



World Scientific News

WSN 89 (2017) 131-138

EISSN 2392-2192

Factors determining the position in the ranking of innovative countries

Paweł Stępień¹, Ireneusz Miciuła²

The Institute of Finance, Faculty of Economics and Management,
University of Szczecin, al. Pope John Paul II 22a, 70-453 Szczecin, Poland

^{1,2}E-mail address: pawel.stepien@wneiz.pl , ireneusz.miciula@usz.edu.pl

ABSTRACT

The aim of the article is to present a methodology for creating a ranking of innovative countries. The analysis of creating innovative indices involves specifying factors that determine the position of a particular country in terms of innovativeness. Knowing and evaluating factors determining innovation will allow to classify problems in measuring innovation activity and provide general recommendations for the development of innovation indicators.

Keywords: innovation, factors determining ranking of countries in terms of innovativeness, innovation indicators

1. INTRODUCTION

In the course of economic development of the world, there were changes in the importance of various determinants of development and innovative activity. It was J.A. Schumpeter who coined the term innovation. He describes innovation as the introduction of a new good – that is one with which consumers are not yet familiar – or a new quality of a good. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially. The opening of a new market, that is a market into which the particular branch

of manufacture of the country in question has not previously entered, whether or not this market has existed before. The conquest of a new source of supply or raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created. The carrying out of the new organization of any industry, like the creation of a monopoly position [13]. According to P.F. Drucker innovation is the specific instrument of entrepreneurship. The act that endows resources with a new capacity to create wealth [5].

According to the Oslo methodology, innovation is the implementation of a new or significantly improved product, service or process, including a marketing or organizational method, which redefines the way of working and relations between a company and its surroundings. In pragmatic terms, innovations are inventions and solutions which are economically viable and can be commercialized. In other words, innovation is new quality on the market which allows for performing particular tasks in a quicker, cheaper and more effective way. Currently innovation is treated as a manifestation of knowledge on products and services, which is why its development depends on the existence of a pro-innovative economic, social, cultural, formal and legal environment. This is why innovations can be considered in the context of results, i.e. as an effect of technical, social, economic, legal, cultural and organizational processes, or in the context of processes, i.e. as creative thinking processes leading to the application and use of improved solutions in technology, organization and social life. Innovation is a highly "burdened" term, both theoretically and empirically. Literature provides many definitions, which are not always precisely worded [10].

The ambiguity of this term stems mainly from the level of considerations, application of various research principles and translations from foreign languages. Definitions of innovation depend on a particular author's cultural context, paradigms, current fashion, customs and linguistic practices [11]. It should be noted, however, that these differences make it possible to extensively explore the complex structure of this concept. On the one hand, the variety of definitions complicates the practical application of the concept of innovation, but on the other hand, it provides a more thorough understanding of its complex nature [9]. It is therefore extremely important, but at the same time very complex, to measure and record innovation, where not all forms of innovation are included, and some innovation variables are uncertain and often unmeasurable as to the actual effects. International organizations, with this in mind, strive for changes in the measurement of innovation. On the one hand, this confirms the possibility of using imperfect measures to obfuscate the real state of the economy in terms of innovation and on the other hand points to the complexity of the discussed issue.

2. FACTORS DETERMINING POSITION OF THE INNOVATIVE COUNTRY

Today, innovation has become the main pillar of the development of economies, regions and entities. This is very important in the global market, the originality of the business carried out through innovation and technology transfer processes makes it possible to achieve competitive advantage [EU Innovation Union Scoreboard, (2017). http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en].

Innovativeness of the economy comprises the activity of enterprises, government and self-government authorities, research and development entities and institutions which make up the business environment. However, innovative economy is not only the sum total of the elements it is composed of, but it is a synergy resulting from broadly understood cooperation

based on developed network relations. This is why it is so difficult to create a universal indicator which would concern all factors which show innovativeness in various dimensions. The level of innovation is therefore measured with the use of various indices which undergo continuous development in parallel to the development of the surrounding innovative reality [7]. The increasing number of indicators and data taken into account is indicative of the need to develop a more accurate (i.e. closer to reality) assessment of the progress in the development of innovativeness in particular economies. The system of innovation indices in the European Union within the framework of the Innovation Union Scoreboard provides a general overview of 25 indices which can be created on the basis of a higher number of detailed indices [3].

Table 1. 25 indices used in the Innovation Union Scoreboard

No.	Index
	Research system
1.	Number of doctorate graduates up to the age of 34 per 1000 population
2.	Share (%) of population aged 30-34 having completed tertiary education
3.	Share (%) of population aged 20-24 having attained at least upper secondary education
4.	International scientific co-publications per million population
5.	Scientific publications among the top-10% most cited publications worldwide as % of total scientific publications of the country (Scopus database)
6.	Non-EU doctorate students as a % of all doctorate students
	Finance
7.	R&D expenditure in the public sector (% of GDP)
8.	Non-R&D innovation expenditures (% of turnover)
9.	R&D expenditure in the business sector (% of GDP)
10.	Venture capital (% of GDP)
	Entrepreneurship and relations
11.	SMEs innovating in-house (% of SMEs)

12.	Innovative SMEs collaborating with others (% of SMEs)
13.	Public-private co-publications per million population (Thomson Reuters database)
14.	SMEs introducing product or process innovations (% of SMEs)
15.	SMEs introducing marketing or organizational innovations (% of SMEs)
16.	Fast-growing enterprises
	Economic effects
17.	Employment in knowledge-intensive activities (% of total employment)
18.	Exports of medium and high technology products as a share of total product exports
19.	Knowledge-intensive services exports as % of total services exports
20.	Sales of new-to-market and new-to-firm innovations as % of turnover
21.	License and patent revenues from abroad as % of GDP
	Intellectual property
22.	International patent applications per billion GDP (in EUR)
23.	International patent applications in societal challenges per billion GDP (in EUR)
24.	Community trademarks per billion GDP (in EUR)
25.	Community designs per billion GDP (in EUR)

Source: own work based on: (EU Innovation Union Scoreboard, 2017).

A very similar methodology is used to determine the Global Innovation Index (GII), which comprises the majority of indicators presented in Table 1, the difference being that it complements certain general categories by assessing e.g. political stability and tax incentives and it is based on a higher number of detailed indices. GII makes a comparison based on a total of 84 criteria and the resulting value ranges between 0 and 100 [6]. Chart 1 shows the current ranking of innovative countries according to the GII 2017 index.

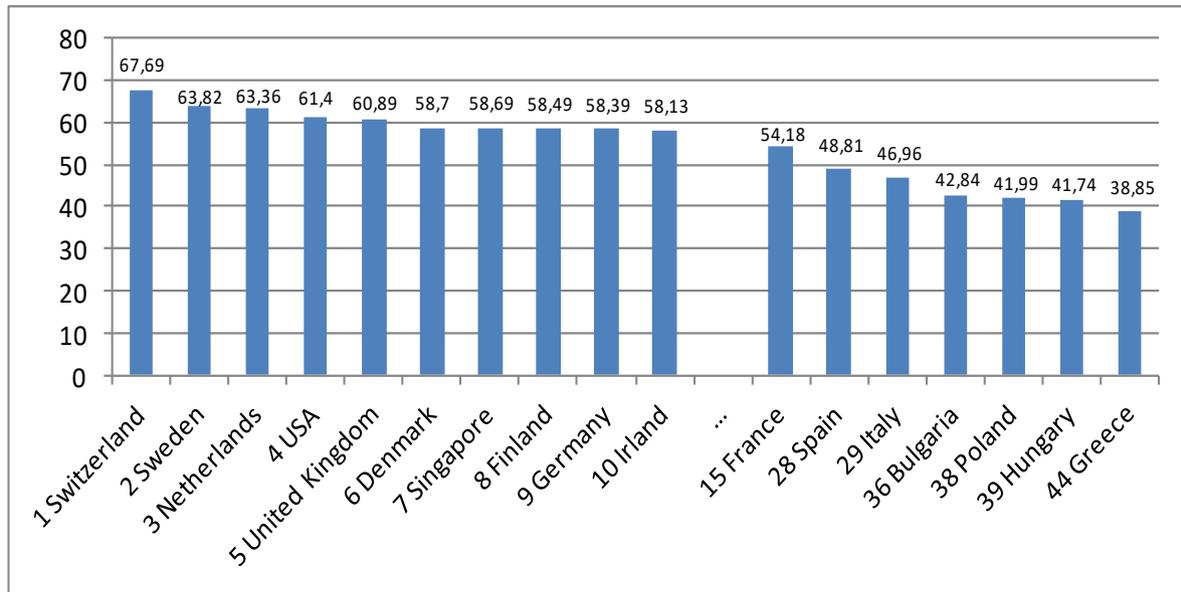


Fig. 1. Ranking of selected countries according to the Global Innovation Index in 2017
 Source: own work based on: (GII Report, 2017).

3. DEVELOPMENT DIRECTIONS OF INNOVATION INDICATORS

Literature and international organizations such as NESTA (National Endowment for Science, Technology and The Arts) emphasis that the methodology of creating innovation indices has a lot of drawbacks and it requires further improvement, also in order to catch up with the changing reality [12]. These indicators include main scientific and technological innovations, which is not sufficient in today's economy. Such a way of measuring innovativeness concerned the period when the linear model of innovation applied. Nowadays, however, the network model of innovation is the prevalent one. It has been pointed out that a significant part of innovations is created outside research and development units and claiming that scientific research and publications directly translate into innovations is a mistake. Moreover, traditional innovation indices prefer innovations in the form of new products and processes resulting from technological progress. Also, there has been a strong criticism of an indicator concerning the number of registered patents and scientific publications available only in a selected database. One of the reasons is that a large number of patents are not commercialized, moreover, patent protection against imitation is ineffective and it is necessary to incur considerable financial outlays. Indicators concerning scientific publications in particular databases are of subjective importance and so is a number of other indicators. Also, the amount of expenditures on innovations should correspond to the level of pay in a particular country because it leads to promoting capital-intensive economies and it is unclear how the amount of expenditures will translate into innovation effectiveness. This is why it has been suggested to put more emphasis on market-related effects of innovation and measurement of activities which contribute to their achievement. NESTA distinguishes four types of activities which are included by innovativeness indices, namely [7]:

- innovations which are similar to innovations included by traditional indices, but are still not taken into account in the measurement,
- innovations which are not based on scientific or technical advancement (e.g. such as those related to the organisation of enterprises),
- innovations which are the effect of a combination of already existing technologies and processes,
- local innovations of limited range, which are not included in the measurement of traditional indices.

Quantitative indices show an image of the economy as described by levels of various factors which influence innovativeness, but it is not exactly clear to what extent. This is why this image is a static one and does not include relations among particular factors in the context of cooperation, network relations and increase in social awareness. Current innovativeness in the economy based on knowledge goes beyond enterprises and science as the social sphere becomes a source of innovation, its co-author and its active consumer.

Needless to say, the phenomenon of innovativeness is a multi-dimensional one and it is difficult to describe due to a large number of unquantifiable features which cannot be perceived in quantitative categories [14]. However, the existing innovation indices are of qualitative nature. In today's economy innovations permeate all aspects of life, which is why the phenomenon of innovativeness needs qualitative indices to an ever increasing degree. We are now witnessing the development of fourth generation indices which will include qualitative and quantitative indicators. In addition, we need to introduce scales that correspond, for example, to the quality of the education system in a particular country.

This includes acquiring scientific titles where one country is not the same with getting this title in another country. Many indicators are also based on indicators that measure the amount of money spent without measuring their effectiveness and there is no comparison between the countries of the organization and the management system, for example registration of patents and technology implementation.

4. CONCLUSIONS

Factors that determine the state's position in terms of innovation need change and improvement. Many factors do not translate into real effects in the innovation of economies. The educational systems of countries are different in terms of quality, and the measures of innovation do not take into account these relationships, but merely measure the numerical values which, in reality, have different effects on real innovation. On the other hand, other factors only include for financial expenditures as a determinant factor in the resulting economies' innovations. While many elements could function well, with the exception of high financial resources, such as the patent system. This gives preference to countries where we have to deal with a high level of funding, often ineffective in relation to the results achieved. This also applies to obtaining information based on only one database based on the development of specific regions of the world.

In spite of the imperfections in the indexes of innovation, focus should be placed on the real improvement of the state of the economy. The analysis of the methods of creating innovative country rankings in the article also allows us to draw conclusions about recommendations for strategies and policies of developing countries. Innovation policy is one

of the elements of a country's economic policy. The existing innovation policy should support broadly understood innovations, diffusion of technology and active involvement in network cooperation, including among public institutions to create conditions which are conducive to innovation [15]. The most important recommendations following from the analysis in the article are the following:

- developing the ability to introduce innovations in the different areas, for example: technology, organisation, education, etc.
- shaping a formal and legal system which is conducive to innovation,
- shaping a favourable financing system and increasing outlays on R & D while striving to increase the efficiency of application and optimum use of innovation as the main factor determining social and economic growth and development,
- creating an atmosphere in which science, technology and economy become interconnected,
- creating a high absorption capacity of the economy,
- taking advantage of international cooperation and globalisation processes in the economy.

The above measures will affect the stimulation of the creation of innovations and their implementation and popularisation among consumers. Measures leading to an increase in innovativeness should involve the analysis of factors influencing the growth of currently used innovation indices and dynamic elements which make up what we call innovativeness. Therefore we are now witnessing the development of fourth generation indices which will include qualitative and quantitative indicators. This positively impacts competitiveness of the whole economy and the level of social wealth.

References

- [1] Adams R., Bessant J., Phelps, R., (2006). Innovation management measurement: a review. *International Journal of Management Reviews*, vol. 8, pp. 21-47
- [2] Arsneault S., (2000). Welfare Policy Innovation and Diffusion: Section 111 Waivers and the Federal System. *State and Local Government Review*, vol. 32(1), pp. 49-60
- [3] Crossan M., Apaydin, M., (2010). A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature. *Journal of Management Studies*, vol. 47, pp. 1154-1191
- [4] Damanpour F., Aravind D., (2012). Managerial Innovation: Conceptions, Processes, and Antecedents. *Journal of Management and Organization Review*, vol. 8, pp. 423-454
- [5] Drucker P. F., (2015). *Innovation and Entrepreneurship: Practice and Principles*. New edition, London: Routledge.
- [6] Garcia J. L. S, Ruiz S. P., (2017). Development of capabilities from the innovation of the perspective of poverty and disability. *Journal of Innovation & Knowledge* vol. 2, issue 2, pp. 74-86

- [7] Glor E. D., (2017). Studying factors affecting creation and fate of innovations and their organizations: a new instrument. *The Innovation Journal: the public sector innovation journal*, vol. 22(2), pp. 2-17
- [8] Gorodnichenko Y., Schnitzer M., (2013). Financial constraints and innovation: why poor countries don't catch up. *Journal of the European Economic Association*, vol. 11, pp. 1115-1152
- [9] Lööf H., Heshmati A., Asplund R., Nass S. V., (2001). Innovation and performance in manufacturing industries: A comparison of the Nordic countries. *Journal of Economics and Finance*, no. 457, pp. 2-39
- [10] Miciuła I., (2015). Financial innovations on the currency market as new instruments to risk management. *Journal of International Studies* vol. 8, no. 1, pp. 138-149
- [11] Ta-Wei P., Shiu-Wan H, Wen M.L., (2010). DEA performance measurement of the national innovation system in Asia and Europe. *Asia-Pacific Journal of Operational Research*, vol. 27, no. 3, pp. 369-392
- [12] Ulku H., (2007). R & D, innovation and growth: evidence from four manufacturing sectors in OECD countries. *Journal of Oxford Economic Papers*, vol. 59, issue 3, pp. 513-535
- [13] Volberda H. W., Van Den Bosch, F. A.J., Heij, C. V., (2013). Management Innovation: Management as Fertile Ground for Innovation. *Journal of European Management Review*, vol. 10, pp. 1-15
- [14] Walker R.M., Damanpour F., Devece C.A., (2011). Management innovation and organizational performance: the mediating effect of performance management. *Journal of Public Administration Research and Theory*, vol. 21, no. 2, pp. 367-386
- [15] Zduńczyk K., Blenkinsopp J., (2007). Do organizational factors support creativity and innovation in Polish firms? *European Journal of Innovation Management*, vol. 10, issue 1, pp. 25-40