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INNOVATION AS AN IMPERATIVE OF THE CONTEMPORARY ECONOMY: CASE OF POLAND

Summary: The paper presents the level of innovativeness of the Polish economy, identifies the changes occurring in this area and compares Poland to other economies, including the EU countries, in this respect. It also indicates that the current level of innovativeness is related to the fact that the Polish economy has fallen into the so-called middle income trap. The conclusion proposes solutions that can become a source of improvement a level of innovation in Polish economy.

The analysis of the data, aiming to determine the level of innovation in the Polish economy, was conducted based on the annual Global Innovation Index Report published for the years 2012-2015.

Keywords: innovation, Global Innovation Index (GII), middle income trap.

Introduction

Many developed countries, including the EU member states, acknowledge that the road to the modern economy, often referred to the knowledge economy (KE), can be built only on increased innovation. Innovation is a major source of competitiveness and plays a key role in stimulating economic growth and creating welfare in the long term.

Innovation is a broad term, present in all spheres of economic life and determined by a variety of factors. The increased innovation in the Polish economy corresponds with the priority of the EU development strategy, Europe 2020, which is smart, sustainable and inclusive growth. Poland has long been using the EU funds to support innovation in the economy, but the effects are rather poor.

Accordingly, an attempt might be worthwhile to determine how (not) innovative the Polish economy is, where to look for the causes of its current position, or whether the diagnosed level of its innovativeness means that Poland will end up among the countries stuck in the middle income trap.

The paper aims to present the current level of innovation in the Polish economy, identifies the changes occurring in this area and compares Poland to other economies, including the EU countries, in this respect. The study was conducted for the period comprising the years 2012-2015. The data used to present the position of the Polish economy in terms of its innovativeness came from the annual Global Innovation Index Reports.

1. The Role of Innovation in The Knowledge Economy

The concepts of innovation, innovativeness and an innovative economy are currently inseparable from the idea of the knowledge economy. In the early 1990s, management guru P. Drucker argued that the knowledge economy was an economic order in which knowledge, instead of labor, raw materials or capital, was a key resource. The knowledge economy, accordingly, is the social order in which social inequality based on knowledge is a major challenge and the system in which a government cannot solve social or economic problems [Drucker, 1994; 1999]. The knowledge economy is built on the creation, dissemination, and use of knowledge and information. This perspective turns knowledge into a product and it becomes the factor stimulating economic growth, creating wealth and boosting employment [OECD, 1999, p. 82].

One of the key drivers of the knowledge economy, in addition to education, ICT advancements, and the institutional and business environment, is innovation. In the most general terms, innovation is a change of something to something newer and more profitable (valuable) [Bał-Woźniak, 2012]. Different approaches to innovation are based on what this change involves, what the degree of novelty is, where the inspiration for changes comes from, or how the process of implementing changes develops (Table 1). Notably, a number of interdependencies exist between different types of innovation, listed in Table 1.

Table 1. Examples of innovation typologies

Distinguishing criteria	Specification
Subject of innovation	<ul style="list-style-type: none"> – product innovation – process innovation
Nature of processes undergoing change in a firm	<ul style="list-style-type: none"> – technological innovation – administrative/organizational innovation
Source	<ul style="list-style-type: none"> – technology push from a firm’s r&d department – market pull, i.e. marketing innovation, driven by a firm’s marketing and sales departments
Degree of novelty	<ul style="list-style-type: none"> – creative innovation – imitative innovation
Change orientation	<ul style="list-style-type: none"> – outward innovation (product innovation, marketing innovation) – inward innovation (process innovation, organisational innovation)
Degree of novelty and the course of an innovation process	<ul style="list-style-type: none"> – radical innovation – incremental innovation
Elements and relations within a system	<ul style="list-style-type: none"> – architectural innovation – modular innovation

Source: Based on: [Podręcznik Oslo, 2008; Grudzewski et al., 2010; Szymura-Tyc, 2015].

Innovativeness is a concept strongly related to innovations. In economic terms, innovativeness is defined as the ability to create new value that may be attributed to a number of entities (e.g. individuals, firms, countries) and relate to value delivered to a variety of stakeholders (e.g. customers, firms, regions, domestic economies). Innovativeness may be analyzed on the macro-economic level through the prism of the entire global economy, domestic economies, specific regions, sectors and industries. It may also be considered in micro-economic terms from the perspective of both for-profit and non-profit organizations (organizational innovativeness), their particular parts (e.g. management) and consumers (consumer innovativeness) [Szymura-Tyc, 2015, pp. 38-42].

Innovativeness, both the one of firms and the one of the economy, is a primary driver of their competitiveness and contributes to achieving competitive advantage. Broadly understood innovativeness is an inherent feature both of a firm and an economy, allowing them to operate, survive and grow in a complex, volatile and competitive environment [Nowacki, Staniewski, 2010]. Importantly, the ability to create innovation should not be one-off in nature, but rather systematic so that the advantage achieved could be renewable and sustainable in the long run.

2. Methodology of the Global Innovation Index

A number of approaches have emerged to measure innovation and compare economies in terms of their innovativeness. The most popular ones are the Innovation Union Scoreboard (IUS) and the Global Innovation Index (GII). Data on the level of innovation in an economy can also be collated from the analysis of particular indices of the Knowledge Assessment Methodology (KAM).

The paper presents the assessment of the innovativeness of the Polish economy as compared with the selected EU and other economies using the methodology of the Global Innovation Index (GII). The GII methodology was developed by Johnson Cornell University, INSEAD The Business School of the World and the World Intellectual Property Organization (WIPO). It is based on the assessment of individual indices comprised in seven main GII pillars: Institutions, Human capital and research, Infrastructure, Market sophistication, Business sophistication, Knowledge and technology outputs and Creative outputs [The Global Innovation Index, 2015]. Table 2 shows the scheme for determining GII. The GII methodology is based on the following elements:

- The Innovation Input Sub-Index – has five input pillars: Institutions, Human capital and research, Infrastructure, Market sophistication, Business sophistication. Enabler pillars define aspects of the environment conducive to innovation within an economy.
- The Innovation Output Sub-Index – innovation outputs are the results of innovative activities within the economy. This sub-index includes two pillars: Knowledge and technology outputs and Creative outputs.
- The overall GII score is the simple average of Input and Output Sub-Indices.
- The Innovation Efficiency Ratio is the ratio of the Output Sub-Index to the Input Sub-Index. This ratio shows how much innovation output a given country/economy is getting for its inputs.
- Each pillar is divided into three sub-pillars, each of which is composed of individual indicators, for a total of 79 indicators.

Moreover, the pool of particular indices is annually adjusted so that it can represent innovation-related achievements on a global scale. In order to calculate the aggregate GII and sub-indices, particular variables undergo the process of normalization¹.

¹ The normalization process involves assigning adequate values (ranging from 0 to 100) to 79 individual indices, based on the min-max method.

Table 2. Scheme of the Global Innovation Index

Main index	Sub-index	Pillar	Sub-pillar
1	2	3	4
Global Innovation Index (GII)	Innovation input	Institutions	Political environment
			Regulatory environment
			Business environment
		Human capital and research	Education
			Tertiary education
			Research & development
		Infrastructure	ICT
			General infrastructure
			Ecological sustainability
		Market Sophistication	Credit
			Investment
			Trade & competition
	Business Sophistication	Knowledge workers	
		Innovation linkages	
		Knowledge absorption	
Innovation output	Knowledge and technology outputs	Knowledge creation	
		Knowledge impact	
		Knowledge diffusion	
	Creative outputs	Intangible assets	
		Creative goods and services	
		Online creativity	

Source: Based on: [The Global Innovation Index Report, 2012].

3. The level of innovativeness of the global and Polish economy – general trends

In 2015, the GII model includes 141 countries which represent about 95% of the world’s population and over 98% of the world’s GDP. Both in 2012 and in 2015, the region leading in terms of the Global Innovation Index was Northern America (USA and Canada), Europe ranked second (39 countries), while South East Asia and Oceania, comprising 16 countries, ranked third (Figure 1). The countries of two regions – Sub-Saharan Africa (32 countries) and Central and Southern Asia (11 countries) – reported the lowest GII values.

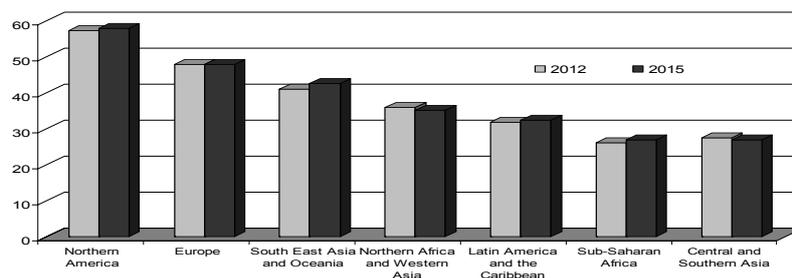


Figure 1. GII by world regions (2012, 2015)

Source: Based on: [The Global Innovation Index Report, 2012; 2015].

The top ten innovative countries comprised eight from Europe, one from North America and one from Asia. In the years 2012-2015, the following countries consistently ranked high: Switzerland, the United Kingdom, Sweden, the Netherlands, the USA, Finland, Singapore, Denmark (Table 3). They were joined by Ireland and Luxemburg in 2015, while Hong Kong (China) dropped from the top ten, although it ranked eighth in 2012, seven in 2013, and ten in 2014.

Table 3. Top ten countries in terms of GII, 2012-2015

Country/ Economy	Rank				2015			
	2012	2013	2014	2015	GII/ out of 141	Output Sub-Index	Input Sub-Index	Innovation Efficiency Ratio
Switzerland	1	1	1	1	68.30	68.60	68.00	1.01
United Kingdom	5	3	2	2	62.40	57.70	67.10	0.86
Sweden	2	2	3	3	62.40	57.80	67.00	0.86
Netherlands	4	4	5	4	61.60	58.90	64.20	0.92
USA	10	5	6	5	60.10	52.90	67.30	0.79
Finland	4	6	4	6	60.00	52.00	67.90	0.77
Singapore	3	8	7	7	59.40	46.60	72.10	0.65
Ireland	9	10	11	8	59.10	55.40	62.90	0.88
Luxemburg	11	12	9	9	59.00	59.00	59.00	1.00
Denmark	7	9	8	10	57.70	49.50	65.90	0.75

Source: Based on: [The Global Innovation Index Report, 2012; 2013, 2014; 2015].

Among the 25 most innovative countries there are 16 European countries (in addition to the listed above, Germany – ranking 12, Iceland – ranking 13) and six countries representing the region of South East Asia and Oceania (Hong Kong – 11, South Korea –14, New Zealand – 15, Australia – 17, Japan – 19). The Northern American countries also rank high (the USA already listed and Canada – 16) and so does Israel (22), representing the region of Northern Africa

and Western Asia. Top ranking representatives of Latin America and the Caribbean are Barbados (37) and Chile (42), while Mauritius (49) and South Africa (60) are the best contenders in the African continent.

Notably, in Switzerland the Innovation Efficiency Ratio went slightly above 1.0, while in the case of Luxemburg it was 1.0, which means that innovation output exceeded innovation input, comprising the conditions that build wide infrastructure conducive to innovation.

Analyzing the 2015 GII compilation for the 28 EU member countries, it can be argued that the Scandinavian countries, the United Kingdom, the Netherlands, Luxemburg, Denmark and Germany are the leaders of the ranking. Poland ranks 46 in the group of 141 countries, while among the EU countries it has the 27th position, outperforming only Romania (Figure 2).

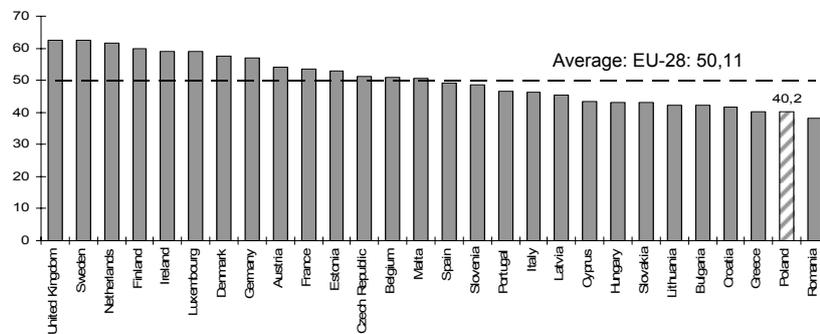


Figure 2. GII for EU-28, 2015

Source: Based on: [The Global Innovation Index Report, 2015].

It is worthwhile to note that the countries ranked high in GII-2015 went through the political transformation process in 1989 similar to what Poland experienced and, as Poland, joined the European Union in 2004. Estonia and the Czech Republic deserve particular recognition as their GII exceeds the average value of the EU-28.

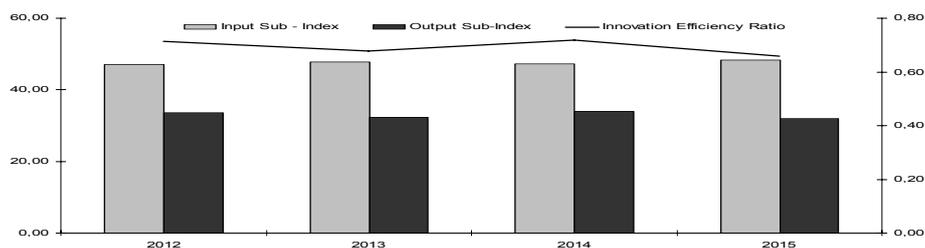
Poland is among these EU countries that have the lowest GII values. This situation, alas, has remained unchanged for a longer period of time (Table 4).

Poland's remote position in the GII ranking in the years 2012-2015, in particular as compared with the UE member states, stems from relatively low values of the Output Sub-Index and Input Sub-Index, which did not change significantly over the analyzed period of time. In the years 2012-2015, the average value of the Output Sub-Index amounted to 33.00, whereas the Input Sub-Index to 47.70 and, as a consequence, the Innovation Efficiency Ratio fluctuated around 0.70 (Figure 3).

Table 4. Poland's position in the GII ranking (2012-2015)

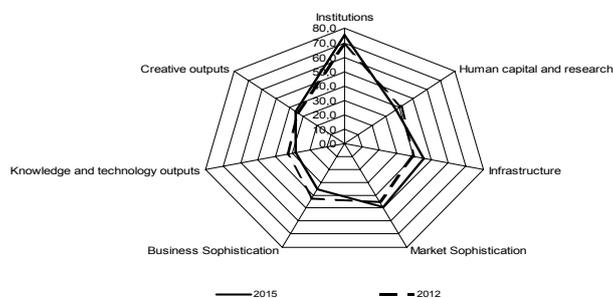
Year	Rank (globally)	Position in the EU	GII	Output Sub-Index	Input Sub-Index	Innovation Efficiency Ratio
2015/out of 141	46	27	40.20	31.90	48.40	0.66
2014/out of 143	45	26	40.60	34.00	47.30	0.72
2013/out of 142	49	27	40.10	32.40	47.80	0.68
2012/out of 141	44	25	40.40	33.60	47.10	0.71

Source: Based on: [The Global Innovation Index Report, 2012; 2013, 2014; 2015].

**Figure 3.** GII components for Poland (2012-2015)

Source: Based on: [The Global Innovation Index Report, 2012; 2013, 2014; 2015].

Apart from analyzing all 76 individual indices of the Global Innovation Index for Poland, it is worthwhile to consider composite values for the seven main pillars of the GII (Figure 4). In order to retain the clarity of the chart, only the values for the years 2012 and 2015 were taken into account.

**Figure 4.** Poland's position in the seven GII pillars (2012 and 2015)

Source: Based on: [The Global Innovation Index Report, 2012; 2015].

The analysis of the composite indices of the GII pillars for the years 2012 and 2015 shows that only in four areas positive changes occurred, while three areas suffered adverse effects. Improvements occurred in Infrastructure, Institu-

tions, Market Sophistication, and, to a lesser extent, in Creative outputs. In contrast, the situation deteriorated in Human capital and research as well as Knowledge and technology outputs, but the most negative change affected Business Sophistication.

Table 5. Strengths and weaknesses of Poland’s economy based on GII 2015

	Strengths	Weaknesses
Innovation input pillars	<ul style="list-style-type: none"> – Political stability; – PISA scales in reading, math & science; – Pupil-teacher ratio, secondary; – Tertiary enrolment; – Ease of crediting; – Royalty and license fee payments 	<ul style="list-style-type: none"> – Tertiary inbound mobility; – Venture capital deals/tr; – Innovation linkages; – JV- strategic alliance deals/tr; – FDI net inflows
Innovation output Pillars	<ul style="list-style-type: none"> – Citable documents H-index; – Cultural and creative services export; – Creative goods export; – Country – code TLDs/ th pop. 15-69 	<ul style="list-style-type: none"> – New businesses / th. pop. 15-64; – FDI net outflows; – ICTs and business model creation; – National feature films/ mn. pop. 15-64; – Printing and publishing output manufactures

Source: Based on: [The Global Innovation Index Report, 2015].

The detailed analysis of the indices making up the seven GII pillars reveals the strengths and weaknesses of the economies, including the economy of Poland (Table 5). The strengths include the areas where individual indices rank high in the GII ranking, whereas the weaknesses are the areas the indices for which rank low.

4. The innovativeness of the Polish economy – in the middle income trap

The attempts at the diagnosis of the innovativeness of the Polish economy can also contribute to the recognition of a different phenomenon – the middle income trap. It is the situation when a country finds it difficult to move from the stage of fast growth based on extensive factors, such as raw materials or cheap labor force, to the stage when growth stems from innovation and the ability to compete in the area of advanced technologies [Egawa, 2013]. As a result, a country that has fallen into this trap fails to catch up with highly developed economies despite its earlier economic success. Some scholars indicate that the middle income trap affects countries where GDP per capita exceeded USD 17,000 (in fixed prices as of 2005) and Poland crossed this threshold in the years 2012-2015 [Radło, Ciesielska, 2013].

The main “sins” of the Polish economy, causing that it may be stuck in the middle income trap, are:

- structural problems of the economy, e.g. excessive employment in agriculture paired with its low efficiency (several times lower than for the entire economy);
- the production and exports dominated by the goods manufactured in the industries of low and medium low technology;
- the lack of new innovative technologies developed by domestic firms;
- the absence of consistent and selective policies aiming to attract foreign investment;
- firms’ competitiveness related to low costs.

Other barriers to Poland’s more intensive growth are the regulatory and system-related problems, such as the inefficient legal and institutional system and the strong presence of the public sector in the economy. In the opinion of numerous experts, the situation is exacerbated by the involvement of the state in supporting inefficient and shrinking industries at the expense of backing that should be provided to “infant” industries, which have the potential to become the drivers of the economy. Moreover, other causes for concern are the education of the society and the development of skills allowing for the implementation of innovation in a workplace, as well as predicted demographic problems, generating new threats of sluggish economic growth [Lissowska, 2014; Radło, 2015].

Conclusions

In the light of the diagnosis of the innovativeness of the Polish economy, a question can be raised: is it possible to improve the situation? Apparently, Poland’s experiences of restructuring and building a new and dynamic economy should help. Priorities that should be given precedence are: favorable changes in the climate conducive to innovation and the rational use of funds allocated to support growth (including the EU funds). In practice, this means supporting inventiveness through effective intellectual property protection, encouraging private firms to financially back R&D, offering tax incentives, supporting the growth of small and medium-sized businesses through the promotion of “the internet economy”, long-term investment in new technologies and education, fostering stronger bonds between business and universities. Finally, administration and public institutions should be streamlined and the climate of cooperation based on mutual trust should be created.

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INNOWACYJNOŚĆ JAKO IMPERATYW WSPÓŁCZESNEJ GOSPODARKI: PRZYKŁAD POLSKIEJ GOSPODARKI

Streszczenie: W artykule zarysowano zagadnienia związane z poziomem innowacyjności polskiej gospodarki, wskazano dokonujące się w tym obszarze zmiany oraz zaprezentowano, jak Polska wypada pod tym względem na tle innych gospodarek świata, w tym unijnych. Wskazano także, iż obecny poziom innowacyjności ma związek z utknięciem polskiej gospodarki w tzw. pułapce średniego poziomu rozwoju. W podsumowaniu przedstawiono propozycję rozwiązań, które mogą przyczynić się do poprawy poziomu innowacyjności polskiej gospodarki w przyszłości.

Analiza danych, pozwalająca zaprezentować poziom innowacyjności polskiej gospodarki, została przeprowadzona na podstawie corocznych raportów The Global Innovation Index Report dla okresu obejmującego lata 2012-2015.

Słowa kluczowe: innowacyjność, globalny indeks innowacyjność (GII), pułapka średniego poziomu rozwoju.