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INNOVATIVENESS OF SMALL AND MEDIUM ENTERPRISES IN CENTRAL AND EASTERN EUROPE

Abstract

- *Goal* – the sector of small and medium enterprises (SMEs) is considered a driving force for economic development. The literature on the subject increasingly emphasises that it is SMEs that initiate transformation of an economy as they play a crucial role in implementing innovations that make it possible to enhance its competitive success. The purpose of the article is to assess the level of innovativeness (innovative activity) of small and medium enterprises in CEE countries.
- *Research methodology* – the article contains an analysis of innovation measures and indicators, including (among others) the share of enterprises classified as innovative, the level of outlays on research and development, the number of research workers, and the number of innovations implemented by companies. The authors verified two research hypotheses: H1: The SME sector in CEE is becoming increasingly more innovative; H2: CEE countries significantly differ in terms of the level of innovativeness in their SMEs. In order to achieve our purpose and verify the research hypotheses, we use publicly available data and indicators published by Eurostat or the European Commission. The study covers EU member states located in Central and Eastern Europe: the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia.

- *Score/result* – the presented statistical data indicate that the innovativeness of small and medium enterprises in CEE countries is growing. An increasing number of SMEs can be classified as innovating companies. The firms' own expenditure on R&D (BERD) and non-R&D innovation has also been rising. A marked increase can be observed in the number of employed scientists and R&D personnel in small and medium enterprises in CEE countries. It should be emphasised, however, that these countries vary significantly in terms of their levels of innovation in the SMEs sector.
- *Originality/value* – the review of the literature on the subject and the conducted analysis have highlighted serious problems with measuring innovation and the availability of data, particularly that regarding SMEs. On the other hand, the obtained results make it possible to identify areas of interest for future research projects. Among them, special attention is deserved by the reasons for the disparities in innovation across SMEs from CEE countries.

| Keywords: sector of small and medium enterprises, innovativeness, measurement of innovativeness, Central and Eastern Europe

1. Introduction

The sector of small and medium enterprises (SMEs) is considered a driving force for economic development. What is more, the literature on the subject increasingly emphasises that it is SMEs that initiate transformation of an economy as they play a crucial role in implementing innovations that make it possible to enhance its competitive success. Therefore, innovativeness is regarded as a determinant of enterprise development and thereby a factor behind the development of entire economies. This is particularly true about developing economies, a category to which most Central and Eastern European countries (CEE) belong.

The purpose of the article is to assess the level of innovativeness (innovative activity) of small and medium enterprises in CEE countries. We conducted a comparative analysis of innovation measures and indicators, including (among others) the share of enterprises classified as innovative, the level of outlays on research and development, the number of research workers, and the number of innovations implemented by companies. Our study examines and verifies the following two research hypotheses:

H1: *The SME sector in CEE is becoming increasingly more innovative.*
H2: *CEE countries significantly differ in terms of the level of innovativeness in their SMEs.*

In order to achieve our purpose and verify the research hypotheses, we use publicly available data and indicators published by Eurostat or the European Commission. The study covers EU member states located in Central and Eastern Europe: the Czech Republic, Estonia, Lithuania, Latvia, Poland, Slovakia, Slovenia, and Hungary. The conducted analysis has allowed us to assess the level of innovativeness in the SME sectors of the particular countries and has provided a basis to formulate conclusions and indicate further research areas in the field under examination.

2. Significance of SME sector

The sector of small and medium enterprises is regarded as a foundation of the economies of many countries. Micro-enterprises and small/medium enterprises account for 99 percent of all the enterprises of the EU. According to experts, it is they that cultivate the spirit of entrepreneurship and innovation [Electronic document (3)].

The SME sector can be divided into three basic types of companies: micro-, small, and medium enterprises. Classification into these categories is performed on the basis of quantitative criteria, i.e. the number of employed persons, annual turnover, and annual balance sheet total (Table 1).

Table 1. Classification of enterprises according to quantitative criteria

Type of enterprises	Characteristic
Micro enterprise	employed fewer than 10 persons, an annual turnover, or an annual balance sheet total does not exceed EUR 2 million
small enterprise	employed fewer than 50 persons, an annual turnover, or an annual balance sheet total does not exceed EUR 10 million
medium enterprise	employed fewer than 250 persons; an annual turnover does not exceed EUR 50 million, or an annual balance sheet not exceeding EUR 43 million

Source: Electronic document (2).

Apart from the formally applicable quantitative criteria for classifying enterprises, also qualitative criteria can be used. They refer to the characteristics of the sector in question (Table 2). The emphasis is on independence in decision-making, flat organisational structure, innovativeness, and efforts to increase market shares

[Tomczyk, 2012: 160]. At the same time, the SME sector is exceptionally varied in terms of the organisational and legal framework under which business is done, the scale, type and range of business activity, or industry structure.

Table 2. Classification of enterprises according to qualitative criteria

Criterion	Enterprises	
	Micro-, small, and medium	Large
Management system		
Managerial functions	Owner	Managers
Information system	Insufficient	Extensive, formalised
Knowledge about management	Limited, often insufficient	Solid
Group decision-making	Happens rarely	Happens frequently
Significance of institutions	Great	Small
Organisation		
Type of organisational structure	Usually functional	Varied
Formalisation of tasks	Low	High
Flexibility of organisational structure	High	Low
Means of transmitting information	Short, often direct	Long and formalised
Delegation of managerial authority	Limited	Broad
Provision of guidance and command control	Direct	Formalised
Finances		
Capital ownership	Capital belongs to family members or another narrow group	With participation of capital market
Access to capital market	No access (hence limited financial resources)	Free access (hence ample financial resorces)
State support in crisis situations	Restricted	Probable

Criterion	Enterprises	
	Micro-, small, and medium	Large
Human resources		
Number of employees	Low	High
Share of unskilled workforce	Low	High
Contacts among employees	Evident across the entire staff	Only in work teams
Production		
Type of production	Work-intensive	Capital-intensive
Types of used materials and devices	Universal	Specialist
Division of labour	Low	High
Possibility to reduce costs thanks to increased production	Low	High
Sales		
Sales market	Individual needs of customers	Mass demand
Market position	Varied	Good
Research and development		
Market research	Short-term	Long-term
Separate R&D units	No permanent R&D units	Permanent R&D units
Development of new products	Usually oriented on the needs of customers	Closely related to basic research
Supply and warehouse management		
Position in supply market	Weak	Strong
System of material supply	Order-based (with the exception of trade)	Based on long-term contracts with suppliers

Source: Lachiewicz, Majetun, 2021: 30–32.

Analysis of the qualitative criteria which can serve as a basis for classification of enterprises reveals a number of challenges that the SME sector faces. In order to stay in business smaller companies have to actively adapt to the needs of customers, expectations of suppliers, activities of competitors, as well as changes in the broadly-understood business environment. When building their competitive advantage, entrepreneurs strive to exploit relational resources by exerting an influence on stakeholders, managing relations, operating in networks of interpersonal relationships, and shaping interorganisational liaisons. Representatives of the SME sector are increasingly aware of the fact that traditional concepts of competitiveness, including [Danielak, Mierzwa, Bartczak, 2017: 19]:

- cost competitiveness,
- quality leadership,
- competition based on the market strength of enterprises,
- marketing concepts of competition,
- focus on market niches,
- cost leadership and differentiation

are no longer sufficient. For this reason, changes in business environment prompt them to search for new sources of competitive advantage. These can be found in innovative business models conducive to creating and providing new values in novel ways [Danielak, Mierzwa, Bartczak, 2017: 21].

Pursuit of new solutions is facilitated by such assets as, e.g., capacity for dynamic action and timely reaction to changes in the environment, rapid adjustment to market needs, creation of new jobs, and openness to new technologies and technical progress [Wolański, 2013: 20].

What is more, small and medium enterprises play an important part in economic development due to their significant share in domestic product, creation of new workplaces, increasing productivity and investment expenditures, as well as undertaking and implementing innovative projects which boost competitive advantage [Danielak, Mierzwa, Bartczak, 2017: 9]. Thanks to these features, enterprises contribute to qualitative and quantitative changes that occur in an economy [Gherghina et al., 2020: 2].

The SME sector seeks solutions in innovative products, unconventional marketing and management methods, as well as ground-breaking technologies [Popescu, 2014: 514]. Development of product, process and organisational innovations enables companies to gain a competitive edge, thereby ensuring that both they and entire economies accomplish sustainable development.

3. The essence of innovativeness

The term 'innovation' is derived from the Latin word *innovatio*, i.e. "renewal". J. Schumpeter was the first economic scholar to fully recognise the importance of the phenomenon. In his opinion, innovation encompassed the following range of activities [Schumpeter, 1960: 64]:

- launching of a new product or semi-finished product characterised by new properties;
- introduction of a new production method and a new technological process;
- opening of a new sales market;
- acquisition of a new source of raw materials and semi-finished products;
- reorganisation of production.

The issue of innovation was further developed by P. Drucker, who perceived it as a tool by means of which entrepreneurs were able to embark on new business ventures, launch novel products, or offer new services, which gave them fresh opportunities to create wealth [Drucker, 1992: 29].

According to the OECD, an innovation consists in implementing a new or significantly enhanced product, process, marketing or organisational method used in economic practice, as well as in shaping the relations with the environment of the enterprise [Electronic document (1)]

The Oslo Manual (2018), which contains recommendations regarding acquisition, presentation and application of data on innovation, defines the term as "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into to use by the unit (process)" [GUS, 2020: 22]. Knowledge indispensable for creating an innovation, the value of novelty and utility, as well as creation and maintenance of the values at which the innovation is aimed are key constituent elements of the innovative process. In line with these assumptions, an innovation must be implemented, i.e. transferred to others for use. Therefore, it can either be an activity or a result of an activity [GUS, 2020: 22–23].

J. Brzóska and J. Cierkosz claim that the path to development and implementation of innovation in itself constitutes innovativeness [Brzóska, Cierkosz, 2016: 12]. An innovation is, therefore, the ability and willingness of entrepreneurs to seek and put into economic practice the outcomes of scientific research. Innovating also involves learning – a process which requires collecting knowledge

and information relevant for the kind of business activity which a given enterprise pursues [Brzóska, 2014: 105–135].

In view of the impact that innovations have on competitiveness as well as economic and civilisational development, attempts are more and more often made to identify the determinants of innovativeness. C.L. Wang and P.K. Ahmed observed that determinants of innovativeness are closely correlated with the innovation potential that an organisation possesses and exploits [Wang, Ahmed, 2004: 313]. The capacities of enterprises to implement innovations are shaped by a number of factors [Stefaniuk, 2019: 36]. H. Albach divides them into two types: internal and external factors. The former group comprises structural factors, including innovation strategies, and organisational structure and processes as well as soft factors, e.g. organisational culture of an enterprise or the style of team management. Among external factors are, among other things, state innovation policy or market and non-market relations with external subjects [Albach, 1993: 31].

It is important, however, that innovativeness is not restricted to a one-off implementation of an innovative project, but that it becomes a process of continuous search for novel solutions. M. Romanowska referred to this kind of approach as 'sustained innovation'. In her opinion, "sustained innovation, manifested in continual undertaking of innovation efforts in various aspects of activity and in building an enduring competitive advantage based on innovation, requires consistent, long-term changes in the systems of law, science, education, and upbringing as well as establishment of stable principles on which to build the functioning of the state" [Romanowska, 2016: 29].

Initiation of innovative processes is a challenging issue for many economies. According to J. Tidd and J. Bessant, innovation plays a multidirectional role in the modern economy. It enables opening of new markets, helps strengthen enterprises' position in their current fields of operation, opens opportunities for implementing new technologies as well as for repurposing hitherto used technologies. As a result, innovations contribute to fortifying national economies, becoming strategic areas of state economic policies [Tidd, Bessant, 2018]. Building competitive advantages around knowledge and innovation is crucial for sustainable development. Economies which are capable of generating innovations on a regular basis increase their chances of achieving success [Kasperkiewicz, 2008].

Globalisation, technological advancement, progressive informatisation, and rapid digitalisation lead to increased involvement in the development of innovative solutions. The phenomena listed above provide an opportunity to eliminate the main differences between nations, regions, and enterprises [Gherghina

et al., 2020: 5]. Of course, changes which take place in this area can generate "new difficult challenges for small enterprises. And yet, the successes of many small companies which have adopted the 'born global' strategy can reassure us that also small and medium enterprises are capable of addressing the challenges which arise from the globalisation process" [Różański, 2016: 5]. Nevertheless, if implemented innovations are to produce satisfactory effects, it is vital to monitor the outcomes of enterprise culture management and to support companies to identify and utilise innovation capacities [Guan et al., 2019: 12].

4. Methodology and measurement of innovativeness

Although seemingly straightforward and intuitive, the notion of innovativeness is rather difficult to define. It is also far from easy to devise a reliable method for measuring innovativeness. Obviously, measurement and assessment of innovation are among the most crucial aspects of research and analysis of innovative phenomena which take place in enterprises. However, the literature fails to provide a single, universal way to measure this category.

Measurement methods of innovativeness vary depending on, for instance, the scale of analysis. Innovativeness of enterprises can be evaluated by means of many different factors, such as: human resources involved in creating innovation, financial resources allocated to creating innovation, the number of filed patent applications, the number of new products or services launched into the market, the commercial viability of investments in innovation, or the share of new products in a company's revenue, as well as many others. They are usually classified into two types: expenditure factors and outcome factors [Karbowski, 2015]. Nawrocki categorises measures of innovativeness in a slightly broader way, dividing them into four categories [Nawrocki, 2015: 222]: 1) resource potential of innovative activity; 2) expenditures on innovation; 3) outcomes of innovative practices, viewed from a quantitative/value-oriented perspective, as well as from qualitative and time-oriented ones; 4) impact of innovative activity on the enterprise's financial results. Boston Consulting Group suggests that an assessment of a firm's innovative activity should employ a balanced collection of measures from three categories: expenditures, processes, and outcomes [Motyka, 2011: 164].

Problems can be encountered also in macroeconomic analyses since measurement and assessment of the innovativeness of economies requires using aggregated macroeconomic data. Among the ways to overcome the limitations of the

methods used for measuring innovation of economies is the methodology applied in the European Innovation Scoreboard (EIS) reports. The annual reports assess the innovative achievements of the EU member states, as well as those of the USA, Japan, Switzerland, Turkey, Norway, and Iceland, based on the Summary Innovation Index (SII). The SII offers a synthetic assessment of innovativeness, not only taking into account resources and expenditures on innovation, but also the results (effects) accomplished as a consequence of applying innovations [Knop, Olko, 2015: 293]. The latest (2021) EU table is based on 32 indicators, grouped into 4 main categories and 12 dimensions[1]. In view of the conducted research, the economies of the EU member states are divided into four groups, depending on the achieved results: innovation leaders, strong innovators, moderate innovators, emerging innovators[2].

Thanks to the applied methodology and extensive comparative material, the reports of the European Commission make it possible to assess the level of innovativeness in the various EU countries – both overall and with regard to particular dimensions [Prystrom, 2018: 127]. The wide range of data encourages scholars to use them in their analyses of different issues associated with innovativeness. The literature contains information about their usefulness for assessing innovativeness from the macroeconomic or regional perspective [Prystrom, 2018: 127]. Among the data describing innovation in the EIS reports there are also indicators referring to the activity of the SME sector, including SMEs with product innovations (percent share), SMEs with business process innovations, and innovative SMEs collaborating with others.

5. Comparative analysis of selected measures of innovativeness of the SME sector in Central and Eastern European countries

Analysis of the current state of innovation and its change trend is an important part of assessing the innovativeness of economies. Because of the limited length of this article and accessibility of data, we only analyse a selection of measures

[1] The exact structure of the SII is presented in [*European Innovation Scoreboard 2021*…, 4]

[2] The group of 'innovation leaders' comprises of countries with an SII above 125 percent of the EU average, The countries which are 'strong innovators' have an SII of 100–125 percent of the EU average. Among 'moderate innovators' are those countries whose SII falls between 70 and 100 percent. The SII of 'emerging innovators' is below 70 percent of the EU average [ibidem, 24].

reflecting the innovative performance of enterprises. The current state is demonstrated using the latest available data, although some of them end at the year 2018, other at 2019, and still other at 2021[3].

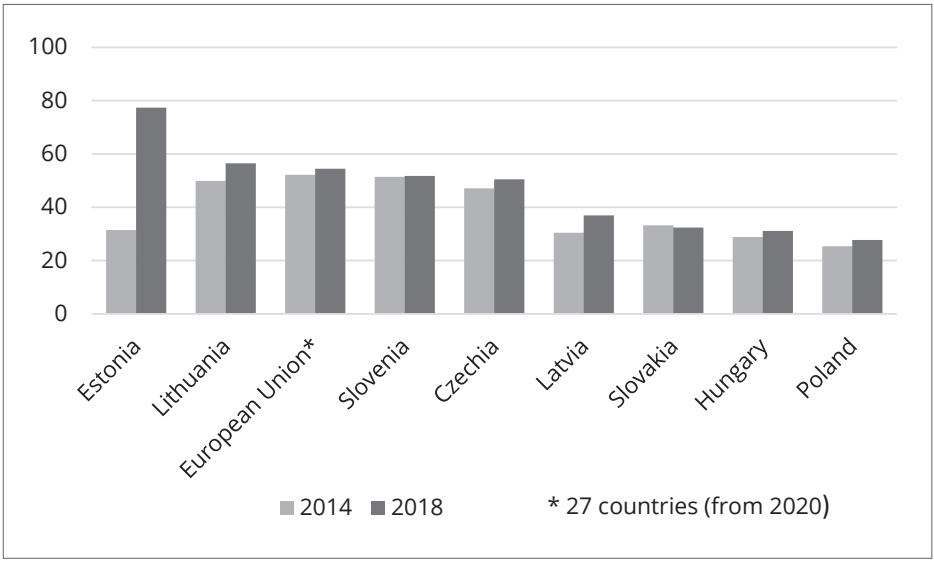
In accordance with what was mentioned above, measures to evaluate the innovativeness of the SME sector were divided into two groups:

1. Indicators which reflect expenditures on innovative activity – they describe the ability of small/medium enterprises to innovate, i.e. the potential of the SME sector for creating and commercialising innovations. Among them are, e.g., the volume of expenditure on research and development, the number of persons employed in R&D, or the expenditure that enterprises incur to finance innovation practices.
2. Indicators which describe the outcomes of innovation activity in SMEs – these serve to assess the innovation position of the SME sector. They include, for instance, the percentage of SMEs regarded as innovating, the percentage of SMEs which implement product innovations, or the percentage of SMEs which implement process innovations.

In Central and Eastern Europe, Estonia is the leader as regards both the overall share of innovating companies and their share in the SMEs sector. As data collected in the years 2016–2018 reveal, more than 70 percent of small and medium enterprises in Estonia were classified as innovative (see Chart 1). Also Lithuania's percentage of innovating SMEs was above the EU average. Over 56 percent of Lithuanian SMEs were described as innovative. Poland ranked the lowest in this group of countries: less than 28 percent of Polish SMEs engaged in innovation. Hungary and Slovakia also occupy relatively low positions in this ranking. Still, it can be noticed that the percentage of innovating SMEs is growing in every Central and Eastern European country. This can be a confirmation of the increasing innovativeness of the sector as well as its growing significance for enhancing the innovative character of CEE economies.

[3] Analysis of the innovativeness of small and medium enterprises poses methodological and statistical difficulties. Data used for analysis mainly come from Eurostat or the European Innovation Scoreboard. Indicators from the latter source regard the years 2014–2021. Some data on SME's innovativeness found in Eurostat databases are only available for up to 2018 or 2019, depending on the type. Moreover, some of the information is only collected for entrepreneurs who employ from 10 to 249 persons (e.g. the percentage of innovating enterprises).

Chart 1. Share of innovative SMEs in CEE countries, 2014, 2018



Source: authors own work based on: Eurostat Statistics Database (1).

Rising internal expenditure on research and development also testifies to an increasing level of innovativeness. The latest data published by Eurostat confirm the growing involvement of small and medium enterprises in research and development. Nearly all CEE countries report rises in R&D expenditure (BERD, Business Enterprise Research and Development), both in terms of overall value and per enterprise.

In the years 2011–2019 (see Table 3), of all the economies under analysis the highest expenditures were made by SMEs from the larger (area and population wise) economies, i.e. Poland, the Czech Republic, Hungary, and Slovenia. Besides, Poland and Lithuania were countries in which the greatest dynamics of increases in R&D expenditure was noted. The assessment of innovativeness of the SMEs in CEE countries is slightly different when we take into consideration the relative values of the indicators reflecting expenditure on innovation (e.g. per one enterprise). From this perspective, Slovenia and Estonia were countries where BERD expenditures were the highest. Both in 2011 and 2019, their value was far above what the other countries of the region reported. Czech companies ranked quite high in this regard, whereas enterprises from Latvia and Poland ranked the lowest. It is worth remembering, however, that in Central and Eastern European countries, with the exception of Estonia and the Czech Republic, it is

the state that plays a major role in financing R&D [Ciborowski, 2016: 85]. For this reason, in spite of the fact that BERD expenditure keeps growing, in all the CEE countries, it still remains lower than the EU average:

Table 3. BERD in Small and Medium Enterprises for CEE Countries in the years 2011–2019

GEO/ TIME/ Unit	2011		2014		2019		Average 2011–2014
	Mln euro	Euro per inhabitant	Mln euro	Euro per inhabitant	Mln euro	Euro per inhabitant	Mln euro
Czechia	613,59	58,5	676,67	64,4	718,61	67,5	648,07
Estonia	193,15	145,3	71,55	54,4	133,93	101,1	95,01
Latvia	20,67	10,0	29,00	14,4	34,40	18,0	27,29
Lithuania	33,48	11,0	89,73	30,5	177,44	63,5	92,82
Hungary	310,21	31,1	436,24	44,2	649,12	66,5	454,20
Poland	290,08	7,6	596,23	15,7	1483,69	39,0	837,65
Slovenia	303,25	147,9	315,22	152,9	299,61	144,0	288,09
Slovakia	78,47	14,6	93,60	17,3	144,10	26,5	104,81

Source: authors own work based on: Eurostat Statistics Database (2).

The SME sector's potential for creation and commercialisation of innovations largely depends on the human resources involved in the process. Higher quality human capital allows companies to maintain an advantage in innovation and accelerate the diffusion and absorption of novel solutions. To a certain extent, the presence of scholars and other R&D employees among the staff of an organisation can be interpreted as a reflection of the quality of its human capital. As can be seen in Table 4, Czech SMEs typically employed large numbers of this kind of workers. Poland, Lithuania, and Hungary noted a rapid growth of this indicator. For instance, in comparison with 2012, the number of R&D employees in Polish small and medium enterprises grew more than four-fold. In 2019, it reached over 34,000 persons, far exceeding the relevant figures recorded in the other CEE countries. The growing trend to hire persons with higher education and other R&D employees by SMEs may be a valuable opportunity to boost the innovative performance of these companies.

Table 4. R&D personnel and researchers in SMEs for CEE Countries, in the years 2011–2019

GEO/TIME	2011	2012	2013	2014	2015	2016	2017	2018	2019
Czechia	14 939	15 673	16 569	16 038	15 676	14 496	16 525	16 488	16 791
Estonia	1 307	1 109	1 019	1 116	984	—*	—	1 334	1 518
Latvia	473	535	640	642	723	654	653	840	794
Lithuania	1 415	1 166	1 783	—	2 119	1 966	3 078	3 621	4 028
Hungary	8 942	11 488	13 142	11 976	10 017	8 806	11 601	16 588	17 559
Poland	—	8 495	11 755	13 142	16 111	—	29 162	33 613	34 458
Slovenia	5 417	—	5 959	5 810	5 480	5 253	5 584	5 776	6 390
Slovakia	1 784	1 948	1 936	1 953	2 016	2 342	2 413	2 931	3 212

* – not available.

Source: authors own work based on: Eurostat Statistics Database (3).

An assessment of innovativeness of the SME sector from the point of view of introduced innovations is reflected in the sub-indices of the Summary Innovation Index published by the European Commission.

Table 5. Assesment of innovativeness of the SMEs for CEE Countries by sub-indicies of the Summary Innovation Index

SMEs introducing product innovations			
Economy	2014	2019	2021
Estonia	81,39	81,08	238,84
Slovenia	107,15	74,47	184,76
Lithuania	20,37	120,15	152,45
Czechia	106,68	109,97	117,54
Hungary	13,10	38,48	79,44
Latvia	13,23	31,59	59,72
Slovakia	36,12	32,00	42,21
Poland	2,86	6,83	29,99

SMEs introducing business process innovations			
Economy	2014	2019	2021
Estonia	90,49	115,00	199,17
Lithuania	58,69	143,31	149,83
Czechia	83,17	107,60	127,25
Slovenia	111,56	111,56	111,56
Latvia	42,29	42,74	53,77
Slovakia	60,56	29,68	32,77
Hungary	44,54	14,00	21,79
Poland	8,02	5,15	12,57

Source: authors own work based on: *European Innovation Scoreboard 2014–2021...*

Selected data contained in Table 5 show that in almost every CEE country, the indicators of innovation activity in SMEs have been improving. Only Slovakia recorded a decline in the category of implemented process innovations. At present (2021 Report), SMEs from Estonia are the undisputed leader among the CEE countries as far as the number of product innovations is concerned. Lithuanian SMEs enjoy the highest growth dynamics of the analysed indicators. Slovenia and the Czech Republic are also in the top four countries of the region as regards introduction of product and process innovations by SMEs. Poland ranks at the bottom of all the CEE countries in this respect.

6. Conclusion

The considerations and analyses undertaken in the article allowed positive verification of both hypotheses. The above-presented statistical data indicate that the innovativeness of small and medium enterprises in CEE countries is growing. An increasing number of SMEs can be classified as innovating companies. The firms' own expenditure on R&D (BERD) and non-R&D innovation has also been rising. A marked increase can be observed in the number of employed scientists and R&D personnel in small and medium enterprises in CEE countries.

It should be emphasised, however, that these countries vary significantly in terms of their levels of innovation in the SMEs sector. The leader, Estonia, has a highly innovative SME sector – at least compared to the other countries of the region. It is there that the greatest number of innovative companies can be found, as well as the highest BERD expenditure per enterprise, and the highest indicators of product and process innovations. The SME sectors of Lithuania, the Czech Republic, and Slovenia also compare very favourably with those of the other CEE countries. The innovativeness of Polish SMEs is the least impressive. Despite significant amounts of expenditures on research and development and non-R&D innovation, or a high number of scientists and R&D staff employed by companies from the SME sector, the results accomplished by this sector are the worst in the region. For instance, the value of the sub-index 'SMEs introducing product innovations' in the SII was almost 8 times lower in Poland than in the regional leader, Estonia, while in the case of 'SMEs introducing business process innovations', the value was more than 15 lower. This confirms the observation that the levels of innovativeness of the SME sector in CEE countries vary widely.

The review of the literature on the subject and the conducted analysis have highlighted serious problems with measuring innovation and the availability of data, particularly that regarding SMEs. On the other hand, the obtained results make it possible to identify areas of interest for future research projects. Among them, special attention is deserved by the reasons for the disparities in innovation across SMEs from CEE countries.

References

Albach H., 1993, *Culture and Technical Innovation*, Berlin.

Brzóska J., 2014, *Innowacje jako czynnik dynamizujący modele biznesowe*, Gliwice.

Brzóska J., Cierkosz J., 2016, *Ocena innowacyjności przedsiębiorstw w Polsce*, "Przegląd Organizacji", No. 10.

Ciborowski R., 2016, *Międzynarodowy transfer technologii a innowacyjność krajów Europy Środkowo-Wschodniej*, Białystok.

Danielak W., Mierzwa D., Bartczak K., 2017, *Małe i średnie przedsiębiorstwa w Polsce. Szanse i zagrożenia rynkowe*, Wrocław.

Drucker P.F., 1992, *Innowacja i przedsiębiorczość: praktyka i zasady*, Warszawa.

Electronic document (1), [on-line] https://cordis.europa.eu/article/id/30033-oecd-report-urges-countries-to-promote-science-and-innovation/pl [date of access: 26.08.2022].

Electronic document (2), [on-line] https://eur-lex.europa.eu [date of access: 26.08.2022].

Electronic document (3), [on-line] https://www.europarl.europa.eu/factsheets/pl/sheet/63/male-i-srednie-przedsiebiorstwa [date of access: 26.08.2022].

European Innovation Scoreboard 2021. Methodology Report, 2021, European Commision, Maastricht Economic and Social Research Institute on Innovation and Technology – UNU-MERIT.

European Innovation Scoreboard 2014–2021, [on-line] https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en [date of access: 24.08.2022].

Eurostat Statistics Database (1), [on-line] https://ec.europa.eu/eurostat/data/database, [inn_cis9_type; inn_cis11_type] [date of access: 27.08.2022].

Eurostat Statistics Database (2), [on-line] https://ec.europa.eu/eurostat/data/database, [rd_e_berdsize] [date of access: 20.08.2022].

Eurostat Statistics Database (3), [on-line] https://ec.europa.eu/eurostat/data/database, [rd_p_perssize] [date of access: 24.08.2022].

Gherghina S.C., Botezatu M.A., Hosszu A., Simionescu L.N., 2020, *Small and Medium-Sized Enterprises (SMEs): The Engine of Economic Growth through Investments and Innovation*, No. 12.

Guan H.J., Zhang Z., Zhao A.W., Jia J.Y., Guan S., 2019, *Research on Innovation Behavior and Performance of New Generation Entrepreneur Based on Grounded Theory*, "Sustainable", No. 11,

GUS, 2020, *Podręcznik Oslo. Zasady gromadzenia i interpretacji danych dotyczących innowacji*, Warszawa–Szczecin.

Karbowski A., 2015, *Innowacyjność przedsiębiorstw – miary oraz modele*, "Kwartalnik Nauk o Przedsiębiorstwie", No. 36, Issue 3.

Kasperkiewicz W., 2008, *W poszukiwaniu strategii innowacyjnej polskiej gospodarki*, [in:] *Mechanizmy i źródła wzrostu gospodarczego. Polityka ekonomiczna a wzrost gospodarczy*, J.L. Bednarczyk, S.I. Bukowski, W. Przybylska-Kapuścińska (eds.), Warszawa.

Knop L., Olko S., 2015, *Analiza zmian wskaźników innowacyjności Polski na tle UE na podstawie Summary Innovation Index*, "Zeszyty Naukowe Politechniki Śląskiej", series: *Organizacja i Zarządzanie*, Issue 83.

Lachiewicz S., Majetun M., 2021, *Specyfikacja zarzadzania małymi i średnimi przedsiębiorstwami*, [in:] *Zarządzanie małą i średnią firmą w teorii i ćwiczeniach*, M. Majetun (ed.), Warszawa.

Motyka S., 2011, *Pomiar innowacyjności przedsiębiorstwa*, [on-line] http://www.ptzp.org.pl/files/konferencje/kzz/artyk_pdf_2011/075.pdf [date of access: 15.07.2022].

Nawrocki T., 2015, *Problematyka pomiaru i oceny innowacyjności przedsiębiorstw*, "Zeszyty Naukowe Politechniki Śląskiej", series: *Organizacja i Zarządzanie*, Vol. 79, No. 1930.

Popescu N.E., 2014, *Entrepreneurship and SMEs Innovation in Romania*, "Procedia Economics and Finance", No. 16.

Prystrom J., 2018, *Wybrane problemy monitorowania innowacyjności gospodarek krajów UE*, Białystok.

Romanowska M., 2016, *Determinanty innowacyjności polskich przedsiębiorstw*, "Przegląd Organizacji", No. 2.

Różański J., 2016, *Innowacje w globalizującej się gospodarce*, "Przegląd Organizacji", No. 6, Issue 917.

Schumpeter J., 1960, *Teoria wzrostu gospodarczego*, Warszawa.

Stefaniuk K., 2019, *Innowacyjność i jej znaczenie dla korporacji*, "Zeszyty Naukowe Wyższej Szkoły Humanitas. Zarządzanie", No. 1.

Tidd J., Bessant J., 2018, *Inovation management challenges: from fads to fundamentals*, "International Journal of Innovation Management", Vol. 22, No. 5.

Tomczyk M., 2012, *Małe i średnie przedsiębiorstwa w gospodarce polskiej*, "Obronność. Zeszyty Naukowe", No 4.

Wang C.L., Ahmed P.K., 2004, *The Development and Validation of the Organisational Innovativeness Construct Using Confirmatory Factor Analysis*, "European Journal of Innovation Management", Vol. 7, No. 4.

Wolański R., 2013, *Wpływ otoczenia finansowego na konkurencyjność małych i średnich przedsiębiorstw*, Warszawa.