scientific research activities.

The system of financing scientific research institutes should be based on a combination of program and project financing, i.e. funds of the ministries and participation and implementation of other scientific research projects. Libraries are one of the most important factors for creation of new values and further development of education and science and research. Reform of the library system requires centralization (connection and availability of materials 'at one place'), access to a larger number of databases, and the provision of financial resources for constant renewal and updating of the library fund.

Analysing the segments stipulated above, it is clear that the strategy of scientific research activities in Montenegro 'has identified the role of investment in research and development as a factor in achieving economic growth and integration of Montenegro into the EU'. In doing so, it is necessary to develop and connect several concepts, i.e. environmental concept, the concept of sustainable development, institutional and market concept. Based on the above, the scheme has been made of objectives and key priorities (Figure 2) of Montenegro in the process of accession to the EU and the transition to a knowledge society.

Figure 2: Goals and priorities of Montenegro in the EU accession process

Source: Developed by authors based on the Strategy of scientific and research activities in Montenegro

Montenegro needs to implement a comprehensive reform of the institutions to be the bearers of education and scientific research activities. In fact, reorganization of these institutions is required, as are the commitment to the best ways of financing (program or project-based), the exercise of excellence, and further education and training of personnel involved. The institutions of science, research and education are the basis on which further development of science and transition towards 'knowledge society' relies.

Modern and Europe-oriented institutions will enable the advancement of science and research, which represent an impulse for the increase in total investment. Increased investment in research and development and a favourable institutional environment will result in the creation of innovations and other forms of 'smart' products, which will improve the competitiveness of companies, and thus the entire economy at the international level.

As previously mentioned, weak links among SMEs and the system of education and scientific activities have been found and their insufficient participation in research projects and the use of research results. SMEs, which represent the 'engine' of economic activity, must be a key factor in the dissemination and use of knowledge and its practical application. International recognition and achievement of relevant scientific research is not possible without ensuring the conditions for increasing the mobility of researchers, linking international institutions and exchanging views and best practices.

Along with national strategies, Montenegro and other Western Balkan countries should focus on the achievement of objectives and priorities of the regional strategies, of which the most important is the Western Balkans Regional R&D Strategy for Innovation.

The Western Balkans Regional R&D Strategy for Innovation was defined in 2013 in order to create the foundations for reform of policies and institutional reforms, and promote increase in innovation, economic growth and prosperity. Implementation of the Strategy will provide the Western Balkan countries many opportunities for exploitation of human and financial resources, well affect the creation of a political basis for constantly promoting policy reform and strengthening capacity to mobilize external funds to finance research (Western Balkans Regional R&D Strategy for Innovation, 2013).

Regional cooperation among the countries of the region in the field of research and development will result in positive pressure by the environment, making it a 'signpost' for the countries to adapt to the European Research Area (ERA). This Strategy imposes the main goal on the Western Balkans which is the achievement of the level of investment in research and development of 1.5% of GDP by 2020.

Along with the fundamental objective, the Strategy is focused on meeting the four additional goals: improving the science base and research excellence, fostering cooperation and technology transfer between research institutions and industry, creating the conditions for industrial innovation and innovative start-ups⁴ and improving innovation management and innovation policies.

In order to achieve the objectives of the Regional Strategy for Innovation in the Western Balkans the Action Plan of regional cooperation has been defined proposing five regional initiatives. It covers all aspects of research and development. Facilitation of the Action Plan will be implemented through financial assistance instrument called WISE (Western Balkans Research and Innovation Strategy Exercise Facility).

Four programs have been proposed within the WISE as follows: the establishment of the Research Excellence Fund which aims to encourage cooperation between local researchers and scientists from abroad as well as the development of young scientists, the development of networks of excellence, technology transfer program aimed at promoting cooperation between the research sector and the business sector, and a program for start-ups.

In addition to the previously mentioned Strategy for scientific and research activities of Montenegro and the Western Balkans Regional Strategy for Innovation, Montenegro and other Western Balkan countries should put great emphasis on

⁴ Recently founded companies in the stage of development and market research but with high growth potential yet limited investment in capital, people, and property.

the objectives of the Europe 2020 Strategy which fulfilment would have a positive impact on the integration, economic recovery, and preparation of the country for full membership in the EU. The Europe 2020 Strategy, adopted in 2010, is a ten-year strategy which aims “to make Europe the fastest - growing and most competitive economy in the world based on knowledge’ until 2020” (EUROPE, 2020, 2010).

The Strategy includes the need to achieve smart, sustainable and inclusive growth. Smart growth includes the development of economic activity based on knowledge and innovation. Sustainable growth endeavours to secure economy that makes efficient use of resources and inclusive growth is focused on the achievement of high rates of employment, which will contribute to social and territorial cohesion (Agency for mobility and EU programmes, 2015).

In close connection with the main priorities, five main objectives of the Strategy have been defined and they focus on the areas of employment, research and development, climate change and sustainable energy, education, and combating poverty and social exclusion (European Commission, 2015).

In the area of employment, the goal is to achieve the employment rate of more than 75% of the population aged 25-64. The aim of research and development involves realization of investment of 3% of GDP for research and development by 2020.

The area of climate changes and energy sustainability is based on the realization of the 20/20/20plan, i.e. reducing greenhouse gas emissions by 20% (or 30% if there are conditions) compared to the 1990 levels, getting 20% of total energy from renewable sources and increasing energy efficiency by 20%. Furthermore, in the field of education, it is envisaged that early school leaving rate would be below 10%, increasing the share of people aged 30- 34 years with completed tertiary education to 40%. The objective of reducing poverty and social exclusion requires reduction of the number of people living in risk of poverty and social exclusion by at least 20 million.

In order to achieve priorities, the EU has defined seven key initiatives. The initiatives necessary to achieve smart growth are as follows: Innovation Union (encouraging investment in research and innovation and strengthening the innovation chain), Encouraging the Young (strengthening education systems and easier transition to labour market) and the Digital Agenda for Europe (the application of ICT and high-speed internet).

In the area of inclusive growth, the Agenda for New Jobs (employment, training and modernization of the labour market) is implemented as is the European Platform Against Poverty (social and territorial cohesion and inclusion), while the priority of sustainable growth is achieved through the Resource Efficient Europe (the fight against climate change and clean and efficient energy) and the Industrial Policy of the Globalization Era (creation of a better business environment and strong foundation of industry by providing higher level of competitiveness) (Agency for mobility and EU programmes, 2015).

Assuming constant increase in investment in research and development in the observed countries, the projection of their movement has been made until 2020 (Table 3). The projection is carried out with the help of exponential smoothing, which is commonly used in time series. Using this method, the forecast for the period is obtained as a weighted average of actual and forecasted values of the time series in period t . The real value of the time series in period t is added the weight w (smoothing constant), which takes values between 0 and 1, while the forecast t is added weight. The higher the value of the parameter, the greater the weight that is added to the previous period. (Winters, 1960).

Table 3: Projections of investment in research and development in the Western Balkans and the EU

Year/country	Serbia	Macedonia	B&H	Montenegro	Albania	EU
2003	0,57	0,8	0,02	0,8	0,44	1,8
2004	0,32	1,02	0,03	1,02	0,46	1,76
2005	0,43	0,92	0,03	0,92	0,48	1,76
2006	0,49	1,24	0,07	1,24	0,52	1,78
2007	0,36	1,15	0,03	1,15	0,52	1,78
2008	0,38	1,21	0,14	1,21	0,61	1,85
2009	0,92	1,2	0,31	1,12	0,2	1,94
2010	0,79	0,19	0,27	1,05	0,2	1,93
2011	0,77	0,41	0,29	0,41	0,2	1,97
2012	0,96	0,22	0,27	0,38	0,2	2,01
2013	0,97	0,23	0,28	0,39	0,35	2,02
2014	0,98	0,24	0,29	0,4	0,5	2,03
2015	0,99	0,25	0,3	0,41	0,65	2,04
2016	1	0,26	0,31	0,42	0,8	2,05
2017	1,01	0,27	0,32	0,43	0,95	2,06
2018	1,02	0,28	0,33	0,44	1,1	2,07
2019	1,03	0,29	0,34	0,45	1,25	2,08
2020	1,04	0,3	0,35	0,46	1,4	2,09

Source: authors' calculations

According to the data in Table 3, it is obvious that investment in research and development in Montenegro, expressed as a percentage of GDP, will reach a level of 0.46% of GDP in 2020. However, the specified value will still be lower than that prescribed in the Western Balkans Regional R&D Strategy for Innovation and Europe 2020. On the other hand, among countries of the Western Balkans, the largest value is expected in Albania, where investments in research and development by 2020 will reach the level of 1.4% of GDP. Achieving such levels, Albania will be closer to meeting the objectives of regional strategies. On the other hand, it is expected that the average level of 2.09 % of GDP will be reached at the EU level, which Montenegro and other Western Balkan countries will find difficult to achieve.

3. Conclusion

The analysis of key economic indicators showed that Montenegro achieved the highest level of GDP per capita (5,436 euros in 2014) among the analysed countries of the Western Balkans. However, this value positioned Montenegro only at 25.5% of the EU average, from which it is evident that it considerably lags behind. Furthermore, analysis of the sector structure indicates a high level of the primary sector in GDP (10%). Also, among the observed countries, Montenegro has the lowest level of the secondary sector (17.7%) and the highest level of the tertiary sector (72.3%). A positive economic situation in Montenegro in comparison with other countries of the region is visible from the unemployment rate (18%) and the employment rate of the population aged 30 to 34 years (56.6%). However, in comparison with the EU average (average unemployment rate of 10.2% and the employment rate of population aged 30 to 34 years of 64.9%), it is significantly lagging behind, as do other countries in the region. Among other indicators, it should be noted that Montenegro and other countries in the region have levels of public debt lower than the EU average (59.6% of GDP). Also, as with other countries in the region, Montenegro is import-oriented, which resulted in a deficit of the balance of payments of 15.2% of GDP in 2014, which is the highest level among the observed countries. Montenegro mostly imported refined petroleum and cars, while the export structure was dominated by raw aluminium.

By the analysis of indicators of investment in research and development, a relatively stable position of Montenegro has been noted among countries of the Western Balkans. Namely, in this group of countries, Montenegro achieved one of the highest levels of investment in research and development expressed by a percentage of GDP (0.36%) and per capita (20.2 euros). Also, having analysed the structure of investment in research and development, it is evident that Monte-

Montenegro is oriented towards recommendations and objectives of the EU. However, among the observed countries, Montenegro has the highest level of business sector investment and the lowest levels of investment of the public sector and higher education sector. Like in other countries in the Western Balkans, Montenegro also records a high share of young people who have completed secondary education (81%) and, among the selected countries, the largest proportion of the population aged 30 to 34 years who have completed tertiary education. In general, the indicators of investment in research and development in Montenegro point to its relatively favourable position among countries of the region but also a big lag when compared with the EU average. Improving investment in research and development in Montenegro requires the implementation of measures and objectives prescribed by the national strategy of research. Furthermore, Montenegro tends to meet the objectives of the Western Balkans Regional Innovation Strategy and affirm the necessity of achieving the objectives and priorities of the Europe 2020.

Generally, in the process of accession to the EU and transition towards knowledge society, Montenegro has to create a functional system which will enable a coordinated action of key institutions whose activities will create conditions for increasing investment in research and development, making innovations and their implementation and linking them with SMEs. However, a special emphasis should be put on the mobility of researchers, cooperation of institutions, and the exchange of good practices and relevant scientific research.

References

1. Agency for mobility and EU programmes, (2015), available on: <http://www.mobilnost.hr/>
2. Aghion, P., Howitt P. (1992). A Model of Growth through Creative Destruction, *Econometrica*, 60, (2), 323-351.
3. Aghion, P., Bloom, N., Blundell, R., Griffith, R., Howitt, P. (2005). Competition and Innovation: An Inverted-U Relationship, *The Quarterly Journal of Economics*, 120 (2), 701-728.
4. Ahmed, S. (2009). Human Capital and Regional Growth: A Spatial Econometric Analysis of Pakistan, Thesis, Florence, Italy.
5. Armstrong, H, Taylor J. (2000). *Regional economics and policy*, Oxford, Blackwell
6. Bečić, E., Dabić, M. (2008). Analiza ulaganja poslovnog sektora Republike Hrvatske u istraživanje i razvoj, *Revija za sociologiju/Sociological Review*, 39 (1-2), 69-84.
7. Bezić, H., Karanikić, P. (2014). Utjecaj inozemnih izravnih investicija i transfera tehnologije na gospodarski rast Republike Hrvatske, *Poslovna izvrsnost/Business Excellence*, 8 (1), 27. – 48.
8. Bouaissa, M. (2009). Human Capital Theory, Returns to Education and On the Job Learning: Evidence From the Canadian Data, Preliminary and Incomplete Version, CEA, 43rd Annual Conference, University of Toronto, Ontario, May 29-31.
9. Cheshire, P, Malecki E. (2005). Growth, development and innovation: a look backward and forward, *Papers in Regional Science*, 83, 249-267.
10. Dabić, M, (2007). Innovation and transfer technology: Croatian experience, *Komercijalizacija i društvena primjena znanosti - indijska i hrvatska iskustva*, MZOŠ I HIT, Zagreb, Croatia
11. Damian, D., Lanubile, F. and Oppenheimer, H.L. (2003). Addressing the Challenges of Software Industry Globalization: The Workshop on Global Software Development, In *Proceedings 25th International Conference on Software Engineering*, IEEE Computer Society, Los Alamitos, 793-794.
12. Easterlin, R. (1981). Why isn't the Whole World Developed?, *Journal of Economic History* 41, 1.-19.
13. European Patent Office, (2016), available on: <https://www.epo.org/about-us/annual-reports-statistics/annual-report/2012/statistics-trends/granted-patents.html#tab1>
14. EUROPE 2020, (2010), available on: <http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf>

15. Eurostat (1) (2016), available on: <http://ec.europa.eu/eurostat/web/enlargement-countries/data/database>
16. Eurostat (2), (2016), available on: <http://ec.europa.eu/eurostat/web/science-technology-innovation/data/database>
17. Fagerberg J., Verspagen B., Caniels M. (1997). Technology, Growth and Unemployment across European Regions, *Regional Studies*, Taylor and Francis Journals, 31(5), 457-466.
18. Government of Montenegro- National Council For Sustainable Development, (2011), available on: http://www.mrt.gov.me/ResourceManager/FileDownload.aspx?rid=138043&rType=2&file=Analiza_MNE,%20final.pdf
19. Grossman G.M., Helpman E. (1991). *Innovation and Growth in the Global Economy*, MIT Press, Cambridge
20. Guellec, D., van Pottelsberghe; B. (2003). The impact of public R&D expenditure on business R&D, *Economics of innovation and new technology*, Taylor & Francis Group, 12 (3), 225-243.
21. Karaman Aksentijević, N., Ježić, Z. (2009). Human Resources development and research capacity and their impact on economic growth, *Zbornik radova Ekonomskog fakulteta u Rijeci, časopis za ekonomsku teoriju i praksu - Proceedings of Rijeka Faculty of Economics, Journal of Economics and Business*, 27 (2), 263-291.
22. Kandžija, V.; Cvečić, I. (2010). *Ekonomika i politika Europske unije, Ekonomski fakultet Sveučilišta u Rijeci/ University of Rijeka, Faculty of Economics Rijeka, Rijeka, Croatia*
23. Kandžija, V. (2014). Absorption capacity of EU pre-accession instruments in the Western Balkan countries, *CEMAFI International*, Nice, France
24. Krstić, B., Džunić, M. (2014). Analysis of the Western Balkan countries' competitiveness determinants using the KEI methodology, *Ecoforum Journal*, 3(2), 69-76.
25. Lucas R. E. (1988). On the mechanics of economic development, *Journal of Monetary Economics*, 22, 3-42.
26. Mincer, J. (1974). *Schooling, Experience and Earnings*, NBER Press, New York, SAD
27. National program for integration of Montenegro into the EU (NPI) for the period 2008 – 2012, (2008), available on: https://www.google.hr/url?sa=t&ct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi4ttm9psjOAhVlkywKHTAKAScQFggZMAA&url=http%3A%2F%2Fwww.esiweb.org%2Fpdf%2Fmontengro_National%2520Program%2520for%2520Integration%25202008%25202012.pdf&usg=AFQjCNGpd9c8006SFZJy-owYeYgB0xmrw&sig2=kWMtP9N0J4MlTm2_LAh20A&bvm=bv.129759880,d.bGg

28. National strategy of sustainable development of Montenegro (2007), available on: <http://www.kor.gov.me/files/1207655097.pdf>
29. Puljiz, J. (2009). Čimbenici regionalnog razvoja i regionalnih nejednakosti u Republici Hrvatskoj, Sveučilište u Splitu, Ekonomski fakultet Split, doctoral thesis
30. Romer, P.M. (1986). Increasing Returns and Long-Run Growth. *J.P.E.* 94 (1986), 1002-37.
31. Romer, P.M. (1990). Endogenous technological change, *Journal of Political Economy*, 98, 71-102.
32. Pereira, J., and Auby M., St (2009). What Level of Education Matters Most For Growth? Evidence From Portugal”, *Economics of Education Review*, 28(1), 67--73.
33. Prodanović, S., Petković, D., Bašić, H. (2013). Istraživanje inovacionog potencijala BiH s aspekta upravljanja i odlučivanja o RDI aktivnostima, 8. Naučno-stručni skup sa međunarodnim učešćem ”KVALITET 2013”, Neum, B&H, 06. – 08. juni 2013.
34. Solaki, M. (2013). Relationship Between Education and GDP Growth: A Bivariate Causality Analysis for Greece. *International Journal of Economic Practices and Theories*, 3(2), 133-139.
35. Spatial plan of Montenegro until 2020, (2008), available on: <http://www.mek.gov.me/files/1216637502.pdf>
36. Stevens, P., Weale, M. (2003). „Education and economic growth“, National Institute of Economic and Social Research, London, Great Britain
37. Solow, R.M. (1956). A contribution to the theory of economic growth, *Quarterly Journal of Economics*“, 70, 65-94.
38. Strategy for scientific-research activity of Montenegro 2008-2016 (2008), available on: http://www.herdata.org/public/Strategy_for_Scientific_Research_Activities_2008-2016.pdf and <http://www.mpin.gov.me/files/1226331060.pdf>
39. Švarc, J. (2014). A Triple Helix systems approach to strengthening innovation potential of the Western Balkan countries, *International journal of transitions and Innovation system*, 3(2), 169-188
40. The Observatory of Economic Complexity, 2016, available on: <http://atlas.media.mit.edu/en/profile/country/mne/>
41. Unesco , (2016), available on: <http://data.uis.unesco.org/?queryid=74>
42. Undata, (2016), available on: http://data.un.org/Data.aspx?d=UNESCO&f=series%3AST_SCGERDGDGP
43. Western Balkans Regional R&D Strategy for Innovation (2013), available on: <http://www.worldbank.org/content/dam/Worldbank/document/eca/Western-Balkans-R%26D-Strategy-Innovation.pdf>

44. Winters, P. R. (1960), Forecasting Sales by Exponentially Weighted Moving Averages, *Management Science*, 6(3), 324.–342.
45. World Bank (1) (2016), available on: <http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS>
46. World Bank (2) (2016), available on: <http://data.worldbank.org/indicator/NV.IND.TOTL.ZS>
47. World Bank (3) (2016), available on: <http://data.worldbank.org/indicator/NV.SRV.TETC.ZS>
48. World Bank (4) (2016), available on: <http://data.worldbank.org/indicator/BN.CAB.XOKA.GD.ZS>