

## Determinants of the Development of Innovative Activity of Small and Medium-Sized Enterprises Operating in Sectors of Regional Smart Specialisations

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The aim of the paper is the analysis and assessment of determinants of the development of innovative activity of SMEs operating in sectors of regional smart specialisations. The first part of the paper is a literature review dedicated to the nature of smart specialisations, while the second part is an analysis of the experience of the Świętokrzyskie Voivodeship in terms of opportunities to improve innovativeness of small and medium-sized enterprises through the development of smart specialisations. The research method consists in the analysis of existing materials, such as: The Regional Innovation Strategy of the Świętokrzyskie Voivodeship, the Executive Plan, reports of the European Commission and the World Bank, as well as an analysis of quantitative research carried out among 314 SMEs.

**Keywords:** SMEs, smart specialisations, business development, entrepreneurial exploration.

## Determinanty rozwoju działalności innowacyjnej małych i średnich przedsiębiorstw prowadzących działalność gospodarczą w branżach zaliczanych do inteligentnych specjalizacji regionu

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Celem artykułu jest analiza i ocena wpływu inteligentnych specjalizacji regionu na stymulowanie działalności innowacyjnej małych i średnich przedsiębiorstw. Pierwsza część artykułu to studia literaturowe poświęcone istocie inteligentnych specjalizacji, druga zaś to analiza doświadczeń województwa świętokrzyskiego w zakresie możliwości poprawy innowacyjności małych i średnich przedsiębiorstw poprzez rozwój inteligentnych specjalizacji. Zastosowana metoda badawcza to analiza materiałów zastanych, takich jak: regionalna strategia innowacji województwa świętokrzyskiego, plan wykonawczy, raporty Komisji Europejskiej i Banku Światowego oraz badań ilościowych przeprowadzonych wśród 314 MSP.

**Słowa kluczowe:** MSP, inteligentna specjalizacja, rozwój biznesu, przedsiębiorcze odkrywanie.

**JEL:** O31, O33, O38, M13, M38

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## 1. Introduction

Small and medium-sized enterprises operating in a changing environment should, on the one hand, introduce innovative solutions that strengthen their competitive position, and, on the other, take risk reduction measures. Expenditures on introducing innovations in SMEs, especially in the early stages of their development, are associated with a greater scope of uncertainty than investments in tangible assets. The market is one of the key factors that determine the possibility of introducing innovative solutions in these entities, as the analysis of market processes allows one to make decisions regarding, for example, the use of a new technology, the time of launching a new product onto the market, spatial sales coverage, etc. According to the author of the paper, small and medium-sized enterprises are undertaking more and more intensive activities aimed at increasing their ability to create and market launch innovative products as well as introduce new processes and organisational solutions. SMEs' innovation potential and ability to use it for their development, described as "innovation capacity", have a direct impact on their capabilities of conducting innovative activity. The innovation potential consists of the following key elements: (i) financial potential – internal financial resources as well as resources offered by various financial and non-financial institutions, (ii) human resources – the number of employees and their qualifications and skills, (iii) material potential – the production structure and its market flexibility, (iv) knowledge – market information and technical knowledge (Poznańska, 1998; Stawasz, 1999; Garcia and Calantone, 2002; Zastempowski, 2010). Innovation capacity is defined as the ability of a company to reconfigure its resources in the area of innovation in response to a changing environment (Teece, 2008; Stawasz and Retalewska, 2016). Creating an effective strategy for innovation in small and medium-sized enterprises requires the building of both internal (related to, among others, the management process and organisational structure, personnel qualifications as well as knowledge and organisational culture management) (Lawson and Samson, 2001; Sosnowski and Łobejko, 2008) and external (including the creation of a network of connections with the sphere of science and technology or the innovative business environment) innovation capacity (Zastempowski, 2013). This raises the question of how innovative potential is shaped in small and medium-sized enterprises. Some entities introduce innovations using their own resources, e.g.: financial resources, as indicated by numerous studies (cf. Janasz, 2010; Zastempowski, 2010; Stawasz, 2011; Lisowska, 2013; Karlik, 2013), as well as tangible and human resources, while others acquire the necessary resources (mainly knowledge) from the environment by cooperating with other enterprises and institutions. The development of small and medium-sized enterprises in regional smart specialisations can

provide an opportunity for the development of this cooperation, which will allow for creating networks of participants with specialised skills and resources operating in key regional industries.

The concept of smart specialisation is a key element of the European Cohesion Policy based on the initiatives of smart, sustainable and inclusive growth laid down in the Europe 2020 Strategy. The Regional Innovation Strategy (RIS), which is the basic document for the implementation of the innovation policy at the regional level, is devoted to the realisation of this concept. Smart specialisations should therefore be focused on the creation of effectively functioning regional innovation systems.

Small and medium-sized enterprises, despite their low tendency to innovate, are important actors in the regional innovation system and their development can be fostered by the potential of smart specialisations. Referring to the concept of M. Porter, the development of innovative activity of small and medium-sized enterprises in the region is influenced by many regional factors. These factors include resource-related determinants, demand-related determinants, determinants connected with related and supporting industries as well as with business activity of a given company. Resource-related determinants (human resources, financial resources, information, administrative and technical infrastructure, knowledge and technologies, natural resources) and their quality contribute to competitiveness and innovativeness of enterprises operating in a given region. Demand-related determinants (demanding customers, local demand in specialised segments) can affect the introduction of changes and innovations, investments and intellectual property protection. Cooperation of companies between sectors (knowledge and innovation transfer) as well as the local climate which encourages investment and open competition between local businesses can help improve innovativeness and business performance of regional companies. There are feedback relations between the listed groups of factors resulting in ties and dependencies that stimulate changes in the quality of regional environment which is important for the development of small and medium-sized enterprises (Porter, 2002). The kind of environment conducive to the development of innovation in SMEs will be created by regional smart specialisations supported by the regional innovation policy.

The aim of the paper is the analysis and assessment of determinants of the development of innovative activity of SMEs operating in sectors of regional smart specialisations. Thus, the paper poses the following research questions:

- 1) What is the level of innovativeness of small and medium-sized enterprises operating in the areas of regional smart specialisations?
- 2) What are the causes and sources of introducing innovations by small and medium-sized enterprises operating in the areas of regional smart specialisations?

- 3) What are the barriers to the introduction of innovations by small and medium-sized enterprises operating in the areas of regional smart specialisations?

The paper presents a literature review concerning innovativeness of SMEs, the nature of smart specialisations as well as selected results of the research carried out in 2016 among SMEs operating in the areas of smart specialisations in the Świętokrzyskie Voivodeship.

## **2. Smart Specialisations – Literature Review**

Smart specialisations are “economic areas” determined by the Member States on the basis of the scientific as well as research and development potential created in the region. The implementation of this concept in accordance with the provisions of the Europe 2020 Strategy has required the design and implementation by regional authorities of regional research and innovation strategies for smart specialisations (RIS3) based on the following criteria:

- providing targeted support for policies and investments implemented with the emphasis on key regional priorities and needs in terms of knowledge-based development;
- making use of strengths and competitive advantages of a given region;
- fostering technological and practical innovations and stimulating private-sector investment;
- facilitating full involvement on the part of stakeholders by providing encouragement for innovation and experimentation;
- ensuring that strategies developed are based on facts and include appropriate monitoring and evaluation systems (European Commission, 2012).

According to Oleksiuk, a smart specialisation means the selection of the most important areas of economy and science which constitute the potential of the region, and then focusing support on these areas in order to stimulate the development of the region based on its endogenous potential by increasing innovativeness and competitiveness of enterprises within a given specialisation (Oleksiuk, 2015). A smart specialisation strategy is based on the assumption that there is no region which is the leader in every field. Therefore, the determination of the particular potential of the region and its use to build a regional competitive advantage in a given field are crucial (Foray, 2009).

The introduction of the concept of smart specialisation requires regions to find such technological niches in which they can achieve the role of the leader of innovation, and/or identify such sectors/groups of related sectors

where they can specialise in the implementation of technologies developed by other leaders of innovation (Rogut, 2013). In this context, it is important to integrate the sectoral and regional perspectives of building regional innovation capacity. Within the framework of the sectoral perspective, the main emphasis is placed on defining the field of specialisation along with the identification of technological advantages through: (i) the bottom-up and pro-entrepreneurial process of identifying fields of specialisation with business partners involved in the definition of the area of specialisation and the identification of key pro-innovative ventures; (ii) accumulation of technological resources forming the so-called critical mass, among others, in the form of strong area of research and innovation, well-developed human resources, infrastructure, knowledge and experience, as well as networks of relations; (iii) strong links between the field of specialisation and the science and R&D sector, well-developed scientific research facilities with a strong market position, economic success and well-maintained relations with the sphere of business. In addition, what is needed is a well-developed system of institutions supporting and creating connections between the R&D sector and the business sector (e.g.: science and technology parks, technology transfer centres, technological incubators, clusters). However, in the framework of the regional perspective, the main focus is on the so-called territorial advantage achieved through: (i) territorialisation of specialisation field – smart specialisations should be embedded in endogenous resources of the region and be derived from tradition, experience and the socio-economic past of the region; (ii) combining diversity and similarity of regional resources – complementarity of regional resources and provision of resources that support the development of a given specialisation are necessary elements; (iii) business environment – formal and informal relationships between actors operating in a given region (Nowakowska, 2015, pp. 327–329).

Smart specialisations can arise in any region, regardless of the level of its technological advancement, as there is no such field in which innovative solutions cannot be applied (Foray, David and Hall, 2011). This requires, however, a change in the traditional view of the region's and/or country's specialisation, and focus on the search for the potential for the development of innovativeness and competitiveness based on its specialisation. This approach is particularly important for regions that are not leaders in the field of science and technology, as they are able to achieve greater benefits in the long term by focusing their potential on key areas where they have the appropriate resources (Foray, David and Hall, 2009; Pilarska, 2014; Rogut, 2013).

### **3. Smart Regional Specialisation as a Stimulant for the Development of Innovative Activity of Small and Medium-Sized Enterprises – A Case Study of the Świętokrzyskie Voivodeship**

#### **3.1. Characteristics of Smart Specialisations in the Świętokrzyskie Voivodeship**

The Świętokrzyskie Voivodeship is located in the central-southern part of Poland, in the area of the Kielce Upland, Nidziańska Basin and Przedborska Upland. It is one of the smallest voivodeships in Poland with an area of 11 708 km<sup>2</sup>, which is 3.7% of the country. The voivodeship encompasses the Świętokrzyskie Mountains that constitute the centre of the Kielce Upland, which has an impact on the development of tourism.

The Świętokrzyskie Voivodeship is an industrial and agricultural region (agricultural land covers 55.6% of the total area of the voivodeship), with a high degree of concentration of traditional industry related to manufacturing and processing of metals, mining and processing of mineral resources, and production of food. The division into the industrial north and the agricultural south, providing facilities for organic food production, is very distinctive.

In the Świętokrzyskie Voivodeship, the strategic objective of the Regional Innovation Strategy (RIS3) “*From absorption to results – how to stimulate the potential of the Świętokrzyskie Voivodeship 2014-2020+*” is the creation of culture conducive to innovation, entrepreneurship and competitiveness which will help generate new and sustainable jobs for highly skilled workers and will boost economic growth. The achievement of this objective required the determination of regional smart specialisations (From absorption to results..., 2014, p. 29).

As in most of the regions in Poland, the choice of smart specialisations in the Świętokrzyskie Voivodeship was made in accordance with the concept of entrepreneurial discovery defined as a continuous process whose aim is to identify areas that have the potential to achieve critical mass based on endogenous resources, i.e. skilled workforce, natural resources, clusters, R&D competences, etc. (Redriguez-Pose and Wilkie, 2015; Santini, Marinelli, Boden, Cavicchi and Haegeman, 2016). The process was carried out in three stages:

- the first stage – the preparatory stage (in 2014) was related to the identification of key companies, including SMEs, ready and able to use public support, which allowed for targeting public intervention at the key groups of beneficiaries. In addition, strengthening the potential of business environment institutions through the professionalisation of their services which were tailored to the needs of entrepreneurs;

- the second stage – the stage of testing (2015–2016) was connected with the implementation of instruments supporting innovative activity customised to the needs of enterprises;
- the third stage – the stage of improvement and acceleration (in 2017–2020) involved further deployment of innovation support instruments as well as modifying and targeting the RIS3 at selected regional smart specialisations.

The areas selected as smart regional specialisations should result in the creation of added value, and then spread to other sectors of the economy leading to the improvement of business performance and increased productivity (From absorption to results..., 2014, p. 12). In the case of the Świętokrzyskie Voivodeship, the selection process of these specialisations was based on the analysis of its economic and scientific potential, including a review of existing R&D infrastructure, R&D projects funded, granted patents, and consultations with regional partners cooperating within the innovation system.

Based on these assumptions, seven smart specialisations (SS) were selected: four main specialisations of high innovative potential (*Resource-Efficient Construction, Metal and Foundry Industry, Health Tourism, Spa and Wellness*, as well as *Modern Agriculture and Food Processing*) and three specialisations supporting the main ones (*Information and Communication Technologies (ICT), Sustainable Energy Development*, as well as *Trade Fair and Convention Industry*).

The potential for the development of Smart Specialisation *Resource-Efficient Construction* comprises: the presence of unique deposits of natural resources, strong traditions of the construction sector in the region (e.g.: Dyckerhoff S.A. Cement Plant, “Trzuskawica” Calcareous Factory, NIDA-GIPS LLC., “MORAWICA” Limestone Mine), growing eco and passive construction (Innowator and Dorbud S.A. clusters), the brand of products originating from the region recognisable in the national and European markets, along with the scientific and research potential of Kielce University of Technology with its strong Faculty of Civil Engineering and Architecture as well as Faculty of Mechatronics and Machine Design.

Smart Specialisation *Metal and Foundry Industry* has a long tradition due to the existence of strong industrial centres (Kielce, Ostrowiec Świętokrzyski, Skarżysko-Kamienna and Starachowice), and the presence of large companies with well-known brands, such as Polish Foundries, Celsa Ostrowiec Steelworks, Ostrowiec Foundry, and Ferrometal.

In the case of Smart Specialisation *Trade Fair and Convention Industry*, there is also a great potential for its development due to: a strong national and international position of Kielce Trade Fairs, extensive infrastructure (multifunctional congress and exhibition halls, conference rooms and a multi-storey car park), the Grono Targowe Kielce (GTK) cluster operations, the scientific potential of Jan Kochanowski University with its



specialisations related to marketing and exhibiting, industrial design and graphic design, as well as of Kielce University of Technology with its industrial design, management and marketing.

Smart Specialisation *Health Tourism, Spa and Wellness* also exhibits a significant development potential due to: natural resources of the region (e.g.: sulphate and thermal water – Mineral Pools in Solec Zdrój and Busko Zdrój), tourist attractions (e.g.: Pustelnia Żłotego Lasu in Rytwiany), expanding tourism and hospitality facilities, as well as well-developed healthcare services, especially in the field of oncology, cardiology and ophthalmology.

In the case of Smart Specialisation *Modern Agriculture and Food Processing*, the following assets constitute its development potential: a clean environment, i.e. almost 65% of the region's surface consists of protected areas, traditional agricultural areas with well-developed agriculture, high employment in agriculture (almost  $\frac{1}{4}$  of economically active inhabitants of the Voivodeship), well-developed gardening and fruit farming as well as agri-food processing.

Smart specialisation *Sustainable Energy Development* also has a considerable potential due to: existing sources of renewable energy, the Świętokrzysko-Podkarpacki Energy Cluster and the Effective Energy Consumption Innovation Circle operating in the region, cooperation of companies with complementary industries (e.g.: automation, metal industry, aggregate and construction materials), experience and competence of regional entities in the area of advisory services related to effective energy consumption, e.g.: energy performance certificates for buildings, energy audits, lighting audits, availability of biomass and substrates for biogas plants in the region.

The potential for the development of Smart Specialisation *Information and Communication Technologies (ICT)* is comprised of specialised competencies of employees connected with the ICT industry and related sectors, high innovativeness of companies dealing with ICT and a considerable potential of ICT applications for each of the selected smart specialisations, for example, the ICT industry as a supplier of modern solutions for business, as an integrator of information management processes, or as an animator of generating universal, global-scale solutions.

Each of these specialisations is developed by a specially created consortia composed of representatives of the regional innovation system, including local businessmen, regional business organisations, business environment institutions and universities.

In the author's opinion, on the basis of the analyses conducted, smart specialisations provide considerable foundations for the development of innovation in the region in the form of: units engaged in R&D activity, universities, research laboratories, business environment institutions, cluster initiatives and local government units, which in the future may result in an increase in innovative activity of small and medium-sized enterprises. SMEs



play a major role in achieving the RIS3 objectives in the Świętokrzyskie Voivodeship, the development of which can be fostered by the previously discussed potential of regional smart specialisations in the area of: (i) support for the development of new enterprises based on the industries showing a large potential for innovation, (ii) growth of expenditure on R&D in the business sector, (iii) support for the development of R&D in enterprises, and (iv) transfer of knowledge, innovation and technology within the framework of cooperation between the business sector and the sphere of science.

In 2016, the Świętokrzyskie Voivodeship had 111 128 registered business entities: micro-enterprises – 95.5%, small enterprises – 3.6%, and medium-sized enterprises – 0.9%. A little more than 1/3 of those entities carried out their business activities in the areas of regional smart specialisations (see Table 1), most in *SS Resource-Efficient Construction*, followed by *SS Modern Agriculture and Food Processing*, *SS Health Tourism, Spa and Wellness*, *SS Trade Fair and Convention Industry*, *SS Sustainable Energy Development*, *SS Metal and Foundry Industry*, as well as *SS Information and Communication Technologies* (Lisowska, 2017).

Enterprise	Smart Specialisation						
	Resource-Efficient Construction	Modern Agriculture and Food Processing	Health Tourism, Spa and Wellness	Trade Fair and Convention Industry	Sustainable Energy Development	Metal and Foundry Industry	Information and Communication Technologies
Micro	10810	7870	5708	5767	3296	2266	1944
Small	529	337	183	128	119	205	22
Medium	101	52	39	10	17	55	1
Large	14	8	20	3	3	20	0

Tab. 1. The number of enterprises according to the Polish Classification of Activity divisions assigned to individual smart specialisations by size in 2016. Source: Own elaboration based on data from the Central Statistical Office (GUS).

To examine the development of small and medium-sized enterprises in smart specialisations of the Świętokrzyskie Voivodeship, the paper makes use of the modified context indicator for areas of smart specialisation – *SME concentration by industry – location quotient*<sup>1</sup> (Plan Wykonawczy..., 2015), which allowed for monitoring the number of SMEs in selected manufacturing and service industries in the years 2010–2016.

Year	Location quotient for smart specialisations						
	SS REC*	SS MAFP*	SS HTSW*	SS TFCl*	SS SED*	SS MFI*	SS ICT*
2010	1.06	1.21	0.84	0.75	1.00	1.04	0.62
2011	1.03	1.29	0.86	0.75	1.05	1.05	0.65
2012	1.05	1.30	0.89	0.74	1.02	1.07	0.62
2013	1.08	1.32	0.89	0.73	1.02	1.11	0.67
2014	1.09	1.38	0.88	0.75	1.03	1.12	0.68
2015	1.08	1.35	0.87	0.74	1.04	1.16	0.65
2016	1.07	1.35	0.87	0.78	1.06	1.18	0.69

\* SS REC – *Smart Specialisation Resource-Efficient Construction*, SS MAFP – *Smart Specialisation Modern Agriculture and Food Processing*, SS HTSW – *Smart Specialisation Health Tourism, Spa and Wellness*, SS TFCl – *Smart Specialisation Trade Fair and Convention Industry*, SS SED – *Smart Specialisation Sustainable Energy Development*, SS MFI – *Smart Specialisation Metal and Foundry Industry*, SS ICT – *Smart Specialisation Information and Communication Technologies*.

Tab. 2. Context indicator SME concentration by industry – location quotient for the Świętokrzyskie Voivodeship in the years 2010–2016 according to the regional smart specialisations. Source: Own elaboration based on data from the Central Statistical Office (GUS).

The comparative analysis of the context indicator *SME concentration by industry – location quotient for the Świętokrzyskie Voivodeship in the years 2010–2016* indicates that during the analysed period the concentration of enterprises in Smart Specialisations *Modern Agriculture and Food Processing*, *Resource-Efficient Construction*, as well as *Metal and Foundry Industry* was higher than in Poland relative to the number of enterprises in the Voivodeship and in Poland (see Table 2). This indicates a large concentration of small and medium-sized enterprises in these industries. In the case of Smart Specialisations *Information and Communication Technologies (ICT)*, *Trade Fair and Convention Industry*, as well as *Health Tourism, Spa and Wellness*, the concentration in the analysed period was lower than in Poland relative to the number of companies in the Voivodeship and in Poland. This may indicate a smaller concentration of small and medium-sized enterprises in these industries than in other regions.

According to the author, the smart specialisations selected in the Świętokrzyskie Voivodeship, due to their potential and dedicated support system, can become a stimulant for the development of small and medium-sized enterprises cooperating with the widely understood business environment (e.g.: universities, research laboratories, other economic entities, public administration units, cluster initiatives) in order to initiate and develop their innovative activity which, as seen in statistical data and research presented in the next part of the paper, is carried out by regional business entities only to a minor extent.

### 3.2. Research Results

The subsequent part of the paper presents the results of the study<sup>2</sup> carried out with the use of the CATI technique in the period November–December 2016 among small and medium-sized companies conducting business activities in smart specialisations in the Świętokrzyskie Voivodeship. The aim of the undertaken research was the assessment of the impact of the development of smart specialisations in the region on stimulating innovative activity of small and medium-sized enterprises. The REGON database was the sampling frame, and the so-called legal unit (corresponding approximately to the company along with all its branches) was adopted as the drawing unit (and the statistical unit in the study). At the first stage, approx. 3000 entities located in the Świętokrzyskie Voivodeship were randomly selected, according to company size measured by the number of people employed (3 groups: micro-enterprises – the number of employees 0–9, small enterprises – the number of employees 10–49, and medium-sized enterprises – the number of employees 50–249). The total sample size was divided in proportion to the general population. The actual sample size, i.e. the number of fully completed surveys, was 314. In the analysed group of companies, micro enterprises dominated (87%), while small businesses accounted for 9.9%, and medium-sized ones for 3.1%.

The spatial structure of the market in which the analysed small and medium-sized enterprises operated was dominated by the national market (51.8% of the responses), followed by foreign markets (22.6%). Local markets (the sub-region in which the company operates) and regional ones (the voivodeship in which the company operates) had a similar share, which amounted to 12.5% and 13.1% respectively. Most of the surveyed companies were engaged in provision of services and commerce (65.7%), and only 34.3% in manufacturing activity.

One of the research areas comprised the assessment of the level of innovativeness of the companies investigated, which must be evaluated as very low, as only 32.5% of the companies surveyed introduced innovations in the last three years. Most often those were product (39.8%) and process innovations (32.1%), less often marketing (15.8%) and organisational (12.3%) ones. It is a common trend among small and medium-sized enterprises, confirmed by multiple studies discussed in the literature (cf. Janasz and Koziół, 2007; Lisowska, 2013; Marszałek and Starzyńska, 2013; Stawasz, 2013). The introduced innovations were characterised by a low level of novelty, mostly at the company level (approx. 70%), less often at the level of the local market – a little over 22%, or at the national level – approx. 8%. Such a distribution of the responses was recorded in each category of the companies surveyed based on size (micro, small and medium). The reasons for the introduction of innovations were varied, depending on company size (see Figure 1). The studied micro enterprises most often indicated

competitive pressure (63.1% of the responses) and market needs (52.4%) as the cause of innovation, while the analysed small enterprises pointed to increased competitiveness of the company (67.8% of the responses) and the desire to increase profits (49.5% of the responses). In contrast, the studied medium-sized enterprises indicated business development (52.8% of the responses), quality improvement (39.8%) and lower operating costs (35.2%). These results show different reasons for the need to introduce innovations depending on the scale of operation. For the surveyed micro and small enterprises, the most important are measures employed to improve their market position, while in the case of the studied medium-sized companies widely understood business development is a major issue.

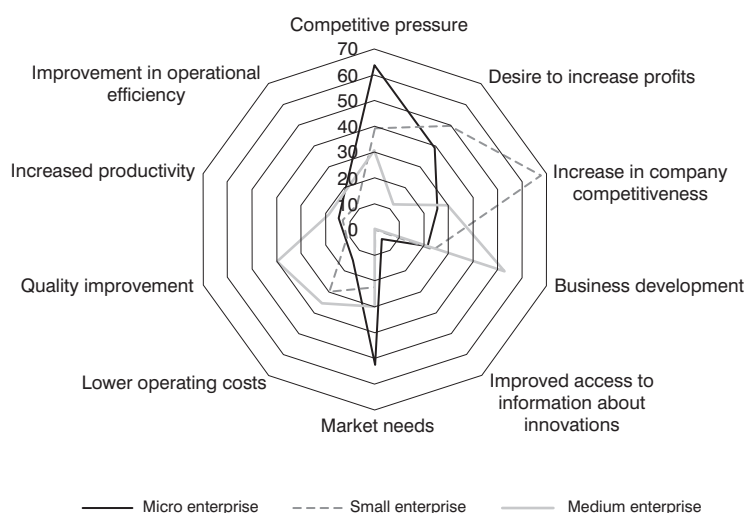


Fig. 1. The reasons for the introduction of innovations (%)\*. \* The respondents were allowed to choose up to 3 responses. Source: Own elaboration based on the CATI study (N = 102).

Entrepreneurs who identified the reasons for the introduction of innovations also indicated the sources of innovation (see Figure 2). The surveyed micro and small enterprises most often indicated as a source of innovation the purchase of a license, patent, or know-how (71.9% and 56.8% of the responses respectively), imitation of external solutions (68.3% and 42.5% of the responses respectively) and cooperation with enterprises which have their own innovations (49.8% and 40.1% of the responses respectively), while the studied medium-sized enterprises pointed to their own ideas and resources (69.5% of the responses), cooperation in creation of innovative ideas with research institutions or universities (49.3% of the responses)

and the involvement of experts (45.9% of the responses). The acquisition of an enterprise with its own innovations and cooperation in co-creation of innovations with other companies were the least important sources of innovation for the surveyed companies.

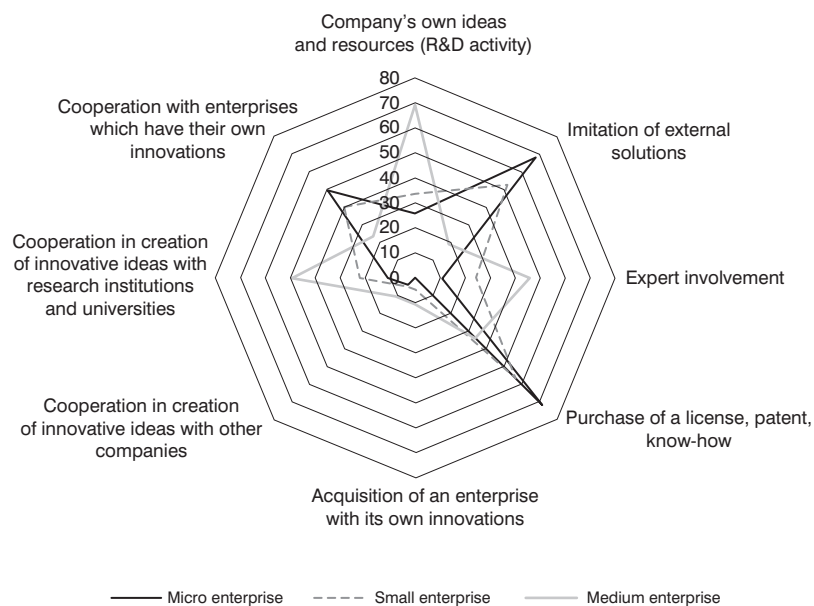


Fig. 2. The sources of introduced innovations (%)\*. \*The respondents were allowed to choose up to 3 responses. Source: Own elaboration based on the CATI study CATI (N = 102).

Another area of research was related to determining barriers to the introduction of innovations in the surveyed enterprises. The studied micro enterprises most often indicated as a barrier to innovation a lack of funding (72.8% of the responses), high costs of preparation and implementation of innovations (51.3% of the responses) and an insufficient technical base (42.5% of the responses), while the analysed small businesses pointed to high risk associated with the implementation of innovations (64.2% of the responses), a lack of suitably qualified personnel (49.3% of the responses) and difficult access to relevant experts and advisors (37.8% of the responses). The medium-sized enterprises indicated high costs of preparing and implementing innovations, high risk associated with the implementation of innovations (52.8% of the responses) and a lack of sectoral contacts (38.9% of the responses) (see Figure 3). These results indicate various problems faced by companies conducting innovative activities.

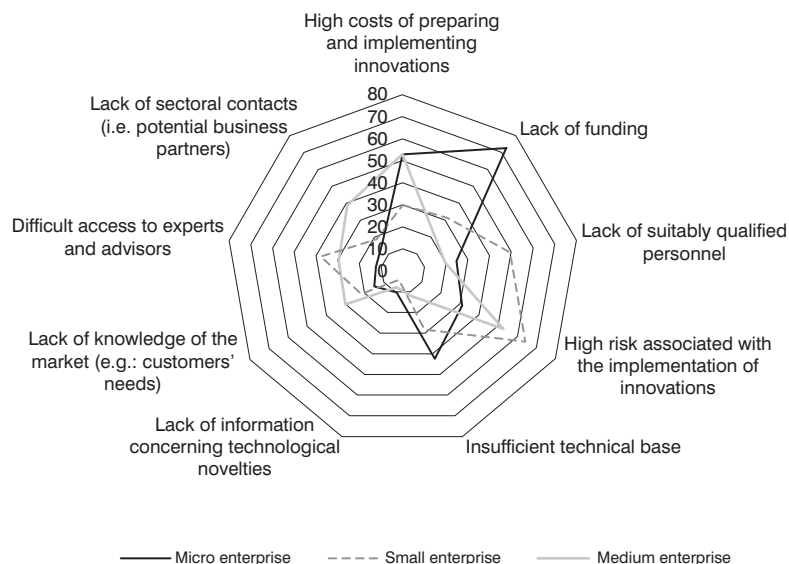


Fig. 3. Barriers to the introduction of innovations (%)\*. \*The respondents were allowed to choose up to 3 responses. Source: Own elaboration based on the CATI study (N = 314).

As indicated by the results of the research, innovative solutions are financed by most of the entrepreneurs (86.2%) with their own resources, only to a small extent with external financial resources, including the EU funds. Access to the EU funds, especially for the development of innovative activity, is difficult due to a low degree of innovativeness and a low level of novelty of innovations introduced in small and medium-sized enterprises, as well as insufficient resources (financial, material, human and informational). This means that only a small number of companies meet the criteria for the acquisition of funds from the EU programmes, for example, from the Smart Growth Operational Programme, the Operational Programme Knowledge Education Development, or the Regional Operational Programme for the Świętokrzyskie Voivodeship.

### 3. Conclusions

Smart specialisations of the Świętokrzyskie Voivodeship are based on the identified internal potential of the region in the form of science and research facilities (i.e. research units, scientific and research units, universities, research laboratories) and its economic base (business environment institutions, technological parks, and clusters). Despite the fairly well-developed infrastructure, in the author's opinion, the major problem of the Świętokrzyskie Voivodeship is low innovativeness of its regional business entities, as indicated by

the statistical data and the research presented in this paper. The research results confirm the nationwide trends including a small number of enterprises engaged in innovative activity (only 1/3), a low level of introduced innovations which are mainly product innovations of an incremental nature introduced at the company level; demand reasons (e.g.: competitive pressure) for the introduction of innovations by enterprises; and a low tendency to finance innovative activity from external sources, including the EU funds.

To improve this situation, it is important to support the development of smart specialisations in the Świętokrzyskie Voivodeship focusing on:

- increasing innovativeness of companies belonging to smart specialisations by supporting the development of R&D and cooperation between the business sector and the sphere of science;
- strengthening the involvement of scientific and research centres in conducting innovative activity by improving qualifications of researchers, encouraging young researchers to pursue projects for entrepreneurs and increasing expenditure on the purchase of apparatus and equipment for the implementation of innovative projects;
- supporting newly-established business entities that conduct R&D activity;
- supporting universities in conducting research on behalf of enterprises;
- supporting business environment institutions providing professional advisory and financial services for enterprises.

### Endnotes

<sup>1</sup> The context indicator *SME concentration by industry – location index* was calculated based on the following

$$\text{formula} = \frac{\frac{\text{number of SMEs in a given specialisation in a given year in the Voivodeship}}{\text{total number of SME sin a given year in the Voivodeship}}}{\frac{\text{number of SMEs in a given specialisation in a given year in Poland}}{\text{number of SMEs in a given year in Poland}}}$$

the index value > 1 shows a larger concentration of companies of a given specialisation in the Voivodeship in a given year relative to the number of companies of a given specialisation in Poland in a given year compared to the number of companies in the Voivodeship in a given year and the number of companies in Poland in a given year, while the index value <1 shows a smaller concentration of companies of a given specialisation in the Voivodeship in a given year relative to the number of companies of a given specialisation in Poland in a given year compared to the number of companies in the Voivodeship in a given year and the number of companies in Poland in a given year.

<sup>2</sup> The analysis was prepared on the basis of the empirical material collected within the framework of the project entitled “Trends in the development of innovativeness in the Świętokrzyskie Voivodeship” Measure 11.1 Effective and efficient system for the implementation of the ROP ŚV 2014–2020, Priority Axis 11 Technical Assistance of the Regional Operational Programme of the Świętokrzyskie Voivodeship for the years 2014–2020.



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