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Review paper

ANALYSIS OF SERBIAN INNOVATION POTENTIAL IN THE PERIOD 2009-2012

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Abstract. *In this paper a review of significance of country’s innovation potential for its economic growth and development is displayed first. Afterwards, positions and values of the global innovation index for the top 25 most innovative economies, for Serbia and for selected countries from its surroundings, for the period from 2009 to 2012 have been displayed. In order to classify selected countries into two or more groups, based on their similarity according to innovation performances, cluster analysis is conducted. The relations between innovation inputs and innovation outputs have been studied on the example of selected groups of countries (the group of European innovative leaders and Serbia with neighboring countries) through the correlation analysis.*

Key Words: *innovation, innovation inputs, innovation outputs, innovation efficiency.*

INTRODUCTORY NOTES

A larger share of new products, services and processes is one of the key assumptions of generating economic growth and improving competitiveness of the country, regardless of the level of its economic development. Growth in innovation potential, on one hand and improving its competitiveness, on the other hand, is the long term requirement for economic and social progress of all countries regardless of the level of economic development (Cvetanovic, Mladenovic, Nikolic, 2011).

The score of the achieved level of innovation of countries is based on a larger number of data. This study used data from the Global Innovation Index Report 2011, 2012.

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The objectives of this research are: a) an explication of the most important theoretical basis on which the concept of innovation potential of the national economy rests, b) review of the metrics of the innovative potential of the economy - Global Innovation Index, c) an empirical analysis of the level and dynamics of the improvement of innovation potential in the economy of Serbia in comparison to 25 most innovative economies in the world and to its surrounding countries in 2009-2012 period.

For an explanation of the main pillars for the concept of innovation potential of the economy, as well as to reflect on the Global Innovation Index metrics in addition to the descriptive approach, graphics explication of the phenomena studied was used. On the other hand, as dominant analytical tools for empirical analysis of the achieved levels and dynamics to improve the innovative potential of selected countries, quantitative tools of correlations and cluster analysis were used.

1. Theoretical Fundametals for Concept of Innovation Potential of the Economy

The explication of the supporting theoretical pillars of the concept of the innovation potential of the economy is not an easy task. It is our opinion that it is not possible to understand the importance of innovation potential for the development of modern economy properly without understanding the messages of three teachings that occupy a significant place in the development of economic science and designing of economic policies of advanced countries over the last twenty or more years. That being said, we have in mind: a) the emergence of new theories or endogenous development, whose holdings are represented by endogenous growth models of Paul Romer (Romer, 1986, 1987, 1990), b) recognition of the concept of national innovation system by Christopher Freemen (Freeman, 1987) and c) learning about creating competitive advantage of nations by Michael Porter (Porter, 1990). The unifying thread of these three teachings, which is defined in the context of the title of this work, the highest possible analytical importance has the position in which the improving innovation of the economy is at the epicenter of explanation of the physiology of macroeconomic phenomena such as the economic growth and the competitiveness of countries (Cvetanovic & Sredojevic, 2012).

Endogenous growth explanations emphasize the existence of positive correlation between the dynamics of the improvement in innovation potential of the country and the quality of the country's key macroeconomic performances. Also, it founds incentives for innovation in the appropriate institutional arrangements as the innovators are not able to realize the benefits of their results in an unfavorable institutional environment, which inhibits the growth of its innovative potential (Jones, 1998).

Endogenous growth (Romer, 1994) theory has not yet become a full conceptual approach to research key factors in the economic prosperity of individual countries. For its creation and promotion we credit a number of economic theorists. Consciously risking going into unjustified neglect of contribution of a large number of researchers to the explanation of complex mechanisms for generating growth, in this paper, a new theory of growth is associated with model presentation for the growth of the American Nobel laureate Paul Romer from the period 1986 -1990 (Romer, 1986, 1987, 1990). In addition, Romer's theoretical opus about the key drivers of economic growth is divided into two parts; endogenous growth models based on externalities (Romer, 1986, 1987) and growth models, the basis of which are research and development activities (Romer, 1990).

Growth models based on externalities (Jones, 1995) start from the premise by which innovation in the broadest context of the economy as a whole allow expression of increasing returns, which is completely contrary to the assumption of perfect competition (Romer, 1986). In the absence of perfect competition, knowledge cannot be perfectly protected with patent or trade secret. The knowledge that each individual company creates by "learning by doing" becomes instantly available and free to all interested parties for their use. So the company can see that it "leaks" new knowledge, but it has benefited from the knowledge that "leaks" to others. This means that at time t there is same level of knowledge for all firms, i.e. the same for the whole economy. This level can be represented by the equation: $A_t = cK_t^b$, for $b > 0$, where A_t is the level of technology (innovation potential of the economy), K_t capital (physical) b the elasticity of A_t for the change in K_t, and c is a constant. The equation $A_t = cK_t^b$ indicates that the level of technology (innovation potential size of the economy) depends on the accumulation of capital at time t. Thus, the total stock of knowledge j is an increasing function of investment and determined by the actions of economic agents, which makes a complex of technological change endogenous. Since the companies are unaware of the production of knowledge, it is always considered that the level of technology A_t as a given size and, at the same time, a factor which can be used at no additional cost (Valdés, 1999).

Previous explicit model was not entirely satisfactory, primarily because of the circumstances that the complex technology (innovation) in the treatment of it was accidental result of the economic activities of the company (Sener & Sarıdogan, 2011). Specifically, in it the companies maximize profits, investing in capital by process of learning by doing and knowledge spillover effects (Cohen & Levinthal, 1990), increasing the general level of knowledge regardless of the fact there is no explicit intention to do it. However, in real life, the facts are that the new knowledge is in the minimum percentage the result of accidental activities, while it is dominantly a result of work of companies who deal with innovation activities in an organized way, while trying to realize monopoly rents (McElroy, 2003; Teece, 2003). Thus, the implicit assumption by which new knowledge is available to everyone for free, as well as the assumption according to which there is perfect competition; make the largest structural defects of this model. Romer associated improvement in the innovation potential of the national economy with an undeniable need for innovators to use commercial valuation of their solutions in order to make profit (Romer, 1986).

Growth in Romer's model is based on research and development and driven by innovation, and results from investment decisions of companies that maximize profits (Romer, 1990, 1994). Romer recognizes that the technology is different from all other goods, because it is uncompetitive in nature and only partially exclusive good. A good level of competitiveness of any good is exclusively its technological feature. Competitively good is used by one company or one person which understandably means it is not to be used by anyone else. In contrast, non-competitive good is available to all without any restrictions. Unlike competitive features, exclusivity of a good is a function of both technology and the legal system. Good is considered exclusive, when its owner can prevent others from using it. Conventional economic goods are distinguished by features of competitiveness and exclusion. Public goods are uncompetitive and non-exclusive. Precisely because they are non-exclusive, the supply of public goods cannot provide security to private individuals, and they cannot be traded in the market. For the theory of growth there is an interesting group of goods that are not competitive, but also partially exclusive, and technology is such kind of good. There are three basic assumptions on which Romer build his model based on the importance of research and development activities in 1990: a) technological change (innovation) is a key determinant of economic growth, b) innovations are mainly the result of deliberate actions taken by individuals to respond to market incentives and, finally, innovations are by their characteristics different from other economic goods. These three assumptions directly lead to the conclusion that the equilibrium is not possible in conditions of perfect competition, but there must be a monopolistic competition. In fact, if all inputs were paid according to marginal product, the company would have losses arising from the additional expenses associated with previous investments in research and development of new products or new processes. In the model of economic growth of Roberta Solow this problem is abstracted due to the fact that the complex technological change (innovation) is treated as an exogenous character variable (Solow, 1956). However, this model is consistent with the premise on which technological change (innovation) is a key determinant of economic growth and at the same time it is a non-competitive good. However, the model is not consistent with the real fact that technology is the result of planned and organized activities of economic actors to maximize cash benefits.

National innovation system comprises of a network of public and private institutions whose activities and interactions determine the emergence, import, continuous improvement, and the general diffusion of new technologies (Freeman & Soete, 1997). The concept connects institutions and determinants of quality of innovation processes in the country (Etzkowitz, et al., 1998). The attribute "national" includes many categories in which the state has a certain impact. In short, the national innovation system is the totality of relationships between organizations and relations involved in the production and diffusion of scientific and technological knowledge (innovation) in the manufacturing process and the society at large is the territory bounded by national borders (Freeman, 2002; Lundvall et al., 2002). In the simplest form, the national innovation system model describes the mutual relationship of the elements of which it is composed, the private sector, whose role is reflected in the use of technologies developed as a result of its own research, market winning of innovations, support of the country in the creation of new theoretical and applied knowledge as well as the creation of infrastructure and institutional conditions conducive to the development of innovation activities in private companies. In a word, the national innovation system should be understood as form of an organization of economy and society, which, in conditions of turbulent changes in the environment, ensures sustainable development of the national economy (Peters, 2006).

The idea of the concept of national innovation systems in rudimentary form can be found in the works of German economist Friedrich List (Peters, 2006). List identified a number of significant determinants of investment such as industrial production, institutions, import foreign technology, education and training. List's main concern was, as some of the authors say, how Germany can overcome its economic backwardness in relation to England, which was then the world's leading industrial nation, and how the economy will catch up and surpass England (Freeman & Soete, 1997). As a reminder, the paper argued for the protection of young industries and appropriateness of the policies able to accelerate and facilitate the industrialization and economic growth. Most of these policies were concerned with teachings about innovation and economic effects of their specific application. The most important characteristic of this strategy was its devotion to the proactive role of the state. List realized the importance of understanding the interdependence of innovation and economic development, concluding that in order to improve the innovation potential of Germany, the government should outline and implement a long-term policy support for the development of science, technology and industrial production.

There are large differences in innovation potentials of the countries that have similar production resources in the standard sense of the word, which again has to do with the key performance of their national innovation systems (LeBel, 2008). Talking about innovation in this light, there is a regard to the use and continuous improvement of existing solutions, as well as the intense process of gaining new knowledge. In both cases, primarily referring to the knowledge that exists within and outside the company, but as far as this other form; we have in mind the knowledge that exists in the country in which the company operates.

A number of authors believe that the concept of national innovation systems primarily emphasizes the importance of tacit knowledge in generating technological innovations (Simoneti, 2001). Otherwise, under the assumption that knowledge is codified explicitly and unambiguously, the company could simply buy it like any other factor of production. However, tacit knowledge means that the company must maintain numerous contacts with other firms, as well as with a number of different organizations in order to gain access to knowledge and especially to make it effective in use.

National innovation systems are formed under the influence of many different factors for each of the analyzed countries, including its size, the availability of natural and human resources, the characteristics of the historical development of public institutions and the dominant forms of entrepreneurial activity (Figure 1). These factors determine to a significant degree the level and dynamics of the innovative potential of improving the national economy (Smith, 2010).

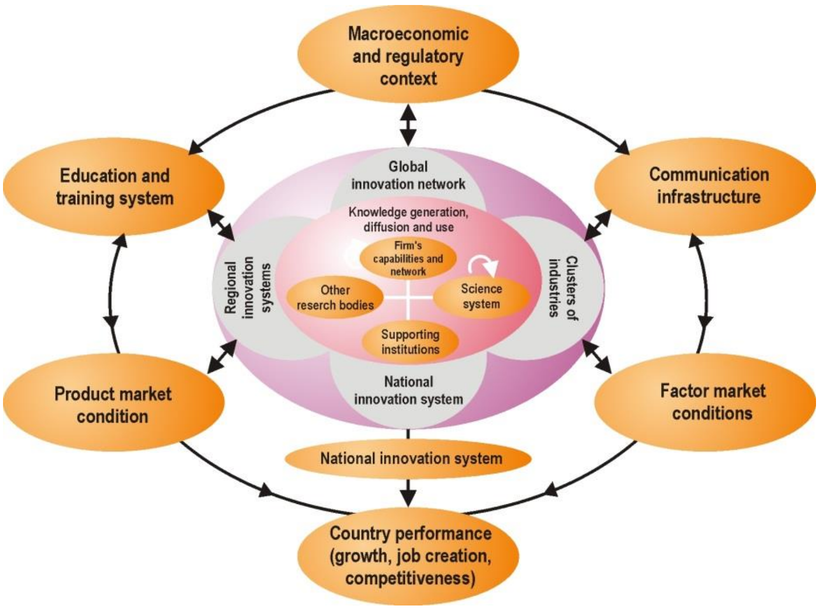

Fig. 1 National innovation system
Source: Modified according to (OECD, Managing National Systems of Innovation, 1999)

Michael Porter's key determination is that innovations initiate and support competition. The main determinants of competitiveness of individual countries are:

a) conditions relating to the factors that determine the dynamics of production and forms of manifestation profiling the competitive struggle in certain areas of business (capital, level of technology, infrastructure, skilled workforce, available information, etc), b) Conditions related to internal demand for goods and/or services of given production areas, c) the presence of related competitive industries in the country and d) conditions in the country that determine how the company is set up, organized and lead, as well as the nature of domestic competition (Porter, 1990).

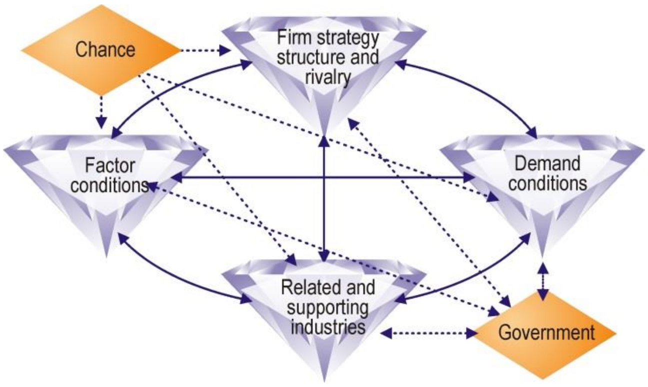

Fig. 2 Porter's diamond of national competitiveness
Source: Modified according to (Porter, 1990)

In the view of Porter, the success is achieved by those countries in which the process of interaction of all the factors of national competitive advantage is most dynamic. Significant improvement of innovation in the economy is not possible, if one of these determinants of the diamond of national competitiveness does not make its full contribution.

2. METRICS OF GLOBAL INNOVATION INDEX

In this paper, innovativeness of the economy is quantified based on data from Global Innovation Index (2011, 2012).

Global Innovation Index is based on two sub-indices: Innovation inputs and Innovation outputs. Innovation inputs consist of five pillars that display elements, i.e. potentials for innovative activities of national economy: (1) Institutions, (2) Human capacity, (3) Infrastructure (4) Market sophistication, and (5) Business sophistication. Innovation outputs consist of two pillars that show the actual results of innovation: (6) Scientific outputs and (7) Creative outputs. Each pillar is divided into sub pillars and each sub-pillar consists of individual indicators (see Figure 3).

Using the model shown in Figure 3, the country will be measured in accordance with its Innovation inputs and outputs, which together determine the overall value of GII and place the country on a ranking list made under the criteria of innovation.

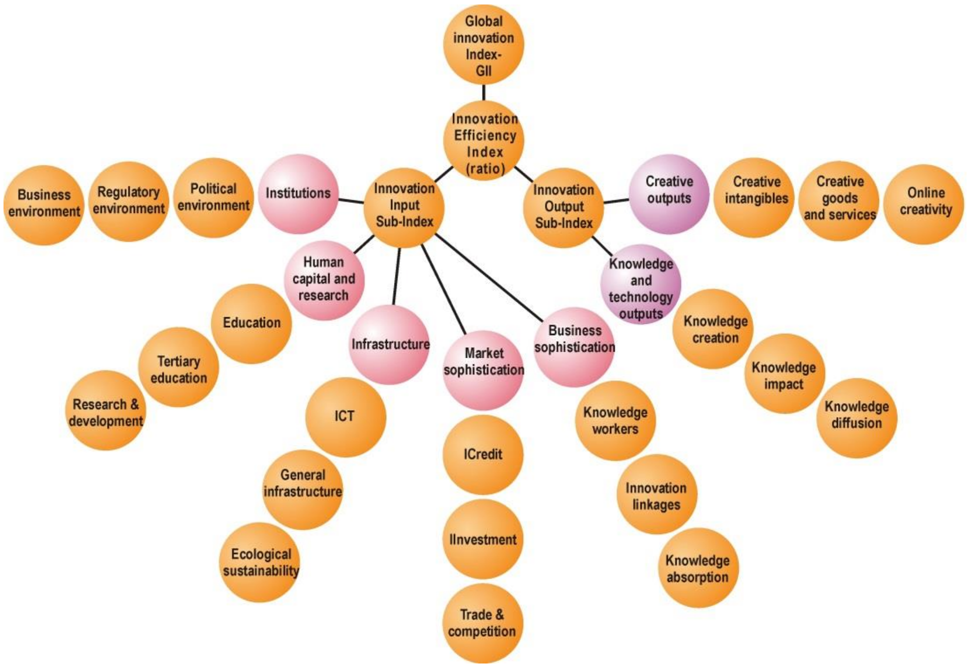

Fig. 3 Metrics of Global Innovation Index
Source: Modified according to (The Global Innovation Index, 2012)

Input parameters determine benefits of the environment in which economic actors operate to create and effectively use various types of innovation in the economy. Outputs are the results of the proof of innovation inputs: patents, trademarks, copyrights, creative products, workers in the areas of knowledge-based services, the share of exports of high-tech products in total exports, etc.

3. Innovation Leaders, Serbia and Neighboring Countries

Figure 4 shows place in the rankings according to the criteria of innovation in the period 2009-2012 (top 25 most innovative economies in the world).

Figure 5 shows place in the rankings according to the criteria of innovation in the period 2009-2012 (Serbia and selected countries in Europe).

There has been a major qualitative shift for Serbia in the criterion of Global Innovation Index in 2012 compared to previous years. In fact, from 101st place in 2010 (and 92nd place in 2009) Serbia was ranked 46th according to this criterion in 2012, surpassing Greece, a long-time member of the European Union. However, even under the condition that there is no doubt about the statistics incompatibility in the data on the basis of which the Global Innovation Index is composed, the fact is that the surrounding countries, Hungary, Slovenia, Bulgaria, Croatia, are significantly ahead of Serbia according to the criterion of Global Innovation Index in 2012. From the countries bordering Serbia only Bosnia and Herzegovina and Macedonia are behind it in the Global Innovation Index (Cvetanovic, Despotovic, Nedic, 2012).

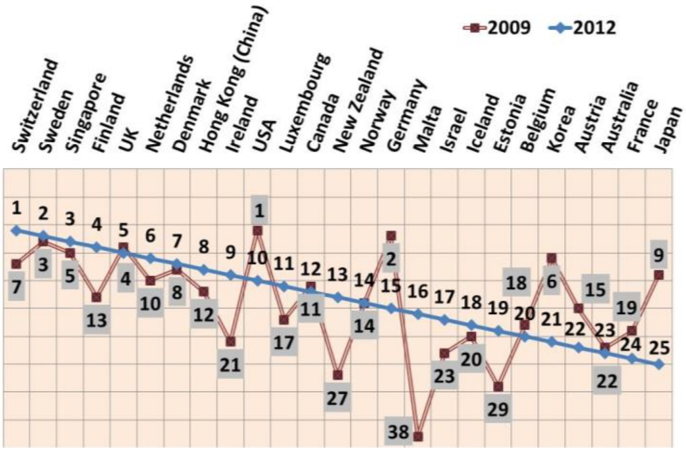

Fig. 4 Rankings of the top 25 most innovative economies in the world
Source: The diagram is based on the database from (The Global Innovation Index, 2011, 2012).

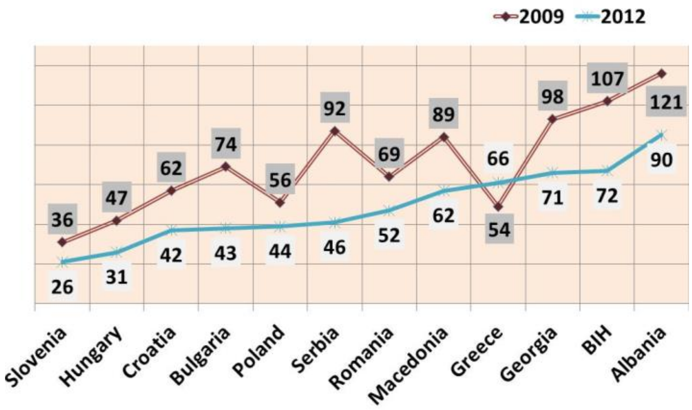

Fig 5. Rankings of Serbia and selected countries
Source: The diagram is based on the database from (The Global Innovation Index, 2011, 2012)

The question timely arises as to what extent innovation input size determines the value of innovation output. Depending on the answer to such a question we can provide useful information to policymakers in which direction it is most appropriate to work on incentives and other government measures to improve innovation of the economy. In order to get the answer to the question of dependencies in values that make innovation inputs and innovation output components, we will use the statistical analysis of a very well known, so called XY diagram. This is a common way to show the connection (direction and degree of quantitative variation agreement) between two variables.

Figure 6 shows the scatter diagram of the relationship between the variables of Innovation inputs and outputs.

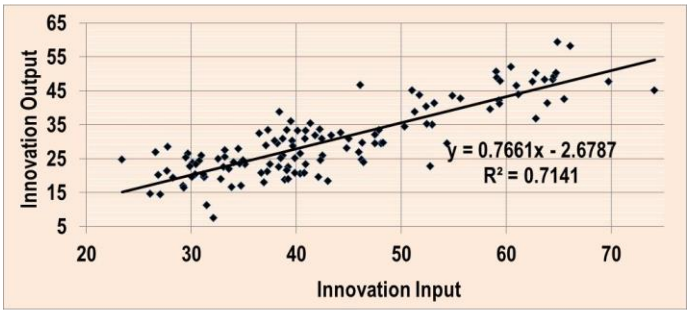

Fig. 6 Scatter diagram for the relationship of Innovation Input and Innovation Output (data on a sample of 125 countries, in 2011)
Source: The diagram is based on the database from (The Global Innovation Index, 2011, 2012)

A graphical representation of data pairs of **innovation inputs** and **innovation outputs** shows a strong correlation between the variations of the observed variables. Customizing the linear form of interdependence and analysis of components in the specified model also suggests previously stated, perceived visual statement. In fact, linear regression function has the following form: y = - 2.678 + 0.766 X, with statistics of $R^2 = 0.714$ and R = 0.845.The value of the coefficient of determination indicates the presence of 71.4% variation in variable **innovation output** is explained by variations in **innovation inputs,** while the remaining 28.6% is a result of the influence of other factors not included in this model. Strong correlation is confirmed by the correlation coefficient 0.845. Testing the hypothesis of linear interdependence of variables over the corresponding regression coefficient obtains the value of the test statistics at 17.527. With probability 0.05 level of significance of the test and the test threshold at 1.9794, we also conclude that there is a statistically significant linear correlation between the variables of **innovation inputs** and **innovation outputs.**

Figure 7 scatter diagram shows the relationship between the variables of Global Innovation Index and Innovation Efficiency Index.

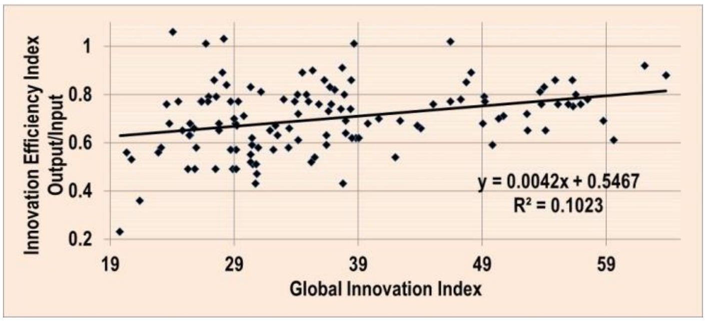

Fig. 7 Scatter diagram for the relationship of Global Innovation Index and Innovation efficiency index (data on a sample of 125 countries, in 2011)
Source: The diagram is based on the database from (The Global Innovation Index, 2011, 2012)

A graphical representation of data pairs for the **Global Innovation Index** and **Innovation Efficiency Index** shows a very weak correlation between the variations of the observed variables. Customizing the linear form of interdependence and analysis of components in the specified model also suggests previously stated, perceived visual statement. In fact, linear regression function has the following form: y = 0.546 +0.004 X, with statistics of $R^2 = 0.102$ and R = 0.319.The value of the coefficient of determination indicates that *only* 10.2% of the variation in variable **Innovation efficiency index** is explained by variations of the **Global Innovation Index,** while the remaining 89.8% is a result of the influence of other factors not included in this model. Weak correlation is confirmed by the correlation coefficient 0.319. Testing the hypothesis of linear interdependence of variables through appropriate regression coefficient obtains value of the test statistics at 3.237. With probability level of significance of the test at 0.05 and the test threshold at 1.9794, we also conclude that there is a statistically significant linear correlation between the variables **Global Innovation Index** and **Innovation Efficiency Index.**

4. Cluster Analysis

By cluster analysis, the observed set of elements is divided into subsets, so that the elements that are similar in some sense are grouped in the same cluster. In this case the method used was agglomerative hierarchical clustering.

Figure 8 shows the dendrogram of the cluster analysis conducted between clusters for which we used data for the Global Innovation Index, innovation index of efficiency, input and output sub-index with the corresponding pillars of The Global Innovation Index 2012. X axis gives the diversity level between the countries analyzed.

In the process of grouping selected European innovation leaders according to the degree of efficiency innovative bottom-up agglomerative hierarchical clustering method was used. In the initial step, each country is treated as a separate cluster. Their merging in pairs of clusters is based on the similarity in terms of the observed values of the variables which is the result of all subsequent clustering iterations until all observed entities are consolidated within one cluster. If we take diversity level of 600 as a possible cross-section in dendrogram, three clusters of the observed countries are clearly identified. The largest group consists of 8 countries, or 53% of the total number of observed countries. The second group includes Norway, Austria and France. The third group relates to Luxembourg and Ireland.

If we consider the world's innovation leader and take the cross section at diversity level of 1250, it is possible to clearly identify two dominant clusters in the presented dendrogram. A striking feature of the first cluster is that its two sub cluster elements are created at a much higher level of diversity than is the case with countries that belong to another cluster. The countries included in the cluster are characterized by a much higher degree of variations in level of innovation effectiveness than is the case with countries within the other cluster. Also, in comparison with clusters that are formed for European leaders, the grouping for the world's leaders in clearly segregated clusters was achieved at a much higher level of diversity, which suggests the expressive degree of variability in the innovative effectiveness worldwide.

Figure 9 shows the dendrogram of the cluster analysis implemented for Serbia and selected group of 11 European countries, the diversity is given on the Y axis. Diversity is determined on the basis of data for GII, sub-indices of *innovation inputs and innovation outputs* and the corresponding pillars.

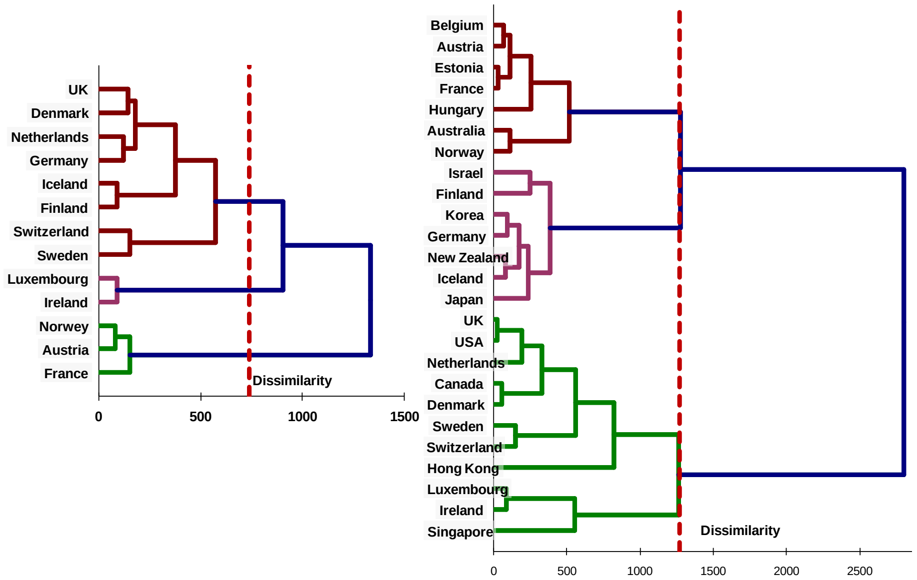

Fig. 8 The dendrogram of the cluster analysis conducted for the European and global innovation leaders

Source: The diagram is based on the database from (The Global Innovation Index, 2012)

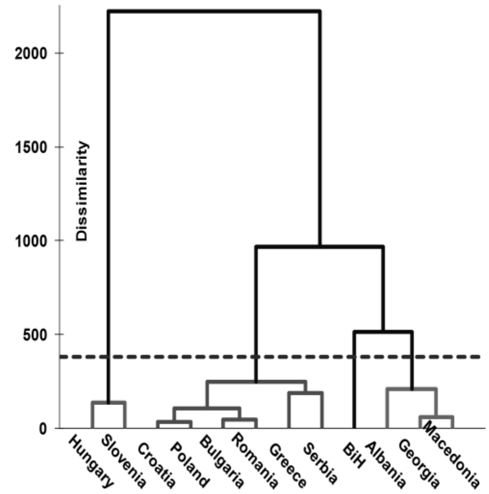

Fig. 9 Dendrogram of the cluster analysis implemented for Serbia and selected group of countries

Source: The diagram is based on the database from (The Global Innovation Index, 2012)

Cluster analysis applied to Serbia and a selected group of countries follows a similar trend for grouping as countries in the category of European innovation leaders. On the dendrogram presented, it can be seen that from the innovative aspect of the degree of efficiency, at the first level of grouping, Serbia is most similar to Greece and then to Croatia, Poland, Bulgaria and Romania. On the other hand, there is the biggest difference compared to Hungary and Slovenia. Overall, at the diversity level of 900 we can identify two clusters, i.e. Hungary and Slovenia on one side against all other countries covered by the analysis.

5. COMPARATIVE ANALYSIS OF INNOVATION FOR SERBIA AND NEIGHBORING COUNTRIES IN 2012

In Figure 10 in the given diagrams, we analyzed Serbia's position in relation to the surrounding by GII and sub-indices of GII.

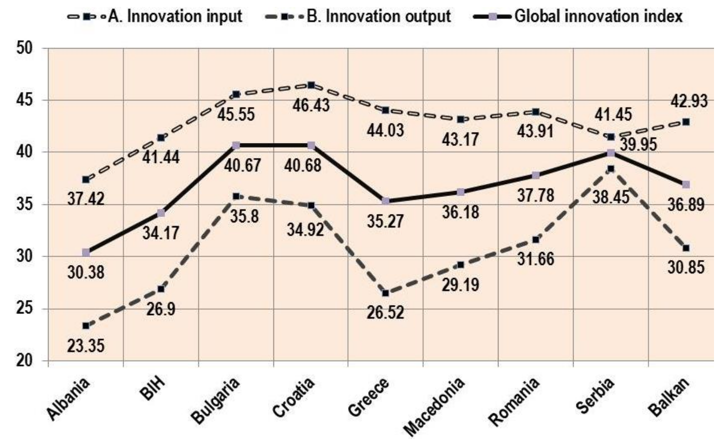

Fig. 10 Innovation Input Sub-Index, Innovation Output Sub-Index and Global Innovation Index, Serbia and neighbors

In order to obtain a more realistic picture of the relationship between innovation inputs and outputs we will investigate the correlation.

Graphical representation of data pairs of variables Innovation input and Innovation output for the selected group of countries indicates a weak (negligible) correlation among the variations of the observed variables.

Adaptation of the linear form of correlation and analysis of specified model components also suggests previously stated, visually perceived statement. In fact, the function of the linear regression has the following form: $y = -14.3 + 1.048 * x$, with the statistics R2 = 0.319 and R= 0.565. Value of determination coefficient shows that 31.9 % of total variations of Innovation output variable is explained by the variations of Innovation input variable, while the remaining 68.1% represents the result of the influence of the other factors which are not included in this model. A weak correlation is also confirmed by the correlation coefficient 0.565. Its value indicates the existence of low grade, direct (straight line extending from the lower left to upper right corner of a graph) linear correlation among the observed variables in countries included in the sample. The slope of the line b1 = 1.048 indicates that the growth of Innovation input variable for one unit of its measurement leads to growth of Innovation output for 1.048. Testing of the hypothesis of linear independence of observed variables over the corresponding regression coefficient gave the value of the statistics test of 1.6788. With a probability level of significance of the test 0.05 and test threshold 2.4469, it can also be concluded that there is no statistically significant linear correlation between the observed variables Innovation input and Innovation output.

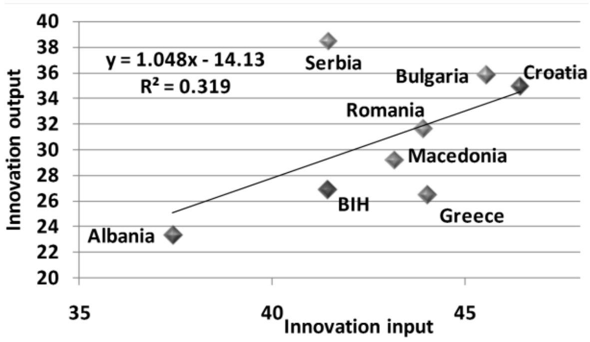

Fig. 11 Scatter diagram for the connection between global innovation index and innovation efficiency index (data on a sample of eight countries)

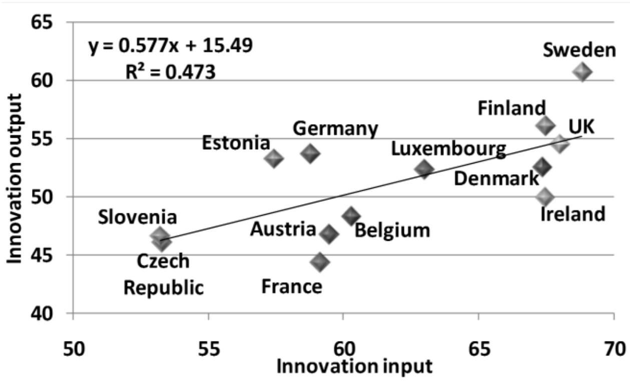

Fig. 12 Scatter diagram for the connection between global innovation index and innovation efficiency (data on a sample of thirteen EU countries)

Graphical representation of data pairs of variables *Innovation input* and *Innovation output* for the selected group of countries indicates a potentially significant correlation among the variations of the observed variables. Adaptation of the linear form of correlation and analysis of specified model components also suggests previously stated, visually perceived statement. In fact, the function of the linear regression has the following form: 15.49 + 0.557 *x, with the statistics $R^2 = 0.473$ and R= 0.7. Value of determination coefficient shows that 47.3% of total variations of *Innovation output* variable is explained by the variations of *Innovation input* variable, while the remaining 52.7% represents the result of the influence of the other factors which are not included in this model. A potentially significant correlation is also confirmed by the correlation coefficient 0.7. Its value indicates the existence of high grade, direct (straight line extending from the lower left to upper right corner of a graph) linear correlation among the observed variables in countries included in the sample. The slope of the line $b_1 = 0.557$ indicates that the growth of *Innovation input* variable for one unit of its measurement leads to growth of *Innovation output* for 0.557. Testing of the hypothesis of linear independence of observed variables over the corresponding regression coefficient gave the value of the statistics test of 3.1474. With a probability level of significance of the test 0.05 and test threshold 2.201, it can also be concluded that there is statistically significant linear correlation between the observed variables *Innovation input* and *Innovation output*. Thus, given the values obtained with the proposed model, it can be concluded that the model is valid for statistical inference, and implementation of correct predictions and projections of *Y*.

CONCLUSION

If observed world-wide, global innovation index data analysis shows significant difference between the economies, even when they have similar general economic development. That could be the consequence of countries' implementation of various distinctive strategies. However, it is obvious that there is a significant correlation between innovation inputs and innovation outputs, if they are observed globally, while this correlation cannot be identified in the relation between global innovation index and innovation efficiency index (IFI).

Serbia and surrounding countries have innovation performance quality at a much lower level compared to other EU countries. One of the reasons for delayed transition of Serbian economy is its low innovativeness.

In considering the relationship between *Innovation Input* and *Innovation Output Index* for Serbia and a select group of countries, it was found that there was no statistically significant effect of innovation input on innovation *results.*

Considering the relationship between *Innovation Input Index* and *Innovation Output Index* for reference European countries revealed a potentially significant direct linear correlation, and statistically important impact (linear correlation) of inputs to innovation *results.*

Possible reason for this correlation disbalance within two observed groups of countries is that GII metrics is primarily appointed to the countries with high-profile national innovation system.

However, Serbia is the only country from the observed group of neighbouring countries which has a very similar subindex of innovation inputs and outputs, and because of this is on the first place in a group by innovation efficiency index. Unfortunately, it is our opinion that this is an echo of innovation inputs from the time of Yugoslavia, and that, in order to give recommendation and priorities for Serbian innovation system's further development, more serious focus on GII paremeters is necessary.

This requires further research after implementation of given metrics in following period of time.

REFERENCES

1. Cvetanović, S. Mladenović, I. Nikolić, M. (2011). "Theoretical basis of the concept of the innovative capacity of economy" (in Serbian: Teorijske osnove koncepta inovacionog kapaciteta privrede), Ekonomika, Niš, No 4, str. 14-23.
2. Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: a new perspective on learning and innovation. Administrative science quarterly, 128-152.

3. Cvetanović, S. Despotović, D. Nedić, V. (2012). "Comparative analaysis of Serbian business sophistication and neghboring countries", Industrija, No 4. pp. 89-106.
4. Cvetanović, S., Sredojević, D. (2012). "The concept of national innovation systems and economic competitiveness", (in Serbian: Koncept nacionalnog invoacionog sistema i konkurentnost privrede), Ekonomske teme, Ekonomski fakultet, Niš, No 2. str. 167-185.
5. Etzkowitz, H., Webster, A., & Healey, P. (Eds.). (1998). Capitalizing knowledge: New intersections of industry and academia. Suny Press.
6. Freeman, C. (2002). Continental, national and sub-national innovation systems—complementarity and economic growth. Research policy, 31(2), 191-211.
7. Freeman, C. Soete, L. (1997). Economics of Industrial Innovation, Pinter, London; pp. 295-297.
8. Freeman, C. (1987). Technology Policy and Economic Performance: Lessons from Japan, Pinter, London: p.4.
9. Jones, C. I. (1995). R & D-based models of economic growth. Journal of political Economy, 759-784.
10. Jones, C. (1998). Introduction to Economic Growth, Norton and Company Inc..
11. LeBel, P. (2008). The role of creative innovation in economic growth: Some international comparisons. Journal of Asian Economics, 19(4), 334-347.
12. Lundvall, B., Dalum, B., Johnson, B., & Sloth Andersen, E. (2002). National Systems of Production, Innovation and Competence Building. Research Policy, (31): 213-231.
13. McElroy, M. (2003). The new knowledge management: Complexity, learning, and sustainable innovation. Routledge.
14. OECD, (1999). Managing National Systems of Innovation. Paris: OECD.
15. Peters, S. (2006). National Systems of Innovation, Creating High-Technology Industries, Palgrave, Macmillan; pp. 18-24.
16. Porter, M. (1990). The Competitive Advantage of Nations, London, Macmilan.
17. Romer, P. (1990). "Endogenous Technological Change", Journal of Political Economy; 98 (5):78 -102.
18. Romer, P. (1987). "Growth Based on Increasing Returns Due to Specialization", American Economic Review, 77 (2): 56-63.
19. Romer, P. (1986). "Increasing Returns and Long-Run Growth", Journal of Political Economy, 94 (5): 1002-1037.
20. Romer, P. M. (1994). The origins of endogenous growth. The Journal of Economic Perspectives, 8(1), 3-22.
21. Sener, S., Sarıdogan, E. (2011). The Effects Of Science-Technology-Innovation On Competitiveness And Economic Growth. Procedia - Social and Behavioral Sciences, Volume 24, Pages 815-828
22. Simoneti, R. (2001). "Governing European Technology and Innovation" in Tomson, G. (ed) The Europian Economy, Sage Publacions, London.
23. Smith, D. (2010). Exploring Innovation, McGraw-Hill, p. 288.
24. Solow, R. (1956). "A Contribution to the Theory of Economic Growth", Quarterly Journal of Economics; 70 (1): 65–94.
25. Teece, D. J. (2003). Capturing value from knowledge assets: the new economy, markets for know-how and intangible assets. Essays on Technology Management and Policy, 47-75.
26. The Global Innovation Index. (2011). INSEAD.
27. The Global Innovation Index. (2012). INSEAD.
28. Valdés, B. (1999). Economic Growth: Theory, Empirics and Policy, Cheltenham, Edward Elgar.

ANALIZA INOVACIONOG POTENCIJALA SRBIJE U PERIODU 2009-2012. GODINE

U ovom radu prvo je prikazan pregled značaja inovacionog potencijala zemlje za njen ekonomski rast i razvoj. Nakon toga su prikazane pozicije i vrednosti globalnog indeksa inovativnosti za 25 najinovativnijih ekonomija sveta, za Srbiju i za odabrane zemlje iz njenog neposrednog okruženja, za period od 2009 do 2012. U cilju klasifikacije odabranih zemalja u dve ili više grupa, na osnovu njihove sličnosti prema inovacionim performansama, izvršena je klaster analiza. Odnosi između inovacionih ulaza i inovacionih izlaza su prikazani na primeru odabranih grupa zemalja (grupa evropskih inovativnih lidera sa jedne i Srbije i njenih susednih zemalja sa druge strane) putem korelacione analize.

Ključne reči: *inovativnost, inovacioni ulazi, unovacioni izlazi, inovaciona efikasnost.*