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INNOVATIVENESS OF ENTERPRISES IN POLAND BY REGION

Key words: innovation, innovativeness, innovative activity, region, voivodship

ABSTRACT. The study analyses selected economic aspects of the innovative activity of industrial and service enterprises in Poland by voivodships. The share of innovation-active enterprises and innovative enterprises as well as the share of enterprise revenue from sales of new or significantly improved products in total sales revenue were analyzed. The study was prepared based on available secondary sources. The analysis applies to selected years of the period 2008-2017 due to the completeness and comparability of data. It was found, *inter alia*, that within the scope of measures of innovation adopted in the study, there were multidirectional fluctuations in voivodships. A positive relationship was found between expenditure on innovation activities and the share of revenue from the sale of new or significantly improved products in the total revenue from sales of most industrial enterprises, while a negative relationship was found in the case of service enterprises. One can notice occurring polarization among voivodships in the scope of their parameters subjected to analysis. This is confirmed by the fact that Poland is continuously divided into voivodships that are leaders of innovative activities, as well as those that require special assistance in this respect.

INTRODUCTION

In economic policy, enterprises that grow thanks to the introduction of innovations become increasingly important in determining sustainable sources of economic growth and development. It is one of the basic factors of increasing the economic competitiveness of regions and generating added value for both industry and services. The experience of highly developed countries shows that building a sustainable competitive advantage based on knowledge and innovation contributes to sustainable development and the creation of new jobs. In Poland, there is a visible change in the fact that the existing competitive advantage based on low labor costs is being abandoned in favor of competitiveness based on knowledge and innovation as factors of long-term economic development. In this context, it is becoming important to develop the innovative activity of enterprises [Zadura-Lichota 2010]. The share of innovation-active and innovative enterprises is one of the basic measures determining the level of innovation in the economy. The level of innovation of the Polish economy and enterprises differs from the values achieved by highly developed countries both on a European Union (EU) and global scale. In Poland, there is still an unfavorable structure of financing expenditure on research and development

activities, which are mainly financed from the state budget. In contrast, in countries with a highly developed economy, the private sector finances this type of activity to a greater extent. When determining the level of innovation of the Polish economy and enterprises in relation to highly developed countries, disproportions are visible for the detriment of Poland [EU 2018].

Creating and implementing innovation as the main factor on which the building of competitive advantage is based is of particular significance for Poland as an EU member. The European Union actively supports innovative activities and allocates significant financial resources for this purpose. This is reflected in many documents and declarations adopted at the highest EU level [OCEI 2002, The Council of Europe 2005, EC 2010]. Innovation is an important factor contributing to an increase in the competitiveness of enterprises, the entire economy and its regions. The European Union places great emphasis on creating an economy based on knowledge and innovation. It strives to actively support activities in this field as part of adopted strategies, development and economic growth policies and many other documents. In the summary of the European Council summit in 2005, a declaration was adopted in which it was stated that competitiveness, innovation and the promotion of an entrepreneurial culture are decisive factors leading to the growth of the entire economy, and they are of particular importance for the development of regions [The Council of Europe 2005]. This is reflected in the financial decisions of the European Commission, which, in the years 2014-2020, is increasing funds allocated to R&D and innovation. In the 2014-2020 budget, the EU intends to allocate EUR 80 billion to R&D and innovation [Biernat-Jarka 2013].

The state, potential and innovative capabilities of Polish regions were the subject of previous analyses carried out by other researchers [Firlej 2015, Malinowski 2017, and others]. The authors focused on the analyses of a specific region in the field of innovative activity, emphasizing its great importance for the development of competitiveness. Research concerned the innovativeness of various types of enterprises due to their size and scope of activity [Gierańczyk, Sadoch 2015, Skórska 2016]. The issue of innovativeness of enterprises in the regional aspect is also addressed in book studies [among others Makieła 2013, Jasiński et al. 2019]. The topic of the level of innovation of regions is also reflected in the results of research for Member States published by the European Commission [EU 2017, 2019]. The results of these studies indicate a great diversity of innovativeness of enterprises in Poland in regional terms.

MATERIAL AND RESEARCH METHODS

The results presented in the study are part of research on the innovativeness of the Polish economy with particular emphasis on innovative activity as an element of regional development.

The aim of the study was to identify and present selected economic aspects determining the innovative activity of industrial and service enterprises in Poland by voivodships. The share of innovation-active enterprises and innovative enterprises as well as the share of enterprise revenue from sales of new or significantly improved products in total sales

revenue were analyzed. The study was prepared on the basis of materials and source data of the Central Statistical Office (GUS) and the European Statistical Office (Eurostat).

The research is descriptive and analytical. Critical analysis of published materials, analysis of the state of research in a given subject as well as broadly defined descriptive analysis and simple statistical methods were adopted as the research tool. The study was prepared based on available secondary sources. The analysis applies to selected years of the period 2008 - 2017 due to the completeness and comparability of data.

ASSESSMENT RESULTS

In accordance with the methodology adopted in the *Oslo Manual* [OECD 2005], an innovation-active enterprise is one that has introduced at least one product or process innovation or has implemented at least one innovation project in a given period that has been discontinued or ceased during the study period, i.e. not successfully completed or not completed by the end of this period, i.e. it is still continued. On the other hand, an innovative enterprise in the field of product and process innovation is an enterprise that has introduced at least one product or process innovation on the market in the analyzed period, i.e. a new or significantly improved product or a new or significantly improved process [Matusiak 2011, OECD 2005].

The share of innovation-active enterprises in the examined period showed a multidirectional trend among both industrial and service enterprises (Table 1). In each voivodship, both decreases and increases in the studied parameter were observed in the period analyzed. After averaging the analyzed values, the highest share of innovation-active industrial enterprises was observed in the Opolskie Voivodship, while the lowest one in the Łódzkie Voivodship. On the other hand, with regard to service enterprises in the researched period (2008-2017), the highest number of innovation-active enterprises was observed in the Mazowieckie Voivodship, and the lowest in the Warmińsko-Mazurskie Voivodship. In each voivodship, the share of innovation-active service enterprises was smaller than production ones and, on average, accounted for 65% over the entire period. In the Mazowieckie Voivodship, a similar number of industrial and service enterprises was innovation-active, while the largest disparities occurred in the Warmińsko-Mazurskie Voivodship to the detriment of service providers.

Considering the change in the share of innovation-active industrial enterprises in the last examined period (years 2015-2017) in relation to the first one (years 2008-2010), the highest increase was observed in the Małopolskie Voivodship, and a decrease in the Warmińsko-Mazurskie Voivodship. Similarly, in the case of service enterprises, the largest increase was observed in the Lubuskie Voivodship, and a decrease in the Opolskie Voivodship. On average, there was a slight increase in the case of innovation-active industrial enterprises, and a decrease among those operating in the service area (Table 1).

When analyzing the share of innovative enterprises, one can observe a similar situation as in the case of the share of innovation-active enterprises. At the same time, the share of innovative enterprises was smaller than that of innovation-active ones. This may indicate that not all enterprises that have made an innovative effort have successfully implemented innovations on the market.

Table 1. Innovation-active enterprises in Poland by voivodships in 2008-2017

Voivodships	Innovation-active enterprises [%]													
	2008-2010		2009-2011		2010-2012		2011-2013		2012-2014		2015-2017		Average in 2008-2017	
	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service
Poland	18.1	13.5	16.9	12.3	17.7	13.9	18.4	12.8	18.6	12.3	20.2	11.9	18.3	12.8
Dolnośląskie	17.7	14.0	16.1	9.7	22.6	14.1	20.3	15.6	23.1	11.9	20.4	13.6	20.0	13.2
Kujawsko-pomorskie	18.8	10.0	19.1	11.9	18.4	16.5	15.2	10.7	16.0	10.5	18.6	6.8	17.7	11.1
Lubelskie	19.1	12.3	20.1	10.8	17.7	12.1	17.2	11.1	21.9	18.3	23.2	8.0	19.9	12.1
Lubuskie	16.0	11.7	12.5	11.2	17.1	12.8	20.5	11.1	16.3	5.8	15.8	12.7	16.4	10.9
Łódzkie	14.2	10.7	11.5	8.5	14.4	12.7	17.0	11.0	15.8	13.0	17.3	9.6	15.0	10.9
Małopolskie	17.3	13.1	20.2	12.1	18.8	15.1	20.1	13.4	16.3	11.9	23.5	11.8	19.4	12.9
Mazowieckie	18.4	16.3	15.0	14.4	17.2	19.5	19.3	16.6	20.2	15.8	21.4	16.9	18.6	16.6
Opolskie	20.3	15.2	20.6	10.3	23.0	5.7	20.7	10.5	21.3	15.9	23.1	2.7	21.5	10.1
Podkarpackie	21.8	14.9	22.2	12.5	19.3	12.6	21.0	9.6	19.7	11.9	21.2	13.1	20.9	12.4
Podlaskie	18.2	9.2	17.1	9.3	23.8	8.3	24.2	12.2	19.4	11.3	18.6	6.2	20.2	9.4
Pomorskie	16.4	14.2	16.5	15.3	12.3	11.4	17.3	10.8	17.0	9.0	20.2	14.9	16.6	12.6
Śląskie	21.1	13.3	17.0	15.1	20.8	10.0	16.9	12.6	21.9	12.9	20.8	10.6	19.8	12.4
Świętokrzyskie	16.9	11.6	15.9	7.9	18.5	8.6	17.7	6.7	14.8	9.3	20.8	5.4	17.4	8.3
Warmińsko-mazurskie	19.4	9.2	16.1	9.7	19.1	5.5	21.0	9.7	19.3	4.7	16.0	3.9	18.5	7.1
Wielkopolskie	17.1	13.1	18.9	12.3	12.8	11.7	16.4	10.3	15.6	8.2	19.4	9.6	16.7	10.9
Zachodniopomorskie	16.4	12.1	14.1	6.6	18.4	11.9	17.7	12.5	18.6	11.6	20.9	9.4	17.7	10.7
Average for voivodships in the researched period	18.1	12.6	17.1	11.1	18.4	11.8	18.9	11.5	18.6	11.4	20.1	9.7	18.5	11.3

Source: own study based on [GUS 2011-2019]

Table 2. Innovative enterprises in Poland by voivodships in 2008-2017

Voivodships	Innovative enterprises [%]													
	2008-2010		2009-2011		2010-2012		2011-2013		2012-2014		2015-2017		Average in 2008-2017	
	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service
Poland	17.1	12.8	16.1	11.6	16.5	12.4	17.1	11.4	17.5	11.4	18.5	10.4	17.1	11.7
Dolnośląskie	16.6	13.3	15.0	9.6	20.7	12.9	19.0	13.4	22.1	10.5	17.8	11.8	18.5	11.9
Kujawsko-pomorskie	17.9	9.4	18.8	11.9	17.5	10.8	13.6	8.4	14.9	10.0	17.4	6.8	16.7	9.6
Lubelskie	17.1	12.0	19.3	9.7	15.9	11.4	15.9	10.1	21.2	17.5	20.1	8.0	18.3	11.5
Lubuskie	15.9	10.9	12.3	10.2	16.4	12.2	19.2	9.5	15.5	5.5	15.3	10.7	15.8	9.8
Łódzkie	13.4	10.3	11.1	8.5	13.7	11.4	15.6	10.4	15.2	11.9	16.0	9.4	14.2	10.3
Małopolskie	16.3	12.8	19.5	11.1	17.4	13.0	18.1	11.8	15.6	11.5	20.7	9.4	17.9	11.6
Mazowieckie	17.3	15.6	13.9	13.7	15.3	16.9	18.5	15.2	19.1	15.1	19.5	14.2	17.3	15.1
Opolskie	19.3	13.7	20.1	10.3	22.3	5.7	20.0	10.1	19.5	15.7	22.6	2.5	20.6	9.7
Podkarpackie	20.7	12.8	21.0	11.4	17.9	11.6	19.9	9.5	18.4	10.8	19.4	11.1	19.6	11.2
Podlaskie	17.0	8.3	17.1	8.9	22.0	8.1	23.4	12.0	18.7	10.6	18.2	6.2	19.4	9.0
Pomorskie	15.3	12.4	16.2	14.1	11.0	10.7	15.3	9.6	16.5	8.1	17.9	13.2	15.4	11.4
Śląskie	20.3	12.4	15.2	13.2	19.1	8.9	15.4	10.8	19.9	11.4	19.3	9.3	18.2	11.0
Świętokrzyskie	16.5	11.4	15.6	7.7	18.2	8.4	17.6	6.7	14.2	8.1	19.2	5.2	16.9	7.9
Warmińsko-mazurskie	18.6	8.7	15.5	9.4	18.6	5.3	20.1	9.1	17.4	4.4	14.3	3.9	17.4	6.8
Wielkopolskie	16.2	12.4	18.5	11.7	12.0	11.6	15.7	8.5	14.9	7.7	18.6	8.9	16.0	10.1
Zachodniopomorskie	15.5	11.9	13.2	6.5	18.2	11.7	16.7	12.5	17.4	10.7	18.1	9.2	16.5	10.4
Average for voivodships in the researched period	17.1	11.8	16.4	10.5	17.3	10.7	17.8	10.5	17.5	10.6	18.4	8.7	17.4	10.5

Source: own study based on [GUS 2011-2019]

Considering the type of innovation in the analyzed period, industrial enterprises introduced organizational innovations to a greater extent, while in the case of service enterprises these were marketing innovations.

According to the guidelines in the *Oslo Manual* [OECD 2005], the share of revenue from the sales of new or significantly improved products introduced to the market in the last three years in the total sales revenue is one of the indicators for assessing the effects of a company's innovative activity. It shows changes in their competitiveness and modernization of the product range.

Total sales revenue includes:

- net revenue from the sales of products, both goods and services;
- net revenue from the sales of goods and materials.

Net revenue from the sale of products is treated as amounts due from the sale of finished products in enterprises producing goods, and in the case of service-providing entities - the sale of services.

When analyzing revenue from the sale of new or significantly improved products, the following were taken into account [OECD 2005]:

- new or significantly improved products for the market on which the entity operates, placed on the market in the last three years;
- new or significantly improved products only for the enterprise, introduced to the market in the last three years.

The share of revenue of industrial enterprises from the sale of new or significantly improved products in the total revenue from sales in the analyzed period (years 2010-2017) was definitely higher (over 8%) than the one of service enterprises (only 1.9%) (Table 3). On average, the highest share of this type of revenue in the total sales revenue of industrial enterprises was observed in the Pomorskie and Wielkopolskie Voivodships, while the lowest in the Lubelskie, Lubuskie and Zachodniopomorskie Voivodships. Service enterprises achieved the highest level of the analyzed parameter in the Lubelskie and Mazowieckie Voivodships, while the lowest in the Opolskie, Podlaskie, Warmińsko-Mazurskie and Kujawsko-Pomorskie Voivodships. In the Warmińsko-Mazurskie, Podlaskie and Lubuskie Voivodships, both industrial and service enterprises achieved on average low shares of revenue from the sales of new or significantly improved products in the total sales revenue. On the other hand, in the Pomorskie Voivodship, this share achieved by industrial enterprises was almost three times higher than the total average in the analyzed period. However, in the Lubelskie Voivodship, this share in industrial enterprises was, on average, the lowest, while in service enterprises it was the highest. This may indicate better economic efficiency achieved by service enterprises compared to industrial ones in the scope of innovative activity in this voivodship.

When studying the relationship between expenditure on innovation activities in enterprises by voivodships and the share of enterprise revenue from the sales of new or significantly improved products in total sales revenue by voivodships, a correlation coefficient was used (Table 4).

In the case of industrial enterprises, a positive relationship between the analyzed variables, which translates into an increase in the share of enterprise revenue from the sale

Table 3. Share of enterprise revenue from the sale of new or significantly improved products in the total revenue from sales in Poland by voivodships in 2010-2017

Voivodships	Share of enterprise revenue [%]													
	2010		2011		2012		2013		2014		2017		Average in 2008-2017	
	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service	industrial	service
Poland	11.3	4.1	8.9	3.3	9.2	3.1	8.6	3.4	8.8	3.3	7.1	3.0	9.0	3.4
Dolnośląskie	6.0	2.8	5.9	4.4	7.7	1.3	10.0	1.1	12.5	3.2	8.8	3.4	8.5	2.7
Kujawsko-pomorskie	14.7	0.5	6.4	0.2	6.5	0.3	7.1	0.3	7.8	0.5	6.7	1.2	8.2	0.5
Lubelskie	3.4	17.4	3.6	18.7	5.3	0.5	4.9	0.4	4.3	0.7	3.8	1.3	4.2	6.5
Lubuskie	4.5	0.8	3.5	0.7	4.7	1.3	6.1	1.1	4.3	0.3	4.4	0.7	4.6	0.8
Łódzkie	6.7	1.1	4.3	2.4	6.2	1.1	5.7	1.0	8.1	1.1	6.5	3.5	6.3	1.7
Małopolskie	10.6	1.1	7.6	0.9	6.5	0.9	6.5	0.5	7.7	1.4	9.7	1.0	8.1	1.0
Mazowieckie	8.5	6.5	5.6	4.5	5.3	4.7	5.7	5.4	4.9	6.1	5.4	5.5	5.9	5.5
Opolskie	5.3	0.6	5.8	0.3	7.8	0.1	7.4	0.1	7.0	0.3	4.5	0.0	6.3	0.2
Podkarpackie	8.5	0.7	10.5	4.1	8.8	10.8	8.5	5.6	7.3	3.3	7.9	1.9	8.6	4.4
Podlaskie	5.0	0.3	4.4	0.5	5.3	0.1	5.1	0.3	4.1	0.6	4.2	0.1	4.7	0.3
Pomorskie	43.4	2.4	32.1	1.6	36.3	1.4	18.2	1.2	27.2	0.7	12.6	0.9	28.3	1.4
Śląskie	10.7	0.9	6.1	1.8	8.3	1.1	10.1	0.9	10.7	0.7	7.8	0.8	9.0	1.0
Świętokrzyskie	5.7	0.6	4.7	0.9	5.3	1.4	6.3	1.2	3.6	0.3	5.2	0.1	5.1	0.8
Warmińsko-mazurskie	12.9	1.1	6.7	0.6	3.1	0.2	2.4	0.3	3.1	0.1	3.9	0.8	5.4	0.5
Wielkopolskie	11.2	1.2	15.7	1.1	12.3	2.3	13.2	5.3	7.5	0.8	6.9	0.7	11.1	1.9
Zachodniopomorskie	2.9	1.3	4.9	0.5	4.0	1.2	4.7	1.0	6.4	1.0	5.6	0.8	4.8	1.0
Average for voivodships in the researched period	10.0	2.5	8.0	2.7	8.3	1.8	7.6	1.6	7.9	1.3	6.5	1.4	8.1	1.9

Source: own study based on [GUS 2011-2019]

of new or significantly improved products in the total sales revenue, together with an increase in expenditure on innovation activities, was observed in 10 voivodships (the highest one in the Lubuskie, Dolnośląskie, Kujawsko-Pomorskie and Podlaskie voivodships). On the other hand, a negative correlation indicating a decrease in the share of the examined income category when increasing expenditure occurred in 6 voivodships and the highest one was observed in the Małopolskie and Podkarpackie Voivodships (Table 4).

In the case of service enterprises, inverse proportions were observed. A positive relationship between the examined variables occurred in 7 voivodships, the highest one in the Warmińsko-Mazurskie Voivodship, and a negative coefficient was observed in 9 voivodships (the highest ones in the Mazowieckie, Lubelskie, Dolnośląskie and Śląskie voivodships) (Table 4).

The results of the conducted analyses are consistent with the results obtained by researchers dealing with the subject of innovation of regions in Poland.

Table 4. The value of the correlation coefficient between outlays on innovative activity in enterprises and the share of enterprise revenues from the sale of new or significantly improved products in the total sales revenues in Poland, by voivodships in 2010-2017

Voivodships	Correlation coefficient	
	industrial	service
Poland	0.43	-0.68
Dolnośląskie	0.90	-0.51
Kujawsko-Pomorskie	0.79	0.12
Lubelskie	0.08	-0.58
Lubuskie	0.95	0.06
Łódzkie	0.58	-0.33
Małopolskie	-0.65	-0.10
Mazowieckie	0.75	-0.58
Opolskie	-0.48	-0.17
Podkarpackie	-0.57	0.28
Podlaskie	0.77	0.35
Pomorskie	0.26	-0.45
Śląskie	-0.23	-0.51
Świętokrzyskie	0.31	0.32
Warmińsko-Mazurskie	-0.40	0.99
Wielkopolskie	-0.33	-0.01
Zachodniopomorskie	0.55	0.21

Source: own study based on [GUS 2011-2019]

CONCLUSIONS

The analyses carried out in the research lead to the following conclusions:

1. The share of both innovation-active and innovative industrial enterprises in the analyzed period increased on average to a small extent, while in the case of service enterprises it decreased on average to a greater extent.
2. Despite an average decline in the share of revenue of industrial and service enterprises from the sale of new or significantly improved products in the total sales revenue, on average, in the analyzed period, a positive relationship was observed between expenditure on innovation activities by enterprises and the share of the analyzed category of revenue in the case of most industrial enterprises. The reverse situation in the case of service enterprises is worrying.

The measures of innovation studied in the analyzed period showed multidirectional fluctuations. One can notice occurring polarization among voivodships in the scope of their parameters subjected to analysis. In the Dolnośląskie, Mazowieckie, Śląskie and, interestingly, Lubelskie Voivodships, positive changes were observed in the parameters analyzed, while in the Kujawsko-Pomorskie, Lubuskie, Świętokrzyskie, Warmińsko-Mazurskie and, surprisingly, Pomorskie voivodships these changes were not favorable. This is confirmed by the fact that Poland is continuing to be divided into voivodships that are leaders of innovative activities, as well as those that require special assistance in this respect. Despite EU funds directed at supporting and developing innovative activity to regions requiring support, there have been no significant effects thus far. The alternative may be actions taken, first of all, to change the mentality of the society, and then allocating funds to direct economic activities. On this basis, it can be assumed that regions, in particular weaker ones, may associate the possibilities of their development as well as building a competitive advantage with the innovative activity of enterprises located within their territory.

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Słowa kluczowe: innowacje, innowacyjność, działalność innowacyjna, region, województwo

ABSTRAKT

Przeprowadzono analizę wybranych ekonomicznych aspektów działalności innowacyjnej przedsiębiorstw przemysłowych i usługowych w Polsce według województw. Analizom poddano udział przedsiębiorstw aktywnych innowacyjnie i przedsiębiorstw innowacyjnych oraz udział przychodów przedsiębiorstw ze sprzedaży produktów nowych lub istotnie ulepszonych w przychodach ze sprzedaży ogółem. Opracowanie sporządzono na podstawie dostępnych źródeł wtórnych. Analiza dotyczyła wybranych lat z przedziału 2008-2017, ze względu na kompletność i porównywalność danych. Ustalono między innymi, że w zakresie miar innowacyjności, przyjętych w opracowaniu, wystąpiły różnokierunkowe wahania w poszczególnych województwach. W przypadku działalności większości przedsiębiorstw przemysłowych stwierdzono dodatni związek między nakładami ponoszonymi na działalność innowacyjną a udziałem przychodów ze sprzedaży produktów nowych lub istotnie ulepszonych w przychodach ze sprzedaży ogółem. Ujemny związek natomiast stwierdzono w przypadku przedsiębiorstw usługowych. Zaobserwowano polaryzację województw w zakresie osiąganych przez nie parametrów poddanych analizie. Potwierdziło to fakt utrzymującego się podziału terytorium Polski na województwa będące liderami działalności innowacyjnej i na te, które wymagają szczególnej pomocy w tym zakresie.

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