

INNOVATION PERFORMANCE OF THE SLOVAK REPUBLIC

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Abstract. The paper introduces an existing system of innovation performance measurement in European Union. The paper aims to analyse the innovation performance and to present the position of the Slovak Republic in European Union. It points out the most significant barriers in innovative performance growth among Slovak SMEs. The analysis is carried on data retrieved from Eurostat and the Statistical Office of the Slovak Republic, as well as from empirical research. Consequently the paper presents conclusions and recommendations for stimulating the innovation performance growth in the Slovak Republic.

Key words: innovations, innovation performance, Summary Innovation Index, barriers in innovations.

Introduction

The globalization brought many changes in the world economy and for the Slovak Republic it is not possible to be successful without a major utilization of innovations. Innovations are influencing every activity in human life. They do not only affect life today, but also future opportunities and living conditions (Maital, Seshadri 2012). Innovations are the accompaniment of business. They represents one of the best tools how to maintain and enhance the economic development of the state and improve the competitiveness of enterprises in local and global business environment. Their essential feature is an implementation of new value-added to products, technologies or services on the market. Innovations are the driving force to keep businesses competitiveness.

The founder of innovation, as a term, could be considered J.A. Schumpeter, who defined an innovation in 20th century as an implementation of production of new product, entering of new market, implementation of new production process or new work organization (Čimo, Mariáš 1999). Definition according to European Union, which is implemented also in Slovak Innovation Strategy defines a innovation as a reproduction and enlargement of product and service portfolios, markets, creation of new production, distribution and supply methods, implementation of changes in management, labour conditions and labour organization and all improvements in work force qualification (Franková 2011).

Today, more than ever, it is necessary that a modern economy is based on knowledge and “innovative open” society. The innovation performance of enterprises is primarily determined by their own innovative activities and the interaction with their innovation-related environment. This environment typically differs among countries (Hinlopen 2010).

The importance of SMEs in the innovation development of the country is discussed quite long and often. It is generally accepted view of their great importance in improving innovation performance (Bobáková 2015).

1. Measurement of innovation performance in the European Union

Measurement of performance of a country includes a lot of potential factors, which are influencing results. One of the most important factor is innovation activity of enterprises (Kovaľová 2016; Dragnić 2013). There are several indicators, which could be used for measuring of position and performance of country (region) in innovation activities (Innovation Union Scoreboard, Global Innovation Index etc.) and innovation performance of enterprise (Innobarometer, Community Innovation Survey etc.). Indicators orientated on measuring of countries’ innovation performance include also measures focused on enterprises’ innovation activities.

Innovation Union Scoreboard

Innovation Union Scoreboard measurement framework is using three main types of indicators and eight innovation dimensions, capturing in total 25 different indicators. The first indicator called “Enablers” capture the main drivers of innovation performance external to the enterprise and cover 3 innovation dimensions: Human resources, Open, excellent and attractive research systems as well as Finance and support. The second indicator “Firm activities” capture the innovation efforts at the level of the enterprises, which are grouped in three innovation dimensions: Enterprise investments, Linkages & entrepreneurship and Intellectual assets. The third indicator “Output” covers the effects of enterprises’ innovation activities in two innovation dimensions: Innovators and Economic effects of innovations. Consequently, the EU Member States are divided

into four groups according to their innovation performance. The first group of Innovation leaders includes Member States in which the innovation performance is well above that of the EU, i.e. more than 20% above the EU average. The second group of Innovation followers includes Member States with a performance close to that of the EU average i.e. less than 20% above or more than 90% of the EU average. The third group of Moderate innovators includes Member States where the innovation performance is below that of the EU average at relative performance rates between 50% and 90% of the EU average. The fourth group of the modest innovators includes Member States that show an innovation performance level well below that of the EU average, i.e. less than 50% of the EU average (European Commission 2015).

Summary Innovation Index compares and ranks the EU Member States and describes the innovation performance. The SII also enables to compare the countries according to selected group of criteria.

The Community Innovation Survey

The Community Innovation Survey (CIS) is a survey of innovation activity in enterprises. The harmonised survey is designed to provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as the objectives, the sources of information, the public funding or the expenditures. The CIS provides statistics broken down by countries, type of innovators, economic activities and size classes. The survey is currently carried out every two years across the European Union, some European Free Trade Association (EFTA) countries and EU candidate countries. In order to ensure comparability across countries, Eurostat, in close cooperation with the countries, has developed a standard core questionnaire starting with the CIS3 data collection, along with an accompanying set of definitions and methodological recommendations (Eurostat 2015).

Innobarometer

Innobarometer is aimed at capturing the main behaviours and trends of EU enterprises as far as innovation related activities are concerned. The research is carried out in the 28 EU Member States, as well as in Switzerland and the United States. It was designed to collect information on the profiles of innovative companies, to measure the impact of innovations on turnover and the proportion of turnover invested in innovation activities, to explore barriers to commercialisation, as well as to identify the areas where public funding could best support innovation (Innobarometer 2015 – The innovation trends at EU enterprises 2015).

The Innobarometer survey has been carried out irregularly by TNS Political & Social network since 2005. The results are presented according to surveyed

areas, not by particular countries. It means, the study presents profiles of innovative enterprises, common problems (barriers) of innovations and other areas according to all respondents. Only main features are highlighted also by the countries.

Slovak statistics on innovations

National statistics about innovation activities in the Slovak Republic are summarized in survey, which is realized by the Statistical Office of the Slovak Republic. Till now, there were several surveys, the first during the year 1999-2001 and the last during the years 2010-2012 (published in 2014) (Statistical Office of the Slovak Republic 2015). In 2016 we expect another survey about innovation activities in Slovakia during the years 2012-2014. The structure and methodology for collecting the information is harmonized within the European Union, so datasets could be easily passed to the Eurostat. Slovak statistics contains no international comparison to EU member states.

Table 1. Share of enterprises with innovation activity in Slovakia in percent

Indicator	1999-2001	2004-2006	2008-2010	2010-2012
Share of enterprises with innovations	19.47	22.7	35.5	34.2
Small enterprises	15.06	17.38	29.0	29.2
Medium enterprises	24.36	31.76	42.5	40.8
Large enterprises	46.84	56.61	65.1	61.5

Source: Based on the data of Statistical Office of the Slovak Republic.

Table 1 presents innovation performance of Slovak SMEs from 1999-2012. We can see an increase in number of enterprises, which performed at least one innovation during this period. The highest share of innovative enterprises was during the period of 2010-2012. Then there was a decrease, which was typical also for most of EU countries. In the EU just under half (48.9%) of enterprises reported innovation activity during the period 2010-2012. The proportion of innovative enterprises in the EU dropped in 2010-2012 compared with both 2006-2008 (51.5% innovative enterprises) and the peak recorded in 2008-2010 (52.8%).

By focusing on the size of enterprises, we can conclude, that the bigger was the enterprise, the more likely it was to realize innovation activity during the observed period.

Global Innovation Index

If we exceed the borders of the European Union, we must mention the Global Innovation Index (GII). Since 2007, the GII Report consists of a ranking of world economies' innovation capabilities and results. The GII includes indicators that go beyond the traditional measures of innovation such as the level of research and development. The Global Innovation Index relies on two sub-in-

dices, the Innovation Input Sub-Index and the Innovation Output Sub-Index, each built around pillars.

Five input pillars capture elements of the national economy that enable innovative activities: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. Two output pillars capture actual evidence of innovation outputs: (6) Knowledge and technology outputs and (7) Creative outputs. Each pillar is divided into sub-pillars and each sub-pillar is composed of individual indicators (79 in total) (Cornell University, INSEAD, WIPO 2015).

In 2015 the Slovakia was ranked on 36th place among 141 evaluated countries, Hungary placed as 35th country, the Czech Republic was on 24th place and Poland on 46th place. In comparison to year 2007, when the GII Global report was created for the first time, the position of Slovakia (35th place) and Hungary (36th place) was more or less the same. A progress could be observed by the Czech Republic (32nd place) and Poland (56th place) from 107 evaluated countries (Cornell University, INSEAD, WIPO 2015).

2. Methodology

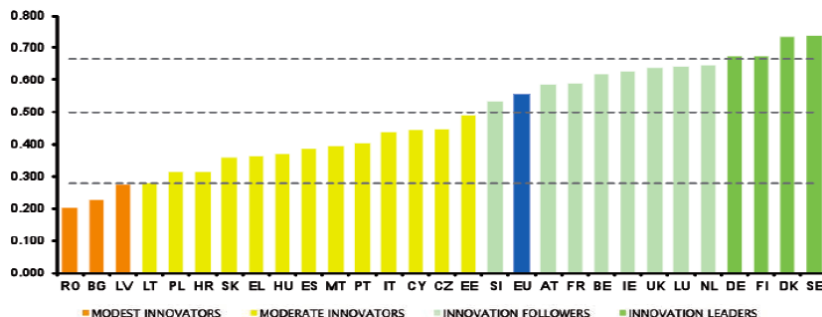
The aim of the paper is to analyse and to present a current position of the Slovak Republic in the European Union according to its innovation performance. The evaluation of Slovakia was done by portfolio of indicators, which are being used for measuring of the country innovation performance. The article is focused on evaluation of Slovak position according to Summary Innovation Index (SII), because the indicator ranks the EU countries and allows detailed analysis of their innovative performance. The sources of information were databases of Eurostat and the Statistical Office of the Slovak Republic. The paper presents results of empirical research realized in 2013-2014 among Slovak SMEs about the main barriers in their innovation activities. Research sample consisted of 140 Slovak SMEs, which were asked to identify and evaluate the importance of barriers by questionnaire. To fulfil the paper goal we formulated a set of research questions: What is an innovation performance of Slovakia in comparison to EU member states? What are the main barriers of Slovak SMEs in innovation activities?

3. Position of Slovakia in the European Union according to innovation performance

For describing the innovation performance of the Slovak Republic we have chosen the Summary Innovation Index (SII). It is a composite indicator obtained by an appropriate aggregation of the 25 indicators. Figure 1 shows the performance results for all EU member states in year 2014. The position of the Slovak republic (SK) in 2014 was in the group of moderate innovators, which included EU member states, where the innovation performance was below that

of the European Union average at relative performance rates between 50% and 90% of the European Union.

Figure 1. EU member states Innovation performance in 2014

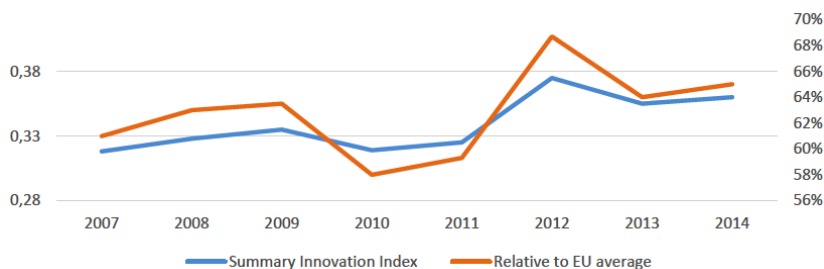


Source: Data extracted from Innovation Union Scoreboard 2015.

The ranking of the Slovak Republic according to SII indicator has been measured since the year 2000. At the beginning the Slovakia was in the group of catching-up countries (countries with the lowest innovation performance), later in 2009, the Slovakia moved to group of moderate innovators. In 2014 Slovakia was on the 10th place out of 13 countries in this group.

The next figure presents the development of innovation performance of the Slovak Republic from 2007 to 2014.

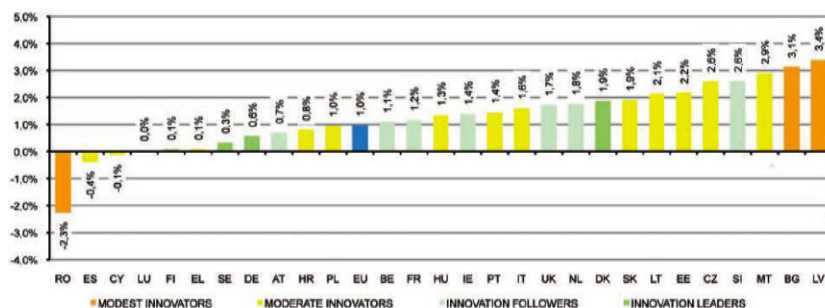
Figure 2. Development of SII of Slovakia during years 2007-2014



Source: Data extracted from Innovation Union Scoreboard 2015.

The Slovak innovation performance, measured by SII, has increased between 2007 and 2014, but declined in 2010 and in 2013 (Figure 2). The performance relative to the EU has had more fluctuations, but over time has increased significantly. Performance relative to the EU reached a peak in 2012 at 69 % of the EU average, but fell to 64% in 2014. The exceptional growth of innovation performance in Slovakia could be confirmed also by the eight position, among EU 28 member states, in rate of innovation performance growth in period of 2007-2014 (Figure 3).

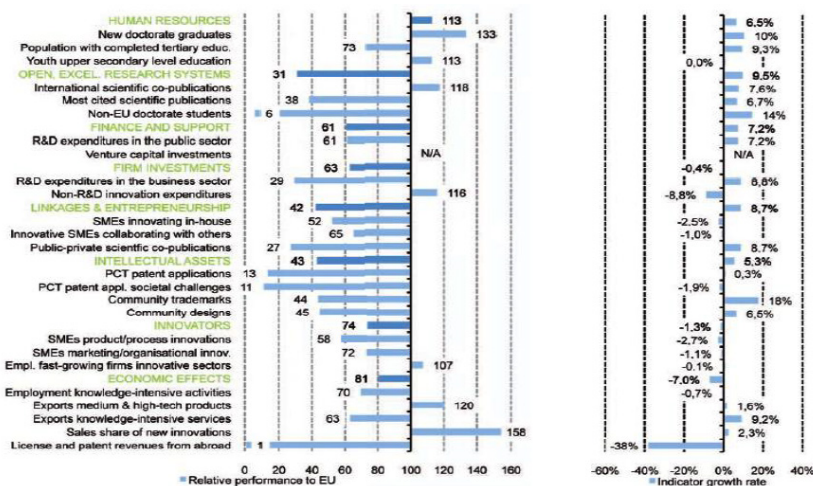
Figure 3. The rate of innovation performance growth of EU countries during 2007-2014



Source: Data extracted from Innovation Union Scoreboard 2015.

As showed in Figure 4, in 2014 the Slovakia performed below the EU average for all observed dimensions, except Human resources, and also for most indicators. Human resources dimension was the only one, where the Slovakia had two out of three indicators better than EU average.

Figure 4. Innovation performance measured by SII in 2014



Source: Data extracted from Innovation Union Scoreboard 2015.

Note: 100 equals to EU SII average in 2014, numbers in %.

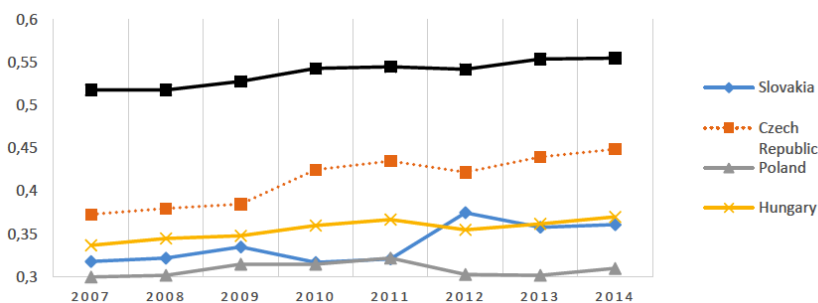
The Slovak second strong dimension was the Economic effects from innovations, where Slovakia had two out of five indicators better than EU average. Slovak strengths were in indicators – Sales share of new innovations (158% of EU average) and New doctorate graduates (133% of EU average). Slovak weaknesses were in indicators – License and patent revenues from abroad (only

1% from EU average), Non-EU doctorate students (6% from EU average), PCT patent applications in societal challenges (11% from EU average) and PCT patent applications (13% from EU average). In comparison to year 2013 the overall Slovak performance in 2014 in most dimensions and most indicators has improved.

The right part of the figure 4 presents the growth rate of particular indicators in 2014. Most of indicators were increased in 2014 (19 out of 25 indicators) in comparison to 2013. The highest growth in terms of indicators was observed for Community trademarks (18%) and Non-EU doctorate students (14%). However, neither the strong growth in these indicators improved the performance significantly. Unfortunately, a very strong decline in performance can be observed in License and patent revenues from abroad (- 38%), while this indicator reached only 1% from EU average. The second biggest decline was for Non-R&D innovation expenditures (- 8.8%). Despite of this, the indicator remained by 16 % over the EU average.

For comparison of innovation performance of V4 countries we selected the SII within the period of 2007-2014. The Fig. 5 shows, that the position and innovation performance of Slovakia was not very optimistic.

Figure 5. Development of SII in V4 countries



Source: Data extracted from Innovation Union Scoreboard 2015.

The best innovation performance had the Czech Republic, which was over the other countries for all the time. The second place belonged to Hungary, the third was Slovakia and Poland was the fourth. In 2012 Slovakia exceeded Hungary and since this year their development of innovation performance was quite similar. Unfortunately, in comparison to EU SII average, the performance of all V4 countries was very moderate. The gap against the EU-28 SII average value remained for Slovakia and other V4 countries, during the observed period, about the same.

The detailed analysis of particular SII dimensions and indicators in 2014 confirmed, that the Czech Republic was over the EU average in 10 out of 25 in-

dicators (4 out of 8 dimensions had the value over 90% of EU average – human resources, firms investments, linkages and entrepreneurship and innovators. Slovakia, Poland and Hungary was in only one dimension over 90% of EU average. In Hungary it was economic effects of innovations (Hungary had 6 out of 25 indicators better than EU average). In Poland it was dimension of human resources (Poland had 5 out of 25 indicators better than EU average). In Slovakia it was human resources dimension (113%) and it had 7 out of 25 indicators better than EU average.

4. Barriers to innovation activities in Slovakia

According to Statistical office of the Slovak Republic, there were innovators in 34.2% of SMEs, while the average in EU was almost 49%. Although the share of Slovak innovative SMEs was quite small, their share on total sales (70%) and total employment (60%) was very significant. It means, that economic importance of enterprises with innovation activity is higher than their amount and these enterprises significantly influence the Slovak economy, Low share of innovative enterprises in Slovakia is a consequence of innovation barriers. Innovation barriers in Slovak enterprises are mostly cost, market and knowledge factors (Fabová 2013).

During the years 2013-2014 we have realized an empirical research among Slovak SMEs. We interviewed 140 small and medium sized enterprises. One of the goals was to identify the main barriers of innovation activities among enterprises. Results in table 2 present that SMEs considered the lack of financial sources, the system of state support, inappropriate legislation, poor connection of enterprises with schools, high costs and complicated administrative environment as the biggest barriers to innovations. Respondents expressed strong dissatisfaction with government support system and its complexity. We can conclude that this is one of the biggest barriers for innovative enterprises in Slovakia. On the other hand, the lowest barrier was the lack of information for performing of innovation activities.

Table 2. Barriers to innovations in Slovak SMEs

	The importance of barrier				
	1 - the lowest	2 - lower	3 - medium	4 - higher	5 - the highest
Lack of financial sources	2.86 %	14.29 %	18.57 %	17.14 %	47.14 %
System of government support for innovations	14.93 %	8.96 %	14.93 %	17.91 %	43.28%
Lack of information	18.46 %	27.69 %	26.15 %	20.00 %	7.69 %
Lack of time for innovations	15.94 %	23.19 %	30.43 %	14.49 %	15.94 %
Inappropriate legislation	9.09 %	9.09 %	22.73 %	18.18 %	40.91 %

Low connection among schools and enterprises	14.71 %	16.18 %	19.12 %	19.12 %	30.88 %
Insufficiently qualified labour force	10.00 %	17.14 %	28.57 %	21.43 %	22.86 %
Low performance of Slovak economy	6.25 %	10.94 %	23.44 %	34.38 %	25.00 %
Low purchase power of customers	5.88 %	8.82 %	27.94 %	29.41 %	27.94 %
High costs for innovations	2.90 %	10.14 %	28.99 %	21.74 %	36.23 %
Complexity of administration	7.58 %	6.06 %	19.70 %	22.73 %	43.94 %
Uncertain demand for innovations	5.80 %	13.04 %	33.33 %	20.29 %	27.54 %

Another research conducted by the authors of Innobarometer (2015) states that the most significant barrier for Slovak enterprises, since the year 2012, was the dominant position of established competitors (63% of enterprises), lack of financial resources (67%) and costs or complexity of meeting standards or regulations (68% respondents). Another important barrier was the low potential demand for innovations (56%). The smallest barrier was the difficulty in maintaining intellectual property rights (35%).

5. Conclusions and recommendations

According to presented information and analysed data, the innovation performance of Slovakia could be described as relatively stable during the period of eight years (2007-2014). Unfortunately, stable in this case means that the performance was developing similarly as the performance of other countries in EU. Although there was one dimension and indicator, where the progress of Slovakia was outstanding (Human resources, Sale share on new innovations), in most dimensions the development was slower. We compared the position of Slovakia among the closest competitor regions (V4 countries). Slovakia overtook Poland and was very close to Hungary, but still was lagging from the Czech Republic. The dominance of the Czech Republic was significant according to most of 25 indicators included in SII. Although the Czech Republic had no dominantly developed dimension (the value of dimension over EU average), all dimensions were developed proportionally and half of them was very close to EU average. The structure of SII in Hungary, Poland and Slovakia was different, because these countries had one dominant dimension and other were very underdeveloped.

Slovakia has a small, underfunded and centrally managed system of research and innovation. The Act no. 185/2009 Law on R&D Stimulus concentrates on support for basic research, applied research and experimental development. The support is given on a case-by-case basis and depends on resources allocated from the State Budget. The overall amount of support from the State budget is too low to generate a significant impact on innovation development (Baláz

2015). Slovak gross expenditure on research and development was 0.89% of GDP in 2014, in 2012 it was 0.81% of GDP. Especially investment from Slovak businesses into research and development system were extremely low. The government should focus on motivation for businesses to increase the amount of money, which they invest into innovations. The most important barriers to innovations (lack of financial sources and complexity of government support system), identified by empirical research, are still obstructing the SMEs' sector. The new indirect support tool for enterprises in Slovakia was introduced in 2015. The amendment of the Act no. 595/2003 Law on Income Tax set a tax relief for R&D performers. Tax relief can be claimed by any organisation performing R&D projects. Tax relief for R&D projects is likely to improve the framework conditions for the development of applied research and innovation in Slovakia. The tax relief is based on fact, that enterprises, which realized some kind of innovation or research activity during the year could deduct 125% of total costs and decrease the income tax base. Accepted are all costs spending on innovations, development, wages for researchers and also spending for cooperation with academic and research institutions orientated on innovations.

Slovak public investments in research and development were strongly supported by the EU structural funds. The question is, what will happen to research and innovation expenditures, when the structural funds from EU will be decreased or stopped?

The Slovak Government attempted to address structural challenges via a number of policy initiatives. The first government document on innovation was created as late as in 2005 (The Competitiveness Strategy – the Lisbon Strategy for Slovakia). The 2007 Innovation Strategy concentrated mostly on the implementation of policy measures from the Structural Funds (Baláž 2015). The 2013 RIS 3 document is a more complex document. It proposes specific policy measures aimed at increasing embeddedness and related variety of the key Slovak industries, reform of R&I governance; reform of public R&D performers; building foundations of excellent science and supporting innovations in SMEs. But there has been done no or minimal improvement in complexity of administration for SMEs, in some areas (low information linking among public institutions, bureaucracy and corruption in system of EU funds distribution), the situation is even worse.

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