

Position of the Slovak Republic in Selected Innovation Rankings

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Abstract: According to modern economic theories, new technologies and knowledge are the main source of economic growth. Similarly, many surveys confirm that countries that can develop commercially applicable innovations are the winners in international competition. The aim of the contribution is to compare the innovation performance of the Slovak Republic using the Global Innovation Index and the Community Innovation Survey. The basic method used in the processing of the issue is descriptive statistics and quantitative comparative analysis. According to the Global Innovation Index, Slovakia significantly worsened in 2022 compared to the previous assessment and has achieved worse results than expected. According to the Community Innovation Survey, the Slovak Republic is among the countries whose companies innovate significantly less than the average of the European Union. The CIS survey also showed that, compared to the EU average, Slovakia is below the average in categories such as shares of innovative companies, shares of companies that invest in innovations and shares of companies that use new technologies. However, it achieves above-average results in the categories of cooperation between companies and institutions in the field of R&D. Our recommendation is to increase the proportion of total expenditure incurred for research and development (and thus for innovation) in both the public and private sectors.

Key Words: innovation performance, the Global Innovation Index, the Community Innovation Survey.

1. INTRODUCTION

Innovation is an important driver of economic progress that benefits consumers, businesses and the economy as a whole. Since innovations fundamentally affect macroeconomic environment, it is important for every country to monitor their development and recognize the economic and social conditions necessary for their creation and support. In this regard, the need to measure the innovation performance of the economy is gaining importance.

The aim of the contribution is to compare the innovation performance of Slovakia using the Global Innovation Index (GII) and the Community Innovation Survey (CIS).

The choice of these two surveys is not random. The Global Innovation Index is a recognized measure of innovation activity at the global level, and its results are often used in decisions about investments in research and development (R&D) and in the creation of innovation support policies. The innovative behavior of enterprises plays a central role in shaping of innovation performance at the sectoral and national level. Since its first launch, the Community Innovation Survey has been a source of information for business analysts and policy makers by focusing on a wide range of aspects of the innovation process carried out by European businesses.

According to both indices, the innovation performance of the Slovak Republic is weak and requires improvement. To improve the current

situation, the author suggests to increase R&D expenditure as R&D is the main driver of innovation.

2. LITERATURE REVIEW

Compared to other policies that have already been implemented at national or regional levels, innovation policies are rather a new issue (Halásková, M. and Halasková, R., 2015). Moreover, there have not been many empirical studies realized in Slovakia yet. Ivanová and Masárová (2018) evaluated the innovation performance of regions of the Visegrad Group with an emphasis on human capital. According to their findings, the best values in innovation performance within the V4 countries are recorded in Bratislava region and Prague region, where the scientific potential of regions is concentrated.

Kučera and Fířa (2022) proved a significant interdependence between R&D expenditure, innovation performance and level of economic development of the EU countries. Higher R&D expenditures are a basic precondition for faster economic growth which is basically represented by GDP per capita. Technological progress influences GDP and dynamic growth is not possible without innovation.

The contribution continues in evaluation of innovation performance of the Slovak republic which the author presented in 2021 (Belanová, 2021). The European Innovation Scoreboard (EIS) 2021 and the Regional Innovation Scoreboard (RIS) 2021 were used. According to the findings, the Slovak republic belonged to the group of Emerging Innovators with performance well below the EU

average. However, according to the Regional Innovation Scoreboard, Bratislavský kraj, a region in Slovakia, belonged to a group of Moderate Innovators. Slovakia’s strengths were in environmental sustainability, sales impacts and use of information technologies at that time. On the other hand, weaknesses include digital skills, enterprises providing ICT training, design applications, and sales of innovative products.

The author has started to deal with this issue already in 2018. In her survey (2018) she documented that the performance of Slovakia according to the EIS 2016 together with Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Portugal, and Spain is below that of the EU average. These countries are moderate innovators. However, the RIS 2016 revealed that Europe's most innovative regions are located in the most innovative countries, although regional innovative hubs exist in moderate innovator countries: Piemonte and Friuli-Venezia Giulia in Italy, País Vasco in Spain and Bratislavský kraj in Slovakia.

The motivation for this contribution was to continue in the topic, to see the development of innovation performance of the SR from the macro, as well as from micro perspective.

3. METHODOLOGY

The basic method used in the processing of the issue is descriptive statistics and quantitative comparative analysis. The main sources of information include the secondary data contained in the Global Innovation Index and the Community Innovation Survey.

The Global Innovation Index is an annual ranking of countries based on their success in innovation. This project was started by Professor Dutta in 2007 with several objectives. His motivation was precisely that innovations are important for economic progress and competitiveness not only for developing but also for developed economies. It is currently published by the World Intellectual Property Organization (WIPO). The index is calculated by a simple average of the scores in two subcategories, the Innovation Input Index and the Output Index. The Innovation Input Index includes 5 basic pillars – institutions, human capital, infrastructure, market sophistication and business sophistication. The Output Index includes only 2 basic categories, namely knowledge and technology and creative outputs. We list the categories of the Global innovation index in a more detail in Table 1.

Table 1: GII indicators

Global innovation index						
Input index					Output Index	
Institutions	Human capital and research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs
Political environment	Education /	ICTs	Credit	Knowledge workers	Knowledge creation	Intangible assets
Regulatory environment	Tertiary education /	General infrastructure	Investment	Innovation linkages	Knowledge impact	Creative goods and services
Business environment	R&D	Ecological sustainability	Trade, diversification, and market scale	Knowledge absorption	Knowledge diffusion	Online creativity

Source: The GII, WIPO (2022)

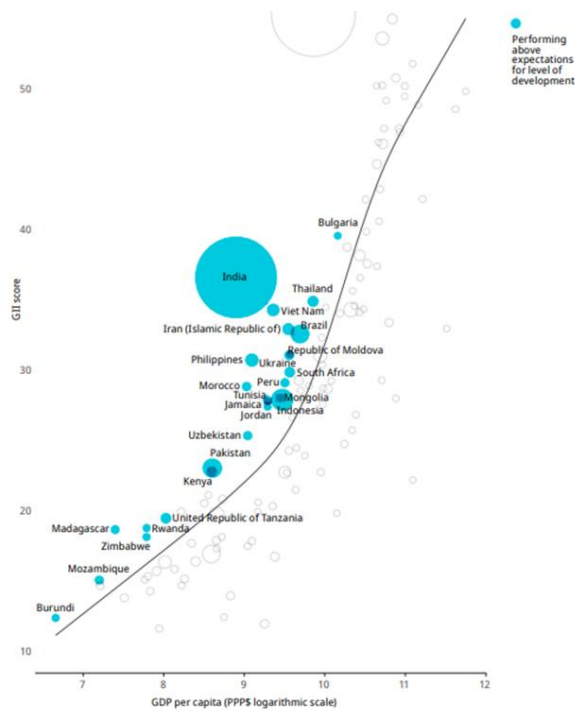
The CIS is a survey conducted within the European Union with the aim of obtaining data on the innovation performance of enterprises. The survey is conducted every two years and includes questions about research and development, innovation activity and innovation results, as well as factors that influence innovation activity.

4. RESULTS

In 2022, Switzerland became the most innovative country according to the GII for the seventh time in a row, closely followed by the USA, Sweden, the United Kingdom, and the Netherlands rounding out the top five. The Global Innovation Index tracks innovation trends against the backdrop of the ongoing COVID-19 pandemic. The report shows that on a global scale, research and development and other investments that drive global innovation activity continue to boom (WIPO, 2022).

Slovakia was ranked 46th out of 132 surveyed countries in the GII 2022. However, we achieved worse results than expected, which can be seen in Figure 1. It shows the relationship between income level (GDP per capita) and innovation performance (GII score). The trend line indicates the expected innovation performance by income level. Economies above the trend line are performing better than expected, and economies below are doing worse than expected.

Figure 1: The positive relationship between innovation and development



Source: GII database, WIPO (2022)

Note: Bubbles sized by population. The cubic spline trendline shows the expected levels of innovation performance at different levels of GDP per capita for all economies covered in the GII 2022.

Environmental performance, import of top technologies, high-tech production, export of top technologies and export of creative goods are considered to be Slovakia's strengths. Weaknesses include business policy and culture, low risk capital investments and gross capital formation.

As the innovative behavior of enterprises plays a central role in shaping of innovation performance at the sectoral and national level, we used the Community Innovation Survey to analyze the innovation performance of the SR from the micro perspective.

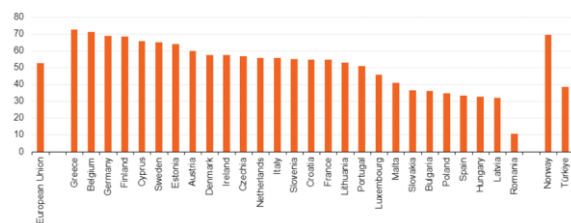
Innovation is essential for any company that wants to be successful in today's competitive economy. Creating an innovation space is therefore crucial for businesses that want to be successful on the market and improve their economic results. Business innovation refers to a wide range of activities that businesses carry out in order to implement innovation processes, develop new goods or services and bring them to market.

The CIS reports on two types of innovation – product innovation and business process innovation.

The CIS is coordinated by the European Commission and implemented in cooperation with national statistical offices in the Member States of the European Union. The survey is conducted through questionnaires that are sent to randomly selected companies. The results of the survey are then used to create innovation support policies within the EU. The survey provides information on various aspects of innovation activity in enterprises, including investments in research and development, use of new technologies, cooperation with other enterprises and research institutions, innovative results and obstacles to innovation activity. This data is then used to assess the level of innovation performance of companies and countries in the EU.

According to the CIS 2020, in the reference period 2018-2020, more than half of all enterprises in the EU Member States reported some form of innovation activity (52.7%). Figure 2 shows the share of innovative enterprises by individual country. Among the EU Member States, the highest proportion of innovative enterprises was recorded in Greece with a share of 72.6% of all enterprises, followed by Belgium (71.3%), Germany (68.8%) and Finland (68.7%). Other countries whose share of enterprises with innovation activities was over 60% are Cyprus, Sweden and Estonia. With its 36.6%, Slovakia ranked 21st out of 27 countries, which is a shift of up to 4 places compared to 2018, when we ranked 25th. Despite this fact, Slovakia still has a lot of areas for improvement. Similar results to Slovakia were achieved by Bulgaria, Poland, Spain and Hungary. The lowest level of innovation activity was recorded in Romania (10.7%).

Figure 2: Share of innovative businesses 2018 – 2020 (in %)

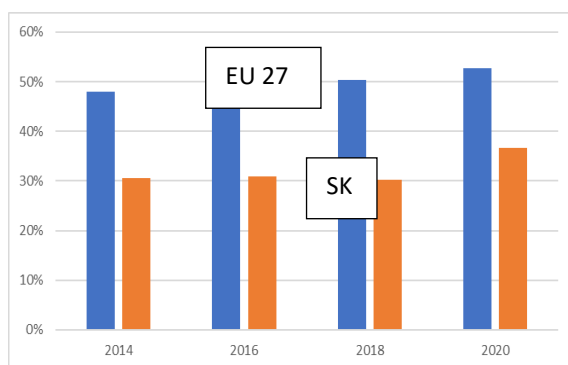


Source: Eurostat (2022)

As shown in Figure 3, since 2014, Slovak companies have been gradually improving their innovation activity, except for 2018, when the innovation performance of companies fell from 31% to 30.2% compared to 2016. Despite this, Slovakia is still

among the countries with insufficient innovation activity in SMEs. In 2020, every third company in Slovakia was innovative (36.6%), while in the EU-27 it is every second company that implements innovation activities in their business. (52.7%). The CIS survey also showed that, compared to the EU average, Slovakia is below the average in categories such as shares of innovative companies, shares of companies that invest in innovations and shares of companies that use new technologies. However, it achieves above-average results in the categories of cooperation between companies and institutions in the field of R&D.

Figure 3: Share of innovative businesses in EU 27 vs. SR



Source: own processing according to Eurostat data

Interestingly, according to the CIS, larger companies are more innovative.

The breakdown of companies by size in terms of product and business process innovation showed that large companies with more than 250 employees innovated more often (74%) than medium-sized companies with 50 to 249 employees (60%).

However, innovation activity is generally attributed to SMEs. Newly established SMEs often create new jobs and arise as a means of commercializing new technologies and innovative ideas. They are often the carriers of positive structural changes in the economy, increase productivity and help economic growth. There are many small and medium-sized, fast-growing businesses with the potential to become a leader in a certain area of business, in which many new ideas are born. However, these ideas can hardly be transformed into new products, patents, competitive advantages or jobs without effective support.

The European Commission's annual report on small and medium-sized enterprises also confirms that there is a positive relationship between innovation in SMEs and the ability of SMEs to generate growth and employment. Countries with an above-average

share of high- to medium-high-technology SMEs achieved a higher average growth in the gross value added of SMEs. The employment rate in countries with an above-average share of knowledge-intensive services in SMEs is also visibly higher than in other EU countries (EC, 2020).

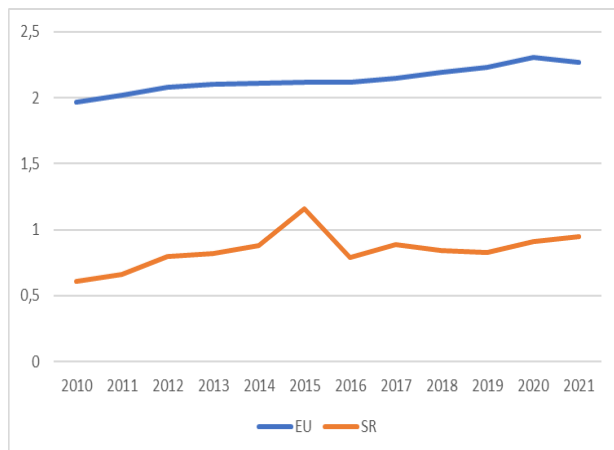
The Statistical Office of the Slovak Republic (SOSR) states that the highest rate of innovation activities is recorded by companies operating in the industry and services sector. It is mainly the automotive industry and the information and communication technology sector. On the contrary, enterprises in the construction sector show the lowest innovation activity. The innovation activity of SMEs lags significantly behind the innovation activity of large - often multinational companies (SOSR, 2022).

The difference in the approach of European and Slovak SMEs to innovation is significant. European SMEs invest much more in qualified people, introduce product and process innovations, improve marketing and dedicate a considerable amount of funds to R&D. Slovak SMEs have significant shortcomings in the introduction of business innovations arising not only from the internal but also from the external environment. In addition to investing in innovation only to a limited extent, they also pay insufficient attention to new trends in the field of digitalization. The low level of innovation of Slovak SMEs is also a result of the undersized education system or low remuneration, which is manifested by the lack or departure of qualified experts. The low rate of qualified people is caused by the poor quality of the education system or according to many experts, due to the weak connection between study and practice.

Regarding the investments into R&D, Slovakia has significantly lagged behind the average for a long time, which has a long-term negative impact not only on the economic competitiveness of the Republic, but also on its overall innovation performance.

Figure 4 shows the development of expenditure on R&D in the period 2010-2021 for the Slovak Republic and the EU.

Figure 4: Development of expenditure on R&D in the period 2010-2021 for the Slovak Republic and the EU



Source: own processing according to EUROSTAT data

As Figure 4 depicts, the European average of spending on R&D is slightly above 2% of GDP, while the Slovak Republic does not even reach 1% of GDP.

According to Fiľa, M. and Kučera, J. (2015), there is a clear positive correlation between investments into research and development and innovation performance, and thus a higher % of R&D expenditure logically also increases a country's innovation performance especially in the medium and long term.

In this regard, it sounds positively that Slovakia accepted new Strategy for research, development and innovation 2030. Along with private investment in research, the goal is to get the country's R&D intensity – the total R&D expenditure as a percentage of a country's gross domestic product – up to the EU average of 2%.

Moreover, as in the case of the EU, considerable fragmentation can be observed in the introduction of innovations in Slovakia. The majority of innovative SMEs are concentrated in the Bratislava region, which is considered the most innovative region of the Slovak Republic (according to RIS 2023, resp. Ivanová and Masárová 2018). As Figure 5 reveals, Bratislava region (SK01), the capital region, is a Moderate Innovator +, the other three regions are Emerging Innovators +.

Figure 5: Position of SR's regions within regional performance groups

Source: own processing according to RIS 2023

5. CONCLUSION

Innovations are understood as an important assumption for increasing the competitiveness of

the economy. Resulting from the conditions, efficiency and other aspects some countries are more, some less successful in innovation activity. In this regard, it makes sense to rank their innovation performance.

According to the Global Innovation Index 2022, Slovakia significantly worsened in 2022 compared to the previous assessment and has achieved worse results than expected. Environmental performance, import of top technologies, high-tech production, export of top technologies and export of creative goods are considered to be Slovakia's strengths. Weaknesses include business policy and culture, low risk capital investments and gross capital formation.

Investing into R&D is an investment in the future of Europe. Most companies operating in the territory of the European Union are aware of this fact. According to the CIS 2020, the most innovations in the field of products and business processes were implemented by companies in Greece, the least in Romania. At the same time, it was also registered that larger companies innovate more intensively than smaller ones. To improve the current situation in innovation performance of the SR, the author suggests to increase R&D expenditure.

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