



Publisher

<http://jssidoi.org/esc/home>



R&D EXPENDITURE, INNOVATION PERFORMANCE AND ECONOMIC DEVELOPMENT OF THE EU COUNTRIES*

Jozef Kučera ¹, Milan Fiľa ²

¹ Department of Finance and Accounting, Faculty of Economics, Matej Bel University in Banská Bystrica, Tajovského 10, 975 90 Banská Bystrica, Slovak Republic

² Institute of Economics and Management, Faculty of Natural Sciences, Constantine the Philosopher University in Nitra, Tr. A. Hlinku 1, 949 74, Nitra, Slovak Republic

E-mails:¹ jkucera2@student.umb.sk; ² mfila@ukf.sk

Received 15 November 2021; accepted 24 January 2022; published 30 March 2022

Abstract. Innovation plays the key role in economic development and also in the growth of the wealth of countries. Innovation is the driving force of each economy, competitiveness of the economy and a main essential component of the knowledge economy, which is based on the production of higher added value and support of the research and development (R&D). Therefore, the European Union with an effort to compete with other world economies is creating the frameworks of innovation policy in order to implement, maintain and disseminate innovation and innovative potential in all areas of socio-economic life. However, the innovation performance and potential differ significantly among the EU countries, and so the wealth of the countries. The main objective of the research made was to identify and quantify the possible impact of R&D expenditure on innovation performance and possible impact of the innovation performance on economic development of the EU countries. To achieve this goal a set of statistical methods was used, main of which is regression and correlation. In the result of our research, we have shown a significant interdependence between R&D expenditure, innovation performance and level of economic development of the EU countries.

Keywords: economic impact; innovation performance; R&D expenditure; real GDP per capita; economic development of the countries; The EU

Reference to this paper should be made as follows: Kučera, J., Fiľa, M. 2022. R&D expenditure, innovation performance and economic development of the EU countries. *Entrepreneurship and Sustainability Issues*, 9(3), 227-241. [http://doi.org/10.9770/jesi.2022.9.3\(14\)](http://doi.org/10.9770/jesi.2022.9.3(14))

JEL Classifications: O11, O30

* This article was created within the research project of the Scientific Grant Agency of the Ministry of Education, Science, Research and Sports of the Slovak Republic and Slovak Academy of Sciences, No. 1/0466/21 - Evaluation of business quality environment in Slovakia with an emphasis on starting a business in the pre- and post-pandemic period.

1. Introduction to the topic of innovation

For more than 50 years, since the neoclassical theory of economic growth composed by Robert Solow was introduced, researchers and economists are still trying to find an answer to question of different levels of successful economic growth and prosperity (Baltgailis 2019).

A search for new ways of understanding growth followed, and out of this emerged a new perspective on economic growth, which put technology and innovation, rather than capital accumulation, at the front. According to Fagerberg (2010), the ability of a poor country to catch up with the rich was seen not only – or mainly – as a reflection of its ability to generate (or attract) sufficient investments, but also of its capacity to absorb existing and generate new technologies (e.g. innovate).

At the very beginning it is necessary to explain and closely characterize the main terms. The initiator of the innovation theory is considered to be J. A. Schumpeter, who in the thirties of the 20th century regarded innovations as a driving force of economy. According to him, innovations represent combination of factors of production influenced by enterprise activities (Baltgailis 2019). Rajapathirana and Hui (2018) stated that innovations are world-widely regarded as pinnacle success factor in highly competitive global economy. One of the most popular Slovak definitions of the first term - innovation can be found in publication "Innovation and Companies" – published by Trnava Self-Governing Region (2010), where innovations are defined as introducing and implementing of new, or much better product (goods or services), process, new marketing method or a new organizational method in company practice, working environment of all organizational parts or in external relations.

The most acclaimed form of explaining the term **innovation** is at present a comprehensive definition in the Oslo manual, which was published in 1997 by OECD: “Technological innovations of products and processes (abr. TPP innovations), which include new products and processes based on new technologies, or significant technical improvements of already existing products and processes. TPP innovation is implemented when the product is launched to the market (product innovation) or a new process innovation is introduced (process innovation)“.

This manual also defines next four basic categories of innovations:

1. Product innovation
2. Process innovation
3. Organization innovation
4. Marketing innovation

Thus, on the one hand there are innovation of products/services (and also innovation of the production processes/methods) and marketing/selling methods – these are closely connected to the processes of R&D, production and sales. On the other hand there are organization innovation which are connected to the internal company structures, values/ideas or in general, with strategic management tools.

Second important term is the **innovation performance**. Level of innovation performance can be expressed by comprehensive methodology, which is used by the European Commission to compare innovation performance of its member states and individual regions of the EU, while it also uses the scheme of several basic indicators, such as:

- European Patent Office, www.epo.org
- Human resources in the area of science and technology (% of population)
- Participation in lifelong education (age of 25-64)
- Public expenses for research and development (% GDP)

- Company expenses for research and development (% GDP)
- Employment in medium-tech and high-tech production (% of overall work force)
- Employment in high-tech services (% of overall work force)
- European Patent Office patents (per one m. citizens)

A way how to measure the innovation performance at micro-economical level was identified f.e. by Gericke (2013), Lofsten (2014) or Kamasak (2015) and can be also implemented in the enterprises' internal processes.

In this article, we are focusing on the possible relationship between the R&D expenditures (which are sometimes called R&D investments) and innovation performance and, subsequently, the relationship between countries' innovation performance and level of economic development (wealth).

2. Innovation performance, expenditure into R&D and wealth of the countries within the EU

Gok and Peker (2017) in their research indicated the positive connection between market performance and innovation performance. Innovation policy of the EU is based on the support of enterprise sphere. This helps to contribute towards better industrial performance and so to support meeting broader social objectives such as industrial growth, increased employment rate and competitiveness of the industry within society and its sustainability. One of the key documents supporting growth of investments into innovations and innovative solutions is Innovation Strategy 2020, approved by the Committee in 2010 and European Industrial Strategy, updated in 2020 with recovery goals after the COVID pandemic. The Strategy 2020 also confirmed the Lisbon Strategic Aim to increase the investment ratio into science, research and innovation at least on the level of 3% GDP of the member countries.

At present, except Sweden, Netherlands, Austrian and Germany, none of the member countries fulfils the set objective of the investment ration on science, research and innovation. To reach the set innovation goals the EU has proposed 10 following measures:

- 1) To continue in investments into innovation regardless of saving measures.
- 2) To improve the quality of Europe and individual state internal systems of research and innovation.
- 3) To modernize educational systems at all levels.
- 4) To use the EU research area for improving cooperation of innovators and researchers.
- 5) To simplify the approach towards European programs.
- 6) To commercialize innovations – improve the links among scientists and enterprises.
- 7) To dispose of the barriers restricting the introduction of new ideas into market – more functions for the SMEs sector.
- 8) To establish European partnerships this would support and accelerate the research, development and introduction of innovations to the market.
- 9) To improve innovations in the public sector.
- 10) To support the cooperation with international partners and open up the opportunity of the EU support programs.

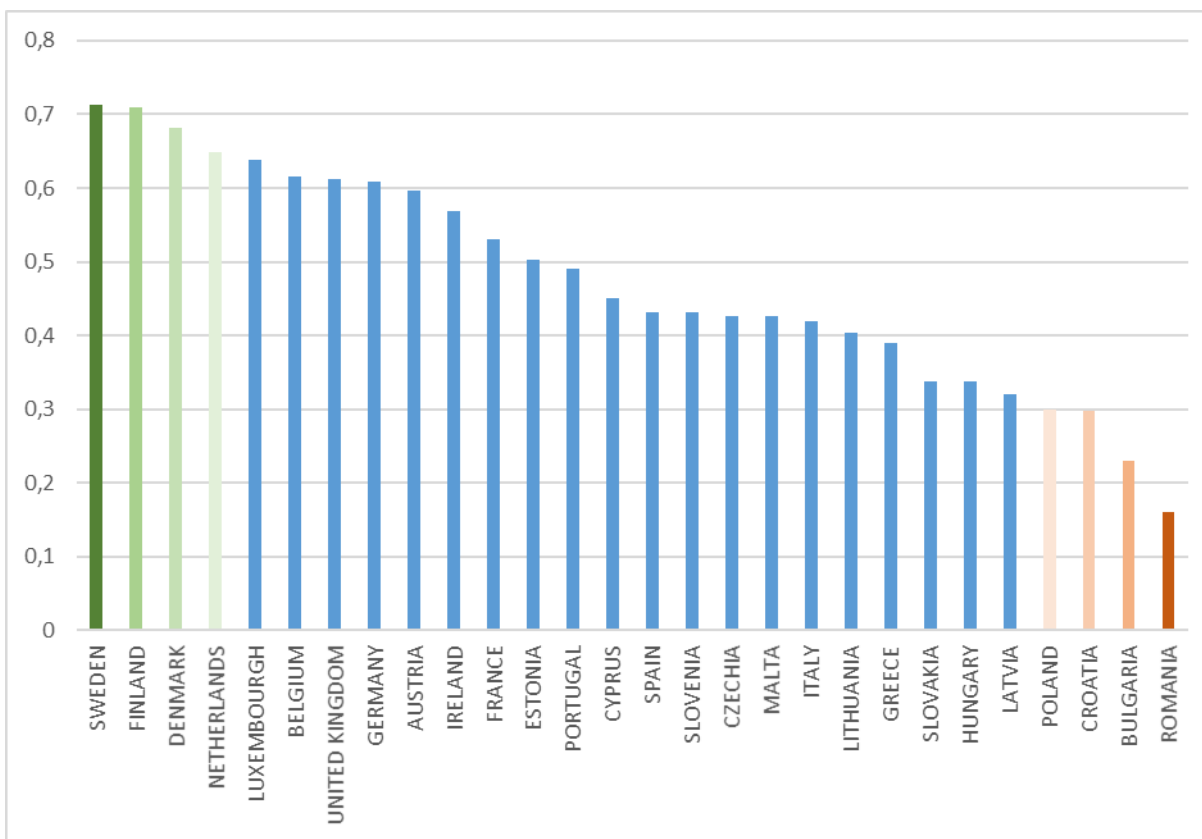


Figure 1. The innovation performance measured by Summary Innovation Index (SII) within the EU countries in 2019

Source: European Union, 2020

The graph (Fig. 1) shows us the innovation performance of the EU countries in 2019. The innovation leaders are Sweden, Finland, Netherlands and Denmark (in the shades of green). The least innovative countries (in the shades of orange) are Poland, Croatia, Bulgaria and Romania.

It is important to note that the economies of the greatest innovators among European countries are strongly focusing in their key strategic documents on sustainable and “green” economic growth. Globocnik, Rauter and Baumgartner (2020) also emphasize the importance of the sustainability-related innovation orientation of the economy. Sustainable economy plays an important role of the covid-recovery financial help from the European Union – f.e. in Slovakia, the largest amount of financial support of the Covid-recovery plan will be used for support of the sustainable and “green” economy projects. Childs and Triantis (1999) examined different R&D investment policies and their success in fulfilling the goals – results could be also used as basics for evaluation of the sustainability-related innovation policies. Carboni and Medda (2020) offer tools for the evaluations of internal enterprises’ policies on the micro-level. Baneliene and Melnikas (2020) modeled the impact of R&D expenditure on GDP growth in the EU under broad conditions of globalization. Regional development from the perspective of R&D expenditure was examined in the research made by Woo, Kim and Lim (2017). Hong (2017) in his research based on data from South Korea identified a link between the volume of R&D expenditure and the country's economic growth.

The state of innovation performance of the largest and smallest innovators in the years 2012-2019 is shown in the graph (Fig. 2) below.

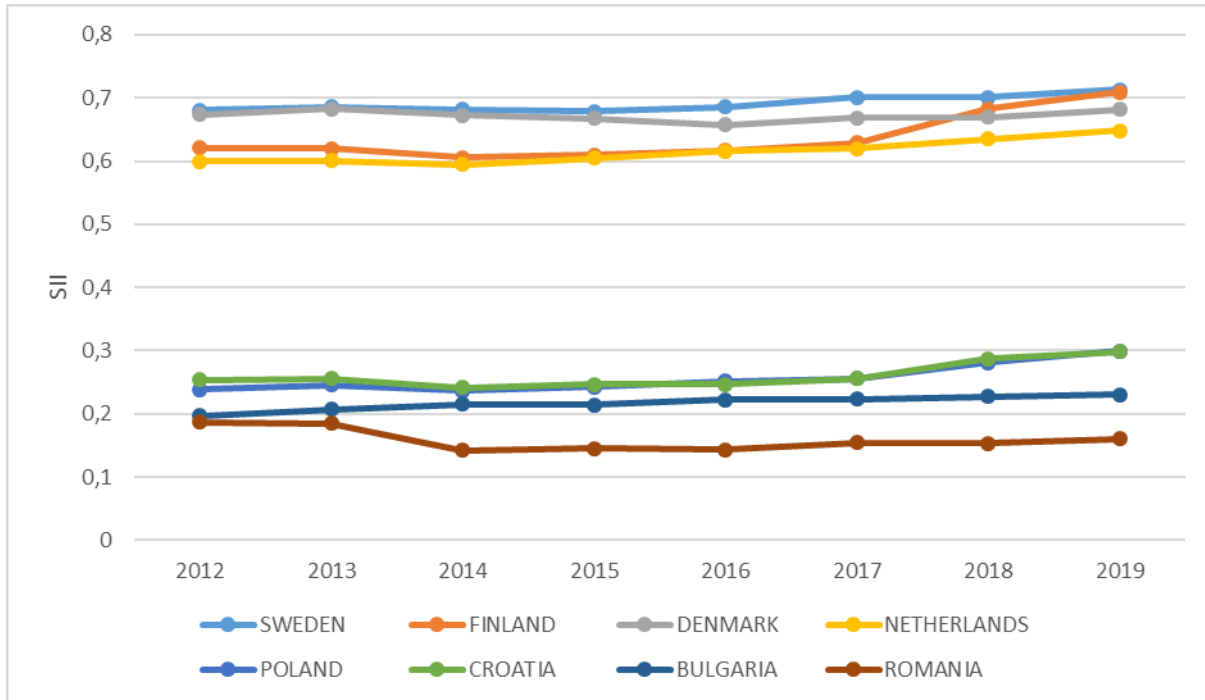


Figure 2. The state of innovation performance of selected countries in 2012-2019

Source: European Union, 2021

Among the expenditure into research and development and the innovation performance there is a precondition of correlation and therefore a higher % of expenditure into research and development should logically increase also the innovation performance of an individual country. A typical example is Sweden which in long term spends on research and development in the comparison with the GDP the largest financial amount and so it represents the leader in innovation performance among the EU member states.

The following graph shows the research and development expenditure (measured in % of total GDP) in selected EU countries (Innovation leaders and the least innovative countries). As we can see on the graph (Fig. 3), the innovation leaders are spending significantly more into R&D than countries, which are the least successful innovators. Wang and Guan (2017) identified a positive correlation between the state government subsidy of the enterprise sector and the innovation performance of this sector. Albulescu and Draghici (2016) pointed out that higher business support alone does not mean higher innovation performance.

From this perspective, it is crucial to support the R&D also by public funds and not only by private financial sources. Wang and Thornhill (2010) are focusing on ways how the R&D development could be financed on micro-level.

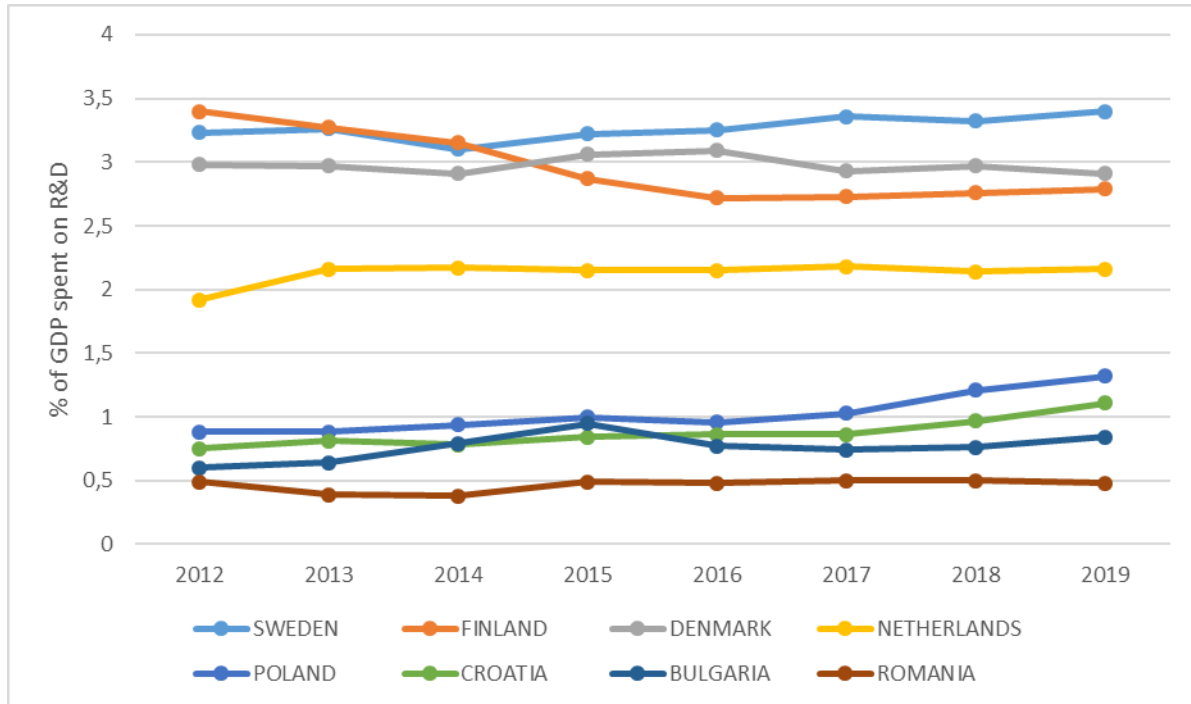


Figure 3. Expenditure into R&D of selected countries in 2012-2019

Source: EUROSTAT, 2021

Among the innovation performance and wealthiness of the countries there is a precondition of correlation and therefore a higher innovation performance leads to higher wealth of the country (measured by the real GDP per capita). Endo and Ikeda (2021) focused in their research on ways how the wealthy countries are reaching the already mentioned sustainable development. The issue of wealth inequality between countries was well examined in the research made by Pfeffer and Waitkus (2021). Orviská, Caplanová and Hudson (2014) perceive the higher level of countries' wealth as an important part of the overall well-being of the country's population. Impact of the countries' wealth on happiness of the population was assessed by Senik (2014). Ketchen, Ireland and Snow (2007) examined different types of enterprises and their contribution to total wealth by using collaborative innovation.

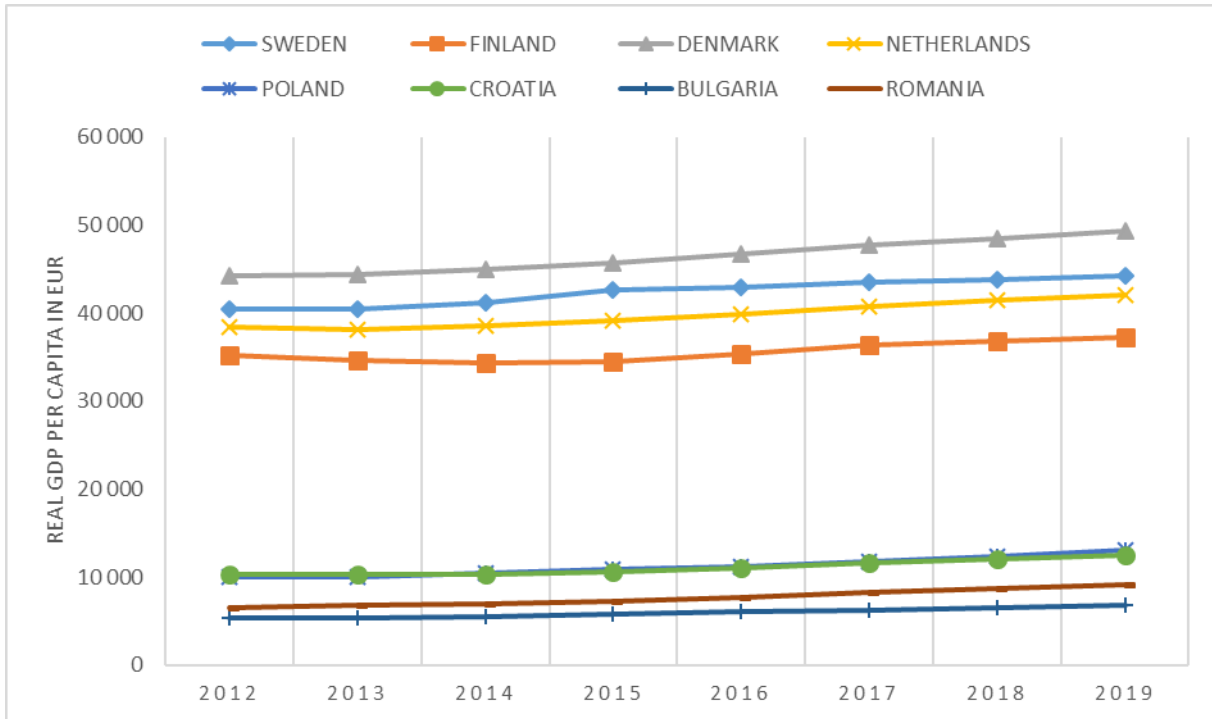


Figure 4. Wealth of the selected EU countries in 2012-2019

Source: EUROSTAT, 2021

The graph (Fig. 4) shows the wealthy of the selected EU countries. As we can see on the graph, the innovation leaders are also one of the most wealthy countries in the EU and the least innovative countries with lower innovation performance are one of the most poor countries in the EU. Azpitarte (2012) in addition to the countries' wealth also examined the impact on salaries. Hamilton and Hepburn (2014) mentioned in their research that GDP per capita should not be the only one indicator of wealth. Fessler and Schurz (2018) pointed out that welfare state and its higher expenditures from public funds in fact goes along with an increase of observed wealth inequality.

The economic growth theories indicate that GDP growth depends on capital increase, investments and from the increase of the workforce through population growth. Modern economic theories of the 20th century attributed the important role of GDP growth to technological progress (Solow's neoclassical growth model, Barro's and Romer's model). Romer (1993), within the endogenous growth theory, assumed that poor countries should adopt the technologies of better developed countries for faster economic growth. Higher R&D expenditures are a basic precondition for faster economic growth which is basically represented by GDP per capita. Technological progress has a significant impact on GDP and rapid/jump growth is not possible without innovation. These findings are the reason for the choice of 3 economic indicators that are used in comparison of selected EU countries in Fig. 3 and Fig. 4.

The literature sources mentioned above are focusing mostly monothematically:

- on the innovation, how to measure it and its' role in the national economies,
- on the support of R&D,
- wealth of the countries and well-being of their population,
- connection between R&D and innovation performance.

There are missing research outcomes on interconnection between all of those 3 indicators that could demonstrate the mutual force of their action. For the purposes of our research, GDP per capita is the best indicator of the countries' wealth especially for its comparability between individual countries and the uniform methodology of its measurement.

3. Methodology

With regard to the identification of a possible relationship between the innovation performance and expenditure into R&D (expressed in % share of GDP), and between the innovation performance (expressed by Summary Innovation Index – SII) and wealth of the EU countries (expressed in GDP per capita), the set of hypotheses and goals shown below were set.

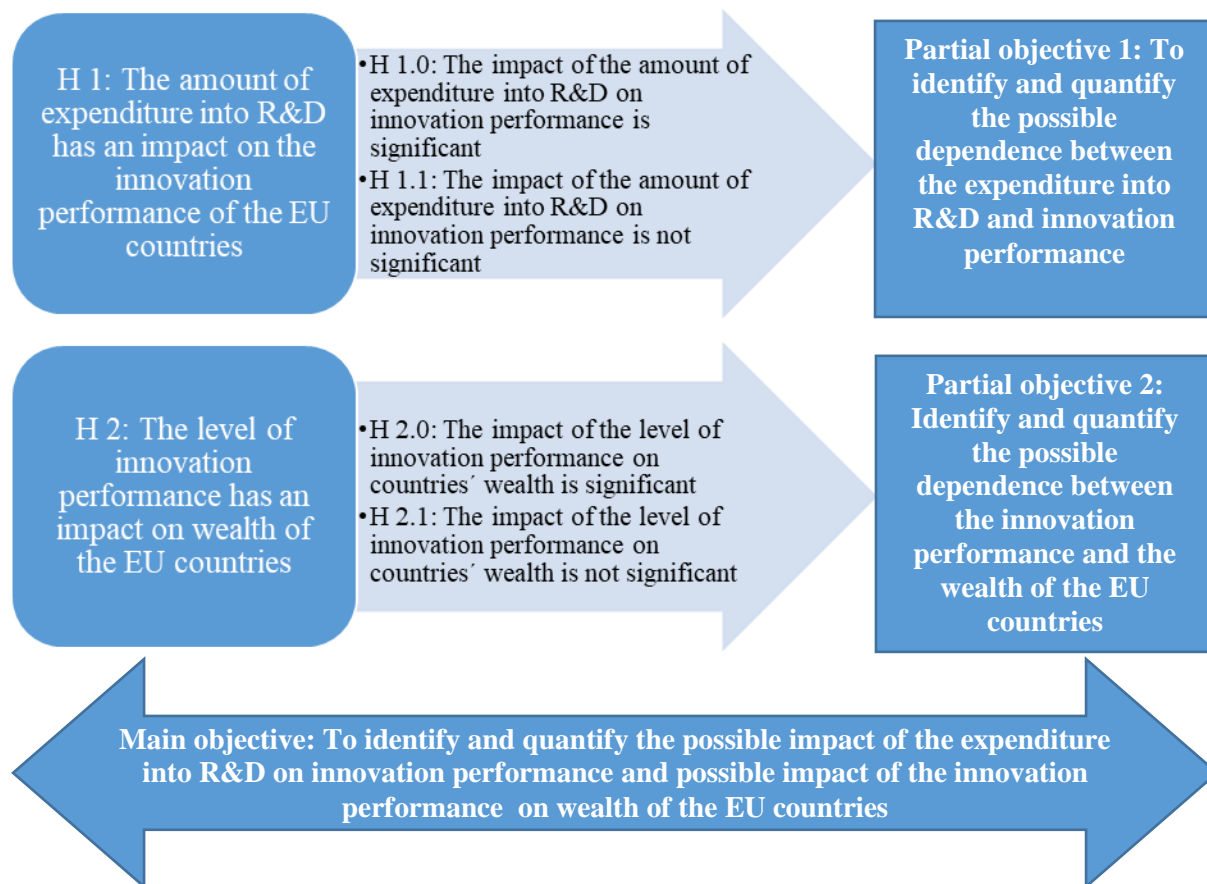


Figure 5. A set of partial objectives and set hypotheses

Source: Made by the authors

The research focuses on 3 main indicators: innovation performance, expenditure into R&D and real GDP per capita in the EU countries. The aim of the research is to find out whether the amount of expenditure into R&D has an impact on innovation performance and whether the level of innovation performance has an impact on the wealth of the EU countries.

The main sources of information include the secondary data contained in the European Innovation Scoreboard 2020 (for the innovation performance levels within the EU countries) and the related EUROSTAT datasets within the EU countries (for the amount of expenditure into R&D and for the level of countries' wealth). The limiting factor of the research made is a not too long timeline during which data from all EU countries were available and the number of EU member states was stable (f. e. BREXIT in 2020).

Empirical, exploratory, comparative and statistical methods of examining secondary data were used to meet the partial as well as main objectives of the research. The analytical tools used include the regression and correlation analysis. These analyses will allow us to confirm or refute the hypothesis. The regression analysis (in identified exponential and linear functions) examines a possible relationship between two variables, where we assume that:

- A. the value of the dependent variable (Y – innovation performance) is affected by a change in the value of an independent variable (X – expenditure into R&D),
- B. the value of the dependent variable (Y – GDP per capita) is affected by a change in the value of an independent variable (X – innovation performance).

Not every innovation or type of innovation contributes equally or equally to innovation performance or economic growth. From this point of view, we do not methodologically monitor the contribution of individual components of innovation or their number, but we monitor the contribution of the overall innovation performance of selected countries.

Limitations of the research made lies in the fact that the theory of economic growth is relatively complex, evolves over time and it is possible to express economic growth by many indicators or factors. This research abstracted from factors such as the quality of the environment, length of working time etc., and focus only on the basic key indicator expressing economic growth – the GDP. The limitation of its growth depends on technological progress, which is not possible without innovation.

4. Connection between R&D expenditure and innovation performance – analytical part

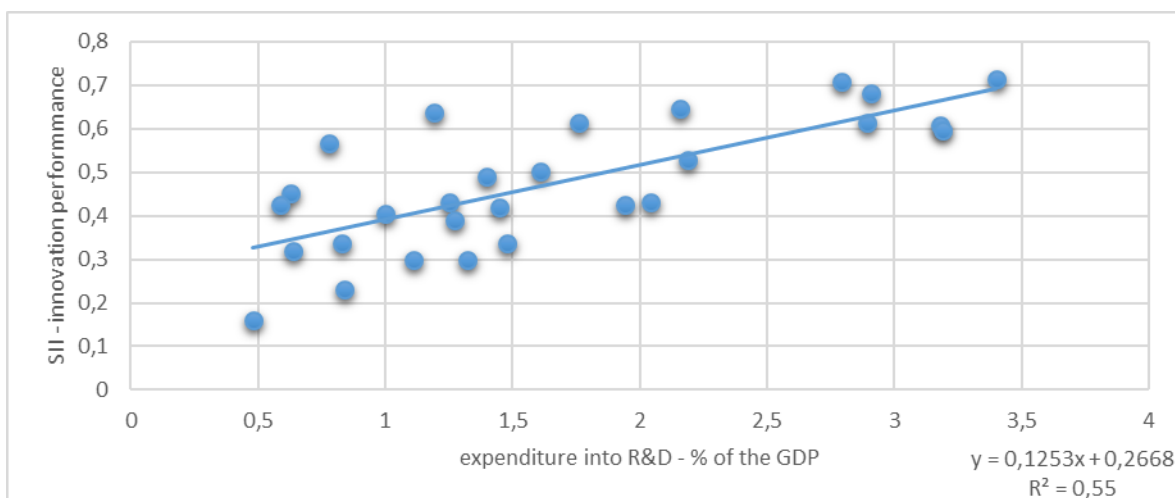


Figure 6. The Dependence of the investments in R&D and innovation performance

Source: Own research, 2021

After the initial analysis through visual assessment using X to Y depending chart we chose a suitable mathematical function of which the curve best reflects the relationship between observed variables. In the case of dependence between expenditure into R&D and innovation performance, a linear function showed preferable, which suggests that innovation performance rise with rising expenditures in R&D in linear way. In the case of dependence between innovation performance and wealth of the EU countries, an exponential function has been used considering the nature of the data applied, which differs from the linear model by the type of mathematical curve used to quantify the relationship between variables. The principle of the rest of the analysis is identical as in any linear and nonlinear dependence.

Table 1. The regression and correlation relationship analysis of the expenditure in R&D and innovation performance

<i>Regression Statistics</i>	
Multiple R	0,741596021
R Square	0,549964658
Adjusted R Square	0,532655606
Standard Error	0,102127353
Observations	28

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0,331394777	0,3313948	31,7732	6,3152E-06
Residual	26	0,271179902	0,01043		
Total	27	0,602574679			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	0,266834271	0,04152885	6,4252748	8,3E-07	0,181470498	0,352198	0,1814705	0,35219804
% of GDP invested to R&I	0,125294482	0,022228041	5,6367757	6,3E-06	0,079604089	0,1709849	0,07960409	0,17098488

<i>GDP invested to R&D Innovation performance</i>	
GDP invested to R&D	1
Innovation performance	0,741596021

Source: Own research, 2021

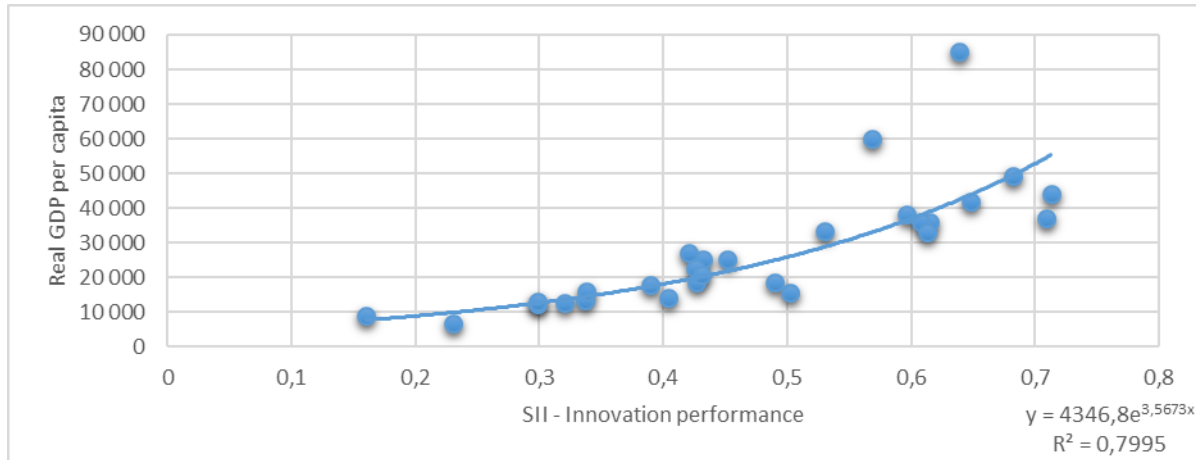


Figure 7. The Dependence of the innovation performance and wealth of the countries

Source: Own research, 2021

Table 2. The regression and correlation relationship analysis of the innovation performance and wealth of the countries

Regression Statistics	
Multiple R	0,781367104
R Square	0,610534551
Adjusted R Square	0,595555111
Standard Error	11059,89313
Observations	28

ANOVA					
	df	SS	MS	F	significance F
Regression	1	4985589532	4,99E+09	40,75817	9,207E-07
Residual	26	3180352136	1,22E+08		
Total	27	8165941668			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-15168,94956	7070,921708	-2,14526	0,041445	-29703,437	-634,46183	-29703,4373	-634,461829
Innovation perform:	90960,49624	14247,72393	6,384212	9,21E-07	61673,88	120247,11	61673,88027	120247,1122

Innovation performance Real GDP per capita	
Innovation perform:	1
Real GDP per capita	0,781367104

Source: Own research, 2021

Table 3. Summary of correlation and regression analysis output

HYPOTHESES	CONFIRMATION / REFUSAL	CORRELATION VALUE	R-SQUARE	SIGNIFICANCE-F
H1	YES	0,74	0,55	0,000006315
H 1.0	YES			
H 1.1	NO			
H2	YES	0,78	0,61	0,000000921
H 2.0	YES			
H 2.1	NO			

Source: Own research, 2021

According to Pearson's correlation coefficient and Cohen's interpretation of the correlation coefficient, there is:

1. a big positive dependence between amount of expenditure into R&D and level of innovation performance,
2. a big positive dependence between the level of innovation performance and GDP per capita/wealth of the countries.

The linear model used to analyse the dependence between amount of expenditure into R&D and level of innovation performance has proved to be statistically significant (Significance F – F test for statistical significance of the model is at 0,000006315, which is considerably less than 0.05, therefore we accept the hypothesis of the model significance). The strength and suitability of the model is evaluated by correlation coefficient (0.74) and R-SQUARE (0,55 – 55% of innovation performance changes could be explained by changes of the R&D expenditure).

The exponential model used to analyse the dependence between the level of innovation performance and GDP per capita has proved to be statistically significant (Significance F – F test for statistical significance of the model is at 0,000000921, which is considerably less than 0.05, therefore we accept the hypothesis of the model significance). The strength and suitability of the model is evaluated by correlation coefficient (0.78) and R-SQUARE (0,61 – 61% of GDP per capita changes could be explained by changes of the innovation performance).

Conclusion and discussion

Globally it can be stated that the situation of the innovation support policy in public as well as in private sector is more than alarming. In the long term, the new EU member states lag behind the average of the EU-28. The largest innovators among the countries are spending the largest amount of funds on R&D and at the same time they are also among the countries with the highest GDP per capita. Thus, innovation not only contributes to the higher competitiveness of the economy but also to a better well-being of its population.

Innovation performance depends highly on the amount of expenditure (of private and also public funds) into R&D and the wealth of the countries depends highly on the innovation performance. In fact, this is a circle of 3 factors that interact together. Growth of one factor increasing the growth of the other and multiply the positive impact on the national economy.

It is important, as a first step towards the higher innovation performance, to adopt comprehensive measures of a legislative nature, containing clear development objectives that will not only be declaratory. The fulfillment of economic strategic objectives (that leads to higher innovation performance) must be regularly assessed and, if necessary, corrected, mainly due to the constantly changing global economic environment. Support of R&D on

public and private seems to be crucial essence for higher innovation performance and secondary also for higher wealth of the country. Within the scope of the research, it is possible to work with a multifactor model in the future, which can extend the analysis by other indicators of modern economic theory in connection with economic growth.

References

- Albulescu, C. T., Draghici, A. (2016). Entrepreneurial activity and national innovative capacity in selected European countries. *International Journal of Entrepreneurship and Innovation*, 17(3), Thousand Oaks: Sage Publications, 155-172 p., ISSN: 1465-7503. <http://doi.org/10.1177/1465750316655902>
- Azpitarte, F. (2012). Measuring poverty using both income and wealth: a cross-country comparison between The US and Spain. *Review of Income and Wealth*, 58(1), Hoboken: Wiley, 24-50 p. ISSN: 0034-6586 <http://doi.org/10.1111/j.1475-4991.2011.00481.x>
- Baltgailis, J. (2019). The issues of increasing the effectiveness of teaching comparative economics. *Insights into Regional Development*, 1(3), 190-199. [https://doi.org/10.9770/ird.2019.1.3\(1\)](https://doi.org/10.9770/ird.2019.1.3(1))
- Baneliene, R., Melnikas, B. (2020). Economic growth and investment in R&D: contemporary challenges for the European Union. *Contemporary Economics*, 14(1), Warsaw: University of Economics and Human Sciences, 38-57 p., ISSN: 2084-0845 <http://doi.org/10.5709/ce.1897-9254.331>
- Carboni, O. A., Medda, G. (2020). Linkages between R&D, innovation, investment and export performance: evidence from European manufacturing firms. *Technology Analysis & Strategic Management*, 32(12), Abingdon: Routledge Journals, 1379-1392 p. ISSN: 0953-7325 <http://doi.org/10.1080/09537325.2020.1769841>
- Childs, P. D., Triantis, A. J. (1999). Dynamic R&D investment policies. *Management Science*, 45(10), Catonsville: Informs, 1359-1377 p., ISSN: 0025-1909, <http://doi.org/10.1287/mnsc.45.10.1359>
- Endo, K., Ikeda, S. (2021). How can developing countries achieve sustainable development: implications from the inclusive wealth index of Asian countries. *International Journal of Sustainable Development and World Ecology*, Philadelphia: Taylor & Francis, ISSN: 1350-4509 <http://doi.org/10.1080/13504509.2021.1910591>
- European Commission (2015). What is Cosme?, available at: http://ec.europa.eu/enterprise/initiatives/cosme/index_en.htm
- European Union (2020). European Innovation Scoreboard 2020. 94p. ISSN: 2467-4435
- Eurostat (2021). Eurostat Database. Available at: <http://epp.eurostat.ec.europa.eu>.
- Fagerberg, J. (2010). The changing global economic landscape: the factors that matter, In Robert M Solow & Jean-Philippe Touffut (ed.), *The Shape of the Division of Labour: Nations, Industries and Households*. Edward Elgar, 6-31 p. ISBN: 978-1-84980-510-0, <http://doi.org/10.4337/9781849809122.00011>
- Fessler, P., Shurz, M. (2018). Private wealth across European countries: The Role of Income, Inheritance and the Welfare State. In: *Journal of Human Development and Capabilities*, 19(4), Abingdon: Routledge Journals, 521-549 p., ISSN: 1945-2829, <http://doi.org/10.1080/19452829.2018.1507422>
- Gericke, M. H. (2013). Performance measurement of innovation. In: *Finance and the Performance of Firms in Science, Education, and Practice*, Proceedings Paper - 6th International Scientific Conference on Finance and the Performance of Firms in Science, Education, and Practice, Zlín: Tomáš Baťa University, 243-254 p. ISBN: 978-80-7454-246-6
- Globocnik, D., Rauter, R., Baumgartner, R. (2020). Synergy or conflict? The relationship among organizational culture, sustainability-related innovation performance, and economic innovation performance. *International Journal of Innovation Management*, 24(1), Singapore: World Scientific Publication ISSN: 1363-9196, <http://doi.org/10.1142/S1363919620500048>
- Gok, O., Peker, S. (2017). Understanding the links among innovation performance, market performance and financial performance. *Review of Managerial Science*, 11(3), Heidelberg: Springer, 605-631 p. ISSN: 1863-6683, <http://doi.org/10.1007/s11846-016-0198-8>

Hamilton, K., Hepburn, C. (2014). Wealth. *Oxford Review of Economic Policy*, 30(1), Oxford: Oxford University Press, 1-20 p. ISSN: 0266-903X <http://doi.org/10.1093/oxrep/gru010>

Hong, JP. (2017). Causal relationship between R&D investment and economic growth in Korea. *Technological Forecasting and Social Change*, Vol. 116, New York: Elsevier Science, 70-75 p. ISSN: 0040-1625 <http://doi.org/10.1016/j.techfore.2016.11.005>

Kamasak, R. (2015). Determinants of innovation performance: a resource-based study. *World Conference on Technology, Innovation and Entrepreneurship*, Amsterdam: Elsevier Science, 1330-1337 p. <http://doi.org/10.1016/j.sbspro.2015.06.311>

Ketchen, D. J., Ireland, R. D., Snow, C. C. (2007). Strategic entrepreneurship, collaborative innovation, and wealth creation. *Strategic Entrepreneurship Journal*, 1(3-4), Hoboken: Wiley, 371-385 p. ISSN: 1932-4391 <http://doi.org/10.1002/sej.20>

Kováčová, E. (2007). *Úloha inovačných centier v znalostnej ekonomike* (translation: The role of innovation centers in the knowledge economy). *Transfer inovácií* (translation: Transfer of Innovation) 10/2007. 22-25 p., available at: <https://www.sjf.tuke.sk/transferinovacii/pages/archiv/transfeer/10-2007/pdf/22-25.pdf>

Lofsten, H. (2014). Product innovation processes and the trade-off between product innovation performance and business performance. *European Journal of Innovation Management*, 17(1), Bingley: Emerald Group Publishing, 61+ p. ISSN: 1460-1060, <http://doi.org/10.1108/EJIM-04-2013-0034>

Ministry of Education, Science, Research and Sport of The Slovak Republic. (2013). Knowledge for prosperity - Research and innovation strategy for intelligent specialization of the Slovak Republic - approved by the Government of the Slovak Republic on 13 November 2013 by Government Resolution no. 28588/2013, available at: <https://www.opvai.sk/media/98825/poznatkami-k-prosperite-strat%C3%A9gia-v%C3%BDskumu-a-inov%C3%A1ci%C3%AD-pre-inteligentn%C3%BA-%C5%A1pecializ%C3%A1ciu-sr.pdf>

Organisation for Economic Co-operation and Development – OECD (2005). Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data, available at: http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oslo-manual_9789264013100-en#page52

Orviská, M., Caplanová, A., Hudson, J. (2014). The Impact of democracy on well-being. *Social Indicators Research*, 115(1). Springer. <https://doi.org/10.1007/s11205-012-9997-8>

Pfeffer, F. T., Waitkus, N. (2021). The wealth inequality of nations. *American Sociological Review*, 86(4), Thousand Oaks, Sage Publications, 567-602 p. ISSN: 0003-1224, <http://doi.org/10.1177/00031224211027800>

Rajapathirana, R. P. J., Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge*, 3(1), Madrid: Elsevier. 44-55 p. ISSN: 2530-7614 <http://doi.org/10.1016/j.jik.2017.06.002>

Romer, P. (1993). Idea gaps and object gaps in economic development. *Journal of Monetary Economics*, 32(3), Amsterdam: Elsevier, 543-573 p. ISSN: 0304-3932 [http://doi.org/10.1016/0304-3932\(93\)90029-F](http://doi.org/10.1016/0304-3932(93)90029-F)

Senik, C. (2014). Wealth and happiness. *Oxford Review of Economic Policy*, 30(1), Oxford: Oxford University Press, 92-108 p. ISSN: 0266-903X, <http://doi.org/10.1093/oxrep/gru004>

Skokan, K. (2004). *Konkurenceschopnosť, inovácie a klastry v regionálnom rozvoji* (translation: Competitiveness, innovation and clusters in regional development). Ostrava: Repronis, 160 p. ISBN: 80-7329-059-6

Šandor, D. (2014). Horizon 2020, available at: http://www.een.sk/?services_17/1028

Šikula, M. et al. (2010). *Stratégia rozvoja slovenskej spoločnosti* (translation: Development strategy of Slovak society). Bratislava: Veda, 2010. 695 p. ISBN 978-80-224.1151-6

Trnava Self-Governing Region (2010). Innovation and companies, published within the project Duo**Stars, available at: <https://portal.trnava-vuc.sk/documents/10180/43039/OP+SR-AT+2007-2013-+Duo+Stars/190cf69f-ce26-4403-9101-a25338a306bb?version=1.1>

Wang, X., Guan, S. (2017). An Empirical Study on the Relationship between Government Subsidy, Enterprise Innovation Capability and Innovation Performance. In: Proceedings of the Fourht International Symposium - Management, Innovation & Development, Hawthorn: St Plum-Blossom Press, 97-102 p.

Wang, T., Thornhill, S. (2010). R&D investment and financing choices: A comprehensive perspective. *Research Policy*, 39(9), Amsterdam: Elsevier, 1148-1159 p. ISSN: 0048-7333, <http://doi.org/10.1016/j.respol.2010.07.004>

Woo, Y., Kim, E., Lim, J. (2017). The impact of education and R&D investment on regional economic growth. *Sustainability*, 9(5), Basel: MDPI ISSN: 2071-1050 <http://doi.org/10.3390/su9050676>

Funding: This article was created within the research project of the Scientific Grant Agency of the Ministry of Education, Science, Research and Sports of the Slovak Republic and Slovak Academy of Sciences, No. 1/0466/21 - Evaluation of business quality environment in Slovakia with an emphasis on starting a business in the pre- and post-pandemic period.

Data Availability Statement: All data is provided in full in the results section of this paper.

Author Contributions: Conceptualization: *Jozef Kučera, Milan Fil'a*; methodology: *Jozef Kučera, Milan Fil'a*; data analysis: *Jozef Kučera*, writing—original draft preparation: *Jozef Kučera*, writing; review and editing: *Jozef Kučera, Milan Fil'a*; visualization: *Jozef Kučera*. All authors have read and agreed to the published version of the manuscript.

Ing. Jozef KUČERA, MSc is PhD student in the field of Finance, who is focusing in his research on the topics of sport industry, financing sport from public sources, innovation policies and business environment in EÚ countries. Mr. Kučera is also a senior policy counsellor in The Chief Sports Auditor dep. of The Ministry of Education, Science, Research and Sport of The Slovak Republic.

ORCID ID: 0000-0002-6165-6965

Assoc. prof. Ing. Milan FILA, PhD. is associate professor in the Institute of Economics and Management of The Constantine the Philosopher University in Nitra, who is focusing in his research on the topics of business development in the EU area, innovations and innovation policies. Mr. Fil'a is also a director of the Slovak Business Agency branch in Nitra.

ORCID ID: 0000-0001-7655-1229

Make your research more visible, join the Twitter account of ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES: @Entrepr69728810

Copyright © 2022 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access