

## INNOVATIVENESS OF POLAND AND POLISH REGIONS AGAINST THE BACKGROUND OF OTHER EUROPEAN UNION COUNTRIES

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### ABSTRACT

The aim of the study is to analyse the diversity of the innovation scale of particular voivodships in Poland as well as to present Poland's innovativeness in comparison to other countries. The authors of this paper have carried out scientific studies and analyses, taking into consideration the data for 2010–2017, published, among others, by Central Statistical Office (Główny Urząd Statystyczny), the European Commission and the Patent Office of the Republic of Poland (Urząd Patentowy Rzeczypospolitej Polskiej). The scope of the analyses concerned the innovative activities of Poland against the background of other countries, in particular, the European Union Member States as well as the diversification of the innovative activity of entrepreneurs conducting business activity in particular voivodships in Poland. It should be noted that there is a significant regional differentiation in this respect.

**Key words:** innovativeness, enterprises, intellectual property, exclusive right, patent, protection law, registration right, voivodships

### INTRODUCTION

The term “innovation” is derived from the Latin word *innovatio* which means “renewal” or *innovare*, which signifies the ideas related to “renewing, refreshing, changing” [Kopaliński 2006]. Referring to the issue of innovation, the literature on the subject points to many diversified approaches to basic characteristics of the concept of innovation, its terminology interpretation as well as the classification of its functions [Montoya-Weiss and Calantone 1994, Drucker 1998]. The concept of innovation was introduced to economic sciences by Schumpeter [1949], who perceived innovations as processes of introducing new products or improving existing products, introducing new production methods or improving them as well as introducing new sales methods, opening new sales markets,

shaping new sources of raw materials, semi-finished products or other resources, opening a new market as part of a particular type of activity or introducing a new kind of production organization. Schumpeter showed that three sequences can be distinguished in the innovation cycle, in the process of introducing them. They include: the idea (innovation), the introduction of innovation (innovation) and its diffusion. Schumpeter's view on innovation was the starting point for further considerations regarding the importance of innovation in the economy. In turn, according to Kotler [2004], innovations should be perceived as a process comprising generating ideas, their selection, devising and verifying concepts, economic analysis, preparing and testing products and their commercialisation. However, according to Simpson et al. [2006], innovation is a process consisting in transforming the

existing possibilities into new ideas and implementing their practical applications, and the above-said process consists of 4 stages: invention, innovation, design and diffusion.

According to Oslo Manual [OECD 2005], innovation may be defined as “the implementation of a new or significantly improved product (good or service) or a process, a new marketing or organisational method in business practices, workplace organisation or external relations”.

As Sławińska [2015] emphasises, large diversification of the definitions related to innovations encountered in the scientific literature on the subject contributed to the fact that the innovation theory also includes many different classifications. These classifications allow us to distinguish different types of innovations which can be characterised by the effects they cause, originality of the changes or their nature, or their importance from the point of view of the influence they exert on the trade sector.

The most basic and frequently used classification is the division of innovations with regard to their technological or non-technological character [OECD 2005]. In this respect one may distinguish four types of innovations:

- product innovation – introduction of goods or services, which are new or significantly improved in relation to its features and the problems they help to solve;
- process innovation – implementation of a new or markedly improved production or delivery method;
- marketing innovation – implementation of a new marketing method which encompasses significant changes in the appearance or packaging of the product, product positioning or promotion or its price;
- organisational innovation – implementation of a new organisational method in the company’s business practices, workplace organisation or external relations.

Product, process and marketing innovations are related to the introduction of new or significantly improved goods or services, production or delivery methods or marketing methods. Organisational innovations are connected with the changes and improvements within the organisation at times leading to the

emergence of other types of innovations. These innovations may be based on the application of knowledge or technology, on the new ways of using the existing knowledge or available technology or the combination of these two factors [OECD 2005].

Innovations can be regarded as a new product or the result of the innovation process in an enterprise, a new consumption pattern or the result of the innovation process whose subject is a consumer. In today’s world, consumers have a significant impact on producers, even though so far they may not be fully aware of the power they hold. Thus, not only the initiative, but also the idea and concept for innovation frequently originates from the user-consumer [Ozimek 2009].

Innovative activities include all scientific (research and development), technical, financial organisational and commercial activities, whose aim is to devise, create and implement innovations. Innovative activity in an enterprise is a complex process. It requires the involvement of a number of production factors such as: capital, knowledge and time, and the structure of the implemented investments is to a large extent determined by the access to sources of finance. As Repetowski [2008] claims: “The starting point for the innovations is a theoretical concept, an idea. However, the idea itself is not an innovation, and it is not an invention either. It remains only a certain idea, which marks the beginning of the innovation process. Innovations are the result of technological, social, economic, legal, cultural and organisational processes that can be shaped”.

The innovation implementation, the ability to create new solutions, acquire and use new knowledge constitute – besides possessing the so-called strategic resources – factors which are conducive to the creation of the competitive advantage of an enterprise. Combining the skills of proper organisation of processes, appropriate coordination of the activities and creating a successful image of an enterprise and its products can be seen as a specific guarantee of the success of the enterprise in the market [Limański 2011]. As Prandecki [2013] states, “devising innovation policy requires not only ensuring proper conditions for entrepreneurs to allow them to implement innovations, but also creating appropriate markets willing to accept the proposed innovations. For this reason, the emphasis

should be placed not on the innovations, but rather on the innovativeness and creativity of the entire society”. Innovative activities are all scientific, technological, organisational, financial and commercial activities, which actually implement or are intended to implement innovations. Certain innovative activities are innovative in its nature, others are not new activities, but they are necessary to implement innovations. Innovative activities include also research and development, which are directly related to the development of specific innovations [OECD 2005].

The aim of this article is to analyse the diversification of the innovation scale of particular voivodships in Poland and presenting Poland’s innovativeness as compared to other countries.

## MATERIAL AND METHODS

The article is based on the analysis of secondary data. In this article the authors have carried out the examination of selected studies and analyses taking into consideration the data available for 2010–2017, published by, among others, by Central Statistical Office (Główny Urząd Statystyczny), the European Commission, the Patent Office of the Republic of Poland (Urząd Patentowy Rzeczypospolitej Polskiej). The scope of the conducted analyses concerned the innovation activity of Poland against the background of other countries of the European Union, and the diversification of the innovative activities of entrepreneurs engaged in business activity in the regions of particular voivodships in Poland. The analyses were supplemented with the data from the Local Data Bank (Bank Danych Lokalnych)<sup>1</sup>.

The hypothesis which the authors undertake to verify in this article points to the emergence of diversity with regard to the level of competitiveness between the countries as well as specific voivodships in Poland.

## POLISH REGIONS’ INNOVATIVENESS LEVEL IN THE LIGHT OF SECONDARY DATA

In the latest Global Innovation Index 2018 depicting the level of innovativeness of particular countries, Poland ranked 39 among the 126 countries evaluated in the classification [SC JCB, INSEAD, WIPO 2018]. According to the European Innovation Scoreboard [EC 2018a] report, prepared for the European Commission addressing the issue of innovativeness within the EU, Poland belongs to the group of countries which have been described as Modest Innovators. Apart from Poland, this group includes also countries such as: Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Portugal, Slovakia and Spain. When analysing the innovation level in 2010–2017, it was noted that innovation performance in Poland increased by 3.2% (the EU in general recorded an increase of 5.8%). Analysing the scores of Modest Innovators<sup>2</sup> group, with the consideration of 10 innovation dimensions<sup>3</sup>, it was noted that the greatest Summary Innovation Index was indicated in the case of countries such as Lithuania (increase by 20.1%), Malta (15.2%) and Latvia (11.6%). When examining the results in particular categories of the innovation dimension, it may be observed that in Poland the greatest increase was recorded in the Innovation-friendly environment category (88.1%). The latter was also the highest score in the group of the presented countries. In the case of the remaining categories, the decrease was recorded in four of them: Innovators (–22.7%), Finance and support (–11.5%), Linkages (–9.9%) as well as in the case of Human resources (–2.9%) – Table 1.

The findings of the Regional Innovation Scoreboard Report providing information on the innovativeness divided into the 220 regions located in 22 the EU countries and in Norway, Serbia and Switzerland<sup>4</sup> point

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<sup>1</sup> Local Data Bank, <https://bdl.stat.gov.pl/BDL/start> [accessed: 06.10.2018].

<sup>2</sup> The EU national innovation systems are measured by the Summary Innovation Index, which is an indicator calculated as an unweighted average of the 27 indicators. On this basis four groups were distinguished: Innovation Leaders, Strong Innovators, Moderate Innovators and Modest Innovators.

<sup>3</sup> Human resources; Research systems; Innovation-friendly environment; Finance and support; Firm investments; Innovators; Linkages; Intellectual assets; Employment impacts; Sales impact.

<sup>4</sup> Countries such as: Estonia, Cyprus, Latvia, Lithuania, Luxembourg and Malta are treated as one region.

**Table 1.** Innovation performance per dimension (2010–2017)

Specification	Summary Innovation Index	Human resources	Research systems	Innovation-friendly environment	Finance and support	Firm investments	Innovators	Linkages	Intellectual assets	Employment impacts	Sales impact
EU	5.8	19.3	13.6	33.8	7.7	11.8	-14.0	1.0	0.9	0.6	4.1
Lithuania	20.1	8.7	7.5	61.2	16.2	55.3	36.2	19.6	25.8	-22.7	4.7
Malta	15.2	20.2	110.1	57.9	-1.0	-22.1	10.6	-18.6	95.2	18.5	48.3
Latvia	11.6	15.1	43.1	24.5	70.7	-31.3	-8.1	2.1	-12.0	42.6	1.1
Spain	7.5	46.0	5.3	65.3	-4.1	10.8	-29.6	-0.5	2.4	25.4	-0.5
Slovakia	4.8	15.7	10.4	15.2	12.7	-19.7	-11.7	10.4	7.8	0.8	12.6
Poland	3.2	-2.9	11.7	88.1	-11.5	18.5	-22.7	-9.9	23.3	0.8	12.1
Italy	2.0	10.1	26.0	-14.6	1.3	5.9	-10.9	-0.7	6.4	3.5	-3.6
Hungary	-0.1	-4.6	14.4	32.9	4.1	15.3	-9.9	-15.6	4.6	-0.7	-14.4
Greece	-0.9	14.3	19.0	14.8	12.5	0.1	-18.7	4.4	22.6	11.9	-40.1
Portugal	-1.5	-23.1	39.6	74.2	-10.1	-11.0	-27.9	-15.2	9.6	33.6	-25.4
Croatia	-2.0	4.9	17.4	16.5	3.6	4.1	-17.1	-24.5	8.4	41.6	-34.2
Czech Republic	-2.9	17.4	23.9	27.2	-65.2	7.8	-31.4	-2.2	17.7	0.4	-5.5
Estonia	-3.2	30.6	42.2	48.6	7.2	-40.6	-86.7	-42.7	43.5	19.5	5.6
Cyprus	-9.2	14.3	51.3	16.8	-6.8	-75.9	-48.9	-38.0	46.1	8.2	-20.0

Source: EC [2018b].

to the fact that 53 regions were classified as regional Innovation Leaders, the subsequent 60 regions were classified in the category of regional Strong Innovators, 85 regions were in the group of regional Moderate Innovators and 22 regions were perceived as Modest Innovators. The data for 2017 show that the most innovative EU region is Stockholm in Sweden, Hovedstaden in Denmark and the south-east region of the UK. The least innovative areas were located in Romania. The data analysis concerning Poland indicated that nine voivodships in Poland were classified as Modest Innovators. The Moderate Innovators group included the following voivodships: Mazowieckie, Małopolskie, Dolnośląskie, Pomorskie, Podkarpackie, Łódzkie and Śląskie. Lubelskie, Warmińsko-Mazurskie and Świętokrzyskie, were evaluated as those with

some of the weakest innovation potential among all 220 regions (210th, 212th and 213rd place respectively) – Table 2.

As the analyses of Duda [2013] indicate, the equity from retained profits and capital provided by the owners constituted the main source of financing the investment in 1999–2011. The limited access to loans (no credit history, no creditworthiness) and limited entrepreneurs' own funds are considered to be significant barriers in the development of enterprises, especially small businesses [Sawicka 2000]. Moreover, among the innovation barriers we need to point to: high costs of developing and implementing innovations; low investments in research and development activity, which to a large extent is caused by the small sales market of Polish SMEs operating mainly

**Table 2.** Innovation scoreboard across Poland in 2017

Voivodeship	RII – 2017	Rank	Group	Change
Mazowieckie	63.6	159	Moderate	–0.1
Małopolskie	57.2	178	Moderate	4.6
Dolnośląskie	56.9	179	Moderate	3.7
Pomorskie	55.0	181	Moderate	0.4
Podkarpackie	51.8	192	Moderate	2.9
Łódzkie	50.4	197	Moderate	4.7
Śląskie	50.3	198	Moderate	2.1
Wielkopolskie	49.3	199	Modest	2.5
Lubelskie	47.4	201	Modest	7.6
Zachodniopomorskie	47.0	204	Modest	5.6
Kujawsko-Pomorskie	46.3	206	Modest	0.0
Podlaskie	45.5	207	Modest	5.1
Opolskie	43.7	208	Modest	–0.6
Lubuskie	41.1	210	Modest	3.1
Świętokrzyskie	36.8	213	Modest	0.6
Warmińsko-Mazurskie	38.9	212	Modest	–3.3

<sup>a</sup> RII 2017 shows performance in 2017 relative to that of the EU in 2017. Rank shows the rank performance across all regions. Change shows the performance change over time calculated as the difference between the performance in 2017 relative to that of the EU in 2011 and performance in 2011 relative to that of the EU in 2011.

Source: EC [2017].

in the local and regional markets [Lisowska 2008]; low demand for innovative products, due to the fact that, when buying goods, the majority of Polish consumers take into account the price of products, high costs of employment of qualified staff [Duda 2013]. The entrepreneurs' low tendency to take risks, which is directly associated with the innovative activity appears to be another innovation barrier [Sawicka 1998].

According to research by Baruk [2015], micro and small enterprises are characterized by a low level of innovation in comparison with large organizations. In addition, it is business managers who frequently enhance developing ideas for innovation; however, in Poland this trend occurs the least often in comparison with other EU Member States (most frequent occurrences are reported in Finland and Portugal). Lei and Ma [2013] emphasize, in turn, that the innovativeness of the employees' knowledge has a positive impact on the efficiency of creating new products while the incentive for improving knowledge and innovation is a pay rise.

Legal protection of intellectual property motivates companies to undertake research and development (R&D) works. Thanks to it, entrepreneurs are aware that financial outlays and all the work devoted to innovative activities will be properly used and will bring measurable benefits. Investment in research and development plays a crucial role in the innovation processes and is an important component of the company's operations as it is thanks to R&D that products, technologies and services are developed. One may distinguish external and internal R&D activities. Internal R&D covers the overall R&D activity carried out within the enterprise (i.e. R&D which is intended to contribute to the development and implementation of innovation within products, processes, marketing or organizational innovations, as well as basic research not directly related to the creation of a specific innovation). External R&D activity of enterprises, in turn, mainly involves a purchase of research and development services available on the market.

Analysing the data from 2010–2016 regarding the share of expenditures incurred by enterprises for R&D, we observe that each voivodship sees their systematic growth. The largest funds for this type of activity

are transferred in such voivodeships as: Małopolskie, Podkarpackie and Pomorskie. In turn, the lowest expenditures are incurred in the following voivodeships: Podlaskie and Lubelskie (Table 3).

According to the Central Statistical Office's (GUS) analyses, in 2014–2016 innovation-active industrial and service enterprises accounted for 20.3 and 14.5% of the total number of these entities, respectively (compared to 18.9 and 10.6% in 2013–2015). There was a correlation that, as in the previous research period, the highest percentage of innovation-active entities was found among entities with 250 or more employees. In the years 2014–2016, the share of innovative industrial enterprises amounted to 18.7% and was the highest in the section of Production of pharmaceutical products. In the previous research period, this share was the highest in the section of Production of coke and refined petroleum products. Among service enterprises, it amounted to 13.6%. As in the previous period, the share of both innovation-active and innovative enterprises among service enterprises was highest in the section of Insurance, reinsurance and pension funds. Similarly to the previous years, product or process innovations were most often introduced by entities employing 250 or more individuals (58.7% of industrial and 42.3% of service enterprises) [GUS 2017].

Taking into account the territorial division, the highest percentage of innovation-active industrial enterprises characterized Małopolskie Voivodeship (23.7%) and of innovative ones – Lubelskie Voivodeship (22.5%), while the highest percentage of innovation-active and innovative service units was noted for Lubelskie Voivodeship (23.6 and 23.3% respectively). In the previous research period (for the years 2013–2015), the largest share of innovation-active and innovative enterprises in the industry was recorded in Opolskie Voivodeship (23.1 and 21.5% respectively), while in services – in Zachodniopomorskie Voivodeship (respectively 13.6 and 13.0%). In addition, in industrial and service enterprises, the share of entities that in 2014–2016 introduced process innovations (new or significantly improved processes) was higher than product innovations (new or significantly improved products) and it remained the same as in 2013–2015 [GUS 2017].

**Table 3.** Share of expenditures incurred by the enterprise sector in total R&D expenditure in 2010–2016

Rank	Specification	2010	2011	2012	2013	2014	2015	2016
		%						
	Poland	26.6	30.1	37.2	43.6	46.6	46.6	65.7
1	Małopolskie	19.7	25.2	37.5	42.6	46.7	44.6	76.9
2	Podkarpackie	54.7	59.1	72.6	81.1	76.7	74.3	75.0
3	Pomorskie	48.4	47.5	41.1	52.2	57.9	60.9	71.2
4	Mazowieckie	25.5	25.9	34.5	42.1	47.8	42.9	67.9
5	Lubuskie	40.9	nd	38.3	nd	52.6	63.4	66.5
6	Śląskie	29.3	38.4	53.9	51.8	46.7	55.0	66.2
7	Dolnośląskie	34.6	45.4	50.9	53.3	58.9	58.1	66.2
8	Kujawsko-Pomorskie	20.7	29.8	38.2	37.6	54.7	65.2	65.5
9	Świętokrzyskie	35.1	nd	69.5	41.1	35.4	43.9	53.4
10	Wielkopolskie	19.7	22.3	19.4	34.4	32.7	36.3	52.1
11	Zachodniopomorskie	19.5	nd	20.2	nd	31.8	38.5	51.6
12	Opolskie	18.2	59.9	41.0	35.4	28.5	42.9	49.6
13	Łódzkie	16.7	17.7	24.4	24.6	30.3	40.6	48.3
14	Warmińsko-Mazurskie	13.9	11.7	38.0	18.8	20.6	19.7	43.3
15	Podlaskie	17.1	nd	23.3	21.4	21.0	29.8	31.9
16	Lubelskie	13.4	20.1	16.6	20.0	15.1	24.3	27.5

Source: Own elaboration based on the Local Data Bank, <https://bdl.stat.gov.pl/BDL/start> [accessed: 04.10.2018].

## PROTECTION OF INNOVATIVE SOLUTIONS

Any innovation created in an enterprise can contribute to creating a company's competitive advantage. However, this effect will only be achieved if the solution is adequately protected, enabling the company to benefit from its own ideas [Skawińska and Zalewski 2018]. The analysis of the intellectual property dimension in Poland has shown that it has been systematically growing over the years. Taking into account Polish applications for individual objects of intellectual property protection, one can notice the greatest activity in reporting industrial designs. Similarly, in the case of patent applications (in PCT mode) and trademarks, Poland has been experiencing a systematic growth (Table 4).

Analysing the available data referring only to a selection of exclusive rights (patents for inventions

and utility rights for utility models), it should be noted that individual regions of Poland show significant differences in the number of inventions and utility models applying for protection. In the analysed period of 2010–2017, the majority of applications came from the following voivodeships: Mazowieckie and Śląskie. The number of granted patents and protection rights also indicated that the following ranked the highest: Mazowieckie Voivodeship and Śląskie Voivodeship [UPRP 2018]. The lowest number of granted exclusive rights was recorded in the following voivodeships: Lubuskie, Podlaskie, Warmińsko-Mazurskie and Świętokrzyskie (Table 5).

It is also worth emphasizing the significance for the innovative activity undertaken in Poland of the following: the Act of 30 May 2008 on certain forms of supporting innovative activity and the Act of 9 November

**Table 4.** Intellectual assets dimension in Poland compared to EU 2010–2017

Specification	Performance relative to EU 2010 in		Relative to EU 2017 in
	2010	2017	2017
Intellectual assets	52.0	75.2	74.5
Patent Cooperation Treaty patent applications	9.6	18.8	19.6
Trademark applications	50.7	80.5	71.2
Design applications	92.6	124.2	128.7

Source: EC [2018a].

**Table 5.** Exclusive rights granted to national entities by the Patent Office of the Republic of Poland (UPRP) in 2010, 2016 and 2017 across voivodships

Specification	Patents for inventions		Utility rights for utility models		
	2010	2016	2017	2010	2016
Dolnośląskie	146	346	259	23	42
Kujawsko-Pomorskie	35	105	90	29	29
Lubelskie	55	191	159	24	32
Lubuskie	7	24	21	9	12
Łódzkie	94	218	199	23	36
Małopolskie	164	351	327	52	84
Mazowieckie	326	811	624	116	88
Opolskie	28	78	61	8	10
Podkarpackie	32	42	94	19	29
Podlaskie	11	52	27	14	18
Pomorskie	81	170	130	12	30
Śląskie	233	477	351	90	137
Świętokrzyskie	25	49	42	15	13
Warmińsko-Mazurskie	18	54	41	5	26
Wielkopolskie	95	252	231	35	41
Zachodniopomorskie	1385	103	137	10	16
Total	2 735	3 323	2 793	484	643

Source: UPRP [2018].

2017 on amending certain acts with the aim of improving the legal environment of innovative activity. The purpose of this law was to eliminate or limit barriers to conducting innovative activities, as well as to increase

the attractiveness of tax instruments for supporting innovative activities in Poland. This amendment mainly covers issues related to the creation of knowledge and its transfer to the economy as well as to financing the



processes of creating innovative undertakings, especially increasing private expenditure on research and development.

## CONCLUSIONS

With increasing competitiveness on the market and development of new technologies, one of the most important factors affecting the success of companies and their advantage over competitors is their ability to go ahead of the expected changes by undertaking broad innovative activities. Innovation, being an entrepreneurial tool, enables the creation of a new product or discovering a new application for a given item and determines its ability to remain on the market. What seems worth highlighting is a significant regional discrepancy between different regions in Poland. Taking into account the territorial division into voivodships, the highest innovation rate was achieved by Mazowieckie, Małopolskie, Dolnośląskie and Pomorskie, while the lowest by Świętokrzyskie and Warmińsko-Mazurskie. The largest expenditures on innovations were noted in Małopolskie Voivodeship, while the smallest expenditures in Podlaskie Voivodeship and Lubelskie Voivodeship.

Summing up, one should bear in mind that the success of the entrepreneur and each creator depends not only on the ability to create innovation but also on the ability to secure their own solutions through appropriate tools to protect intellectual property. Therefore, it should be ensured that proper management of intellectual property is an indispensable element of any process of creating innovative solutions. Moreover, in order for scientific, research and development units or enterprises to be willing to invest in innovative solutions, there must be a mechanism to encourage such activities, ensuring the profitability of investment incurred in creating innovative solutions and transferring them to practical implementation, which will probably benefit from legal regulations regarding innovative activity.

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## INNOWACYJNOŚĆ I JEJ ZRÓŻNICOWANIE W POLSCE I WYBRANYCH KRAJACH UNII EUROPEJSKIEJ

### ABSTRACT

Celami niniejszego opracowania są analiza zróżnicowania skali innowacyjności poszczególnych województw w Polsce oraz określenie poziomu innowacyjności Polski na tle innych krajów. Dokonano kwerendy wybranych badań i analiz uwzględniających dostępne dane za lata 2010–2017, opublikowanych m.in. przez Główny Urząd Statystyczny, Komisję Europejską, Urząd Patentowy Rzeczypospolitej Polskiej. Zakres prowadzonych analiz dotyczył aktywności innowacyjnej Polski na tle innych krajów, zwłaszcza krajów członkowskich Unii Europejskiej, oraz zróżnicowania działalności innowacyjnej przedsiębiorców realizujących działalność biznesową na terenie poszczególnych województw w Polsce. Należy zwrócić uwagę na znaczące zróżnicowanie regionalne występujące w tym zakresie.

**Słowa kluczowe:** innowacyjność, przedsiębiorstwa, własność intelektualna, prawa wyłączne, patent, prawo ochronne, prawo z rejestracji, województwa