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# Impact of the Covid-19 Pandemic on the Innovativeness of SME Enterprises in Poland: A Regional Perspective

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***Abstract:***

***Purpose:*** *The aim of the study was to determine whether the Covid-19 virus pandemic had an impact on the innovativeness of SME enterprises in Poland. The author formulated the following research hypothesis: (H1) The Covid-19 pandemic had a negative impact on the innovativeness of SME enterprises. The author conducted a comparative analysis of key measures of innovation of SME enterprises in three relevant time periods: immediately before the start of the pandemic, during the pandemic, immediately after the end of the pandemic (cancellation of restrictions on the operation of enterprises). The results were aggregated at the regional level.*
***Design/Methodology/Approach:*** *The study is based on an exploratory-descriptive method, involving statistical analysis of collected data in selected analytical contexts. The survey was conducted in three time periods: July 2019, July 2021 and July 2023. The survey covered the same panel of enterprises: 1245 enterprises from all regions of Poland. The data was collected through an online survey. The analysis used measures of innovation effectiveness accepted in the literature and basic measures of descriptive statistics.*
***Findings:*** *The article shows how the Covid-19 virus pandemic has affected the innovation of SME enterprises, with particular reference to the level of: innovation activity of enterprises, innovation expenditures and profits from innovation activities. The study answers the question of whether the restrictions and changes in the operation of enterprises that were introduced during the pandemic had a stimulating or destimulating effect on innovation.*
***Practical Implications:*** *The research conducted can be used in two main areas/groups of stakeholders: (1) national authorities-formulation of economic policies in case of repetition of pandemic threats, formation of regional policies that support innovation, (2) SME business owners-enhancement of the efficiency of innovation activities.*
***Originality/Value:*** *The article presents the results of the Author's own cyclical research. The presented results have not been published and discussed scientifically before.*

***Keywords:*** *Innovation, determinants of innovation, SME sector, regional policy*.

***JEL codes:*** *O30, O31, L20.*

***Paper type:*** *Research article.*

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## 1. Introduction

Innovation is a key element of the modern economy, determining its dynamism, competitiveness and ability to solve social challenges. Supporting innovation at various economic and social levels is becoming essential to achieve sustainable development in the face of changing economic and social realities. The SME sector is an essential pillar of any strong economy, contributing to economic growth, job creation and sustainable economic development. With their high growth rate and business flexibility, SME companies, have a significant impact on the development of innovation, both local, regionally and globally (Igielski, 2022).

The outbreak of the Covid-10 pandemic and the measures taken to minimise the risk of the virus spreading, resulted in a number of significant socio-economic restrictions significantly affecting business and innovation opportunities (Nguyen *et al.*, 2022). The level and extent of the restrictions varied from region to region (Juergensen, Guim and Narula, 2020) (this was due to the socio-economic and geographic specificities of the regions) - thus the effects of the restrictions affected business innovation with varying strength.

Investigating the impact of the effects of the Covid-19 pandemic on various individual aspects of business (on a regional or sectoral basis) is a new area of research (Donthu and Gustafsson, 2020). Determining the impact of the Covid-19 pandemic on the innovativeness of SME enterprises that operate in different regions appears to be of great scientific interest (Greve, 2020).

## 2. Literature Review

Innovation is a key pillar of the modern economy, playing an important role in its development and dynamism. Along with technological progress and changing market conditions, innovation plays an extremely important role in shaping economic growth, company competitiveness and social progress. Innovation is understood as the ability to generate new ideas, technologies, products or processes, as well as the ability to implement and commercialise them. In the economic context, innovation is an important determinant of development dynamics, enabling adapt to changing market needs and efficient use of resources (Distanont and Khongmalai, 2020; Spilbergs *et al.*, 2023).

Innovation plays a key role in generating economic growth (Matsuyama and Uschev, 2022): new technologies, production processes or services act as a

catalyst for development, creating new jobs, increasing productivity and contributing to the generation of additional value in the economy. Innovation has a significant impact on the competitiveness of companies in the market (Dyllick, 1999; Czainska *et al.*, 2021).

Furthermore, innovation stimulates the emergence of new industries and, at the same time, modern innovation plays an important role in creating an economy based on sustainable development.

Regional innovation refers to a location's ability to generate, implement and use innovation for economic and social development. It encompasses a range of factors that influence an area's ability to create and adapt to change and to transform these changes into development opportunities. Regions with high levels of innovation are often more competitive, economically dynamic and better able to adapt to changes in the business environment. Regional innovativeness directly influences the innovativeness of enterprises operating in a given region - hence the development of innovativeness at regional level is crucial for sustainable economic and social development.

Currently, there is an increasing emphasis on developing innovation at the regional level. This approach is confirmed by the creation of regional innovation systems that bring together enterprises, research institutions and administrative bodies that cooperate with each other in order to effectively create, support and disseminate innovations. Regional research conducted in recent years strongly emphasizes that innovation processes are territorial in nature and that innovations are local processes (Mitra, 2019).

The SME sector plays an important role in the economy. The distinguishing factors of enterprises in this sector are the ability to create jobs, high innovative potential, business flexibility and creative entrepreneurship, diversification in the type of business activity and a high ability to diversify business risk (Silva, Gonzalez-Loureiro and Braga, 2021; Iborra, Safon and Dolz, 2020). The role and importance of innovation are discussed in depth in the literature, and a review of research clearly shows that, especially in the case of small and medium-sized enterprises (SMEs), innovation is crucial due to their important role in the modern economy (Dibrell, Davis and Craig, 2008).

The Covid-19 pandemic caused a number of constraints for businesses around the world, significantly affecting the way they do business. The main constraints were (Kang, Diao and Zanini, 2021; Grima et al., 2020; Khan et al., 2020):

1. Lockdowns and restrictions: the introduction of lockdowns and mobility restrictions resulted in the closure of many businesses, particularly in the services, retail and leisure sectors.

2. Changes in working practices: many businesses had to quickly shift their processes to remote working. This has created challenges in terms of maintaining productivity, providing the right technology infrastructure for employees and managing remote working.
3 Reduction in demand: the pandemic caused a decline in demand for many products and services, which negatively affected the turnover of many businesses. The decline in economic activity has also resulted in a loss of customers for many businesses.
4. financial difficulties: the constraints of lockdowns and reduced demand led to financial difficulties for many companies, especially those that were unable to adapt to the new business environment.
5. Restrictions on business mobility and international trade: border closures and restrictions on international travel have affected supply chains and international trade, causing logistical problems and slowing global trade.

The identified constraints have had a significant impact on the economy and the functioning of companies which have had to react flexibly to the changes, adapting their business strategies and investing in innovative solutions to survive and find their way in the new economic reality.

The Covid-19 pandemic had a significant impact on the SME sector and its ability to innovate (Klein and Todesco, 2021; Bressan, Duarte Alonso and Kok, 2021). SME companies have had to respond quickly to changing market conditions, which has required flexibility and innovative approaches - many companies have moved to remote working, changing business models and operational processes (Rahman, AbdelFattah, Bag and Gani, 2022).

The pandemic has increased demand for technology solutions that enable remote working, online communication and digital services (Papadopouls, Baltas and Baltac, 2022). SMEs have had to adapt quickly to this trend, investing in new technology to support business operations (Lee and Trimi, 2021; Kronblad and Envall Pregmark, 2021).

At the same time, the pandemic caused financial difficulties for many SMEs, which may have limited their ability to invest in innovation and continue to continue ongoing innovation projects (El Chaarani, Vrontis, El Nemar, and El Abiad, 2022).

Despite the difficulties, the pandemic also created new challenges that became opportunities to develop innovative solutions. Companies were forced to find creative answers to new problems, which could have contributed to the emergence of innovative products or services.

## 3. Methodology

The study used the classic exploratory-descriptive method of statistical analysis and comparison of collected data for selected time series. The study (collection of primary data) was conducted in three time periods:

1st period - July 2019, immediately before the start of the Covid-19 pandemic.
2nd period - July 2021, during the pandemic Covid-19. During this period, companies struggled with all the effects of changes and restrictions on business.
3rd period - July 2023, after the end of the pandemic. During this period, most (or in some areas all) of the restrictions and changes to business operations were revoked.

The survey covered the same panel of enterprises: 1,245 enterprises from all regions of Poland. The selection of the research sample was a purposive selection - in each region, the number and structure of the surveyed enterprises were selected according to the characteristics of the region.

The structure took into account the size of enterprises (with the accepted division into micro, small and medium-sized enterprises) and the leading type of business activity (manufacturing or service activity - division according to the Polish Classification of Activities PKD). Data from the Central Statistical Office in Poland were used to select the size and structure of the sample.

The data was collected through an online survey. The metrics of the survey included the following characteristics, place of business registration, date of start of business, size of business, legal form, ownership structure. The survey collected business data describing innovative activity innovative activity (number of implementations of innovative solutions), expenditures on innovative activity (share in total expenditures), profits from innovative activity (share in total profits), etc.

In this study, the measures of innovation efficiency adopted in the literature were used: the percentage of enterprises conducting innovative activities, expenditures on innovation, profits from innovation. The data obtained were aggregated at the level of the region and subjected to comparative analysis using basic descriptive statistics.

## 4. Results

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The aim of the study was to determine whether the Covid-19 virus pandemic had an impact on the innovativeness of SME enterprises in Poland. The author formulated the following research hypothesis: (H1) The Covid-19 pandemic had a negative impact on the innovativeness of SME enterprises. The author

conducted a comparative analysis of key measures of innovation of SME enterprises in three relevant time periods: immediately before the start of the pandemic (2019), during the pandemic (2021, after a number of changes and restrictions on the operation of enterprises ), immediately after the end of the pandemic (2023, after the cancellation of restrictions on the operation of enterprises).

The following measures of innovation were used in the analysis: (1) the percentage of companies engaged in innovative activities (introduction of at least one innovative product or service in the three years prior to the survey), (2) the percentage share of expenditures on innovative activities in the total of all expenditures of the company in the year prior to the survey, (3) the percentage share of profits from implemented innovations in the total of all profits of the company in the year prior to the survey.

***Table 1***. *Measures of the innovative activity of the surveyed companies in the years under review*

| Region | Year 2019 | | | Year 2021 | | | Year 2023 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Innovative activity | Expenditures on innovation | Innovation gains | Innovative activity | Expenditures on innovation | Innovation gains | Innovative activity | Expenditures on innovation | Innovation gains |
| Dolnośląskie | 20,70 % | 7,87% | 10,47 % | 18,00 % | 6,90 % | 9,50% | 21,93 % | 8,35 % | 11,37 % |
| Kujawsko-Pomorskie | 13,53 % | 6,78% | 7,97% | 10,00 % | 5,20 % | 6,22% | 11,05 % | 6,30 % | 8,05% |
| Lubelskie | 17,17 % | 8,99% | 13,07 % | 13,87 % | 7,44 % | 10,77 % | 15,00 % | 8,82 % | 13,03 % |
| Lubuskie | 9,08% | 7,97% | 10,49 % | 6,85% | 6,88 % | 8,03% | 7,87% | 7,92 % | 9,35% |
| Łódzkie | 16,58 % | 9,02% | 13,94 % | 16,68 % | 9,73 % | 14,46 % | 17,85 % | 11,00 % | 16,25 % |
| Małopolskie | 23,27 % | 11,16 % | 17,13 % | 23,08 % | 12,52 % | 17,70 % | 25,00 % | 13,85 % | 20,00 % |
| Mazowieckie | 20,73 % | 10,05 % | 17,53 % | 21,65 % | 11,57 % | 18,62 % | 23,00 % | 12,42 % | 20,25 % |
| Opolskie | 8,01% | 7,62% | 8,22% | 6,75% | 6,65 % | 6,68% | 7,00% | 8,00 % | 7,50% |
| Podkarpackie | 14,85 % | 8,57% | 14,69 % | 15,22 % | 9,12 % | 15,53 % | 16,50 % | 10,18 % | 17,83 % |
| Podlaskie | 7,42% | 6,98% | 9,10% | 6,82% | 6,65 % | 7,98% | 7,63% | 7,37 % | 8,02% |
| Pomorskie | 20,67 % | 10,00 % | 17,50 % | 19,30 % | 10,88 % | 17,73 % | 20,33 % | 11,22 % | 19,10 % |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Śląskie | 19,67 % | 11,67 % | 17,03 % | 19,67 % | 12,50 % | 17,57 % | 20,83 % | 13,15 % | 19,17 % |
| Świętokrzyskie | 13,07 % | 6,69% | 9,22% | 10,83 % | 5,44 % | 7,42% | 11,83 % | 5,93 % | 7,22% |
| Warmińsko-mazurskie | 6,85% | 5,75% | 6,67% | 5,37% | 3,33 % | 3,67% | 5,03% | 3,35 % | 3,52% |
| Wielkopolskie | 20,62 % | 14,10 % | 20,85 % | 20,83 % | 14,92 % | 22,48 % | 22,50 % | 14,93 % | 23,67 % |
| Zachodniopomorskie | 15,60 % | 9,17% | 13,45 % | 15,72 % | 10,10 % | 14,32 % | 16,85 % | 11,00 % | 16,25 % |
| **Average total** | **15,49 %** | **8,90%** | **12,96 %** | **14,41 %** | **8,74 %** | **12,42 %** | **15,64 %** | **9,61 %** | **13,79 %** |

***Source:*** *Own study.*

The results were averaged and aggregated at the regional level (according to the administrative division of Poland ). The results obtained, averaged by region, are shown in Table 1.

The results show that for the entire sample, there was a decrease in all analyzed indicators in 2021 compared to 2019. The percentage of enterprises engaged in innovative activities decreased from 15.49% to 14.41% (a change of 6, 93%). The percentage of innovation expenditures decreased from 8.90% to 8.74% (a change of 1.80%). The share of profits from innovation decreased from 12.92% to 12.34% ( a change of 4.52%).

In 2023, there was a noticeable increase in all analyzed indicators (compared to 2019). The percentage of enterprises engaged in innovative activities increased from 15.49% to 15.64% (a change of 0.97%). The percentage of innovation expenditures increased from 8.90% to 9.61% (8.01% change). The share of profits from innovation increased from 12.92% to 13.68% (a change of 5.87%).

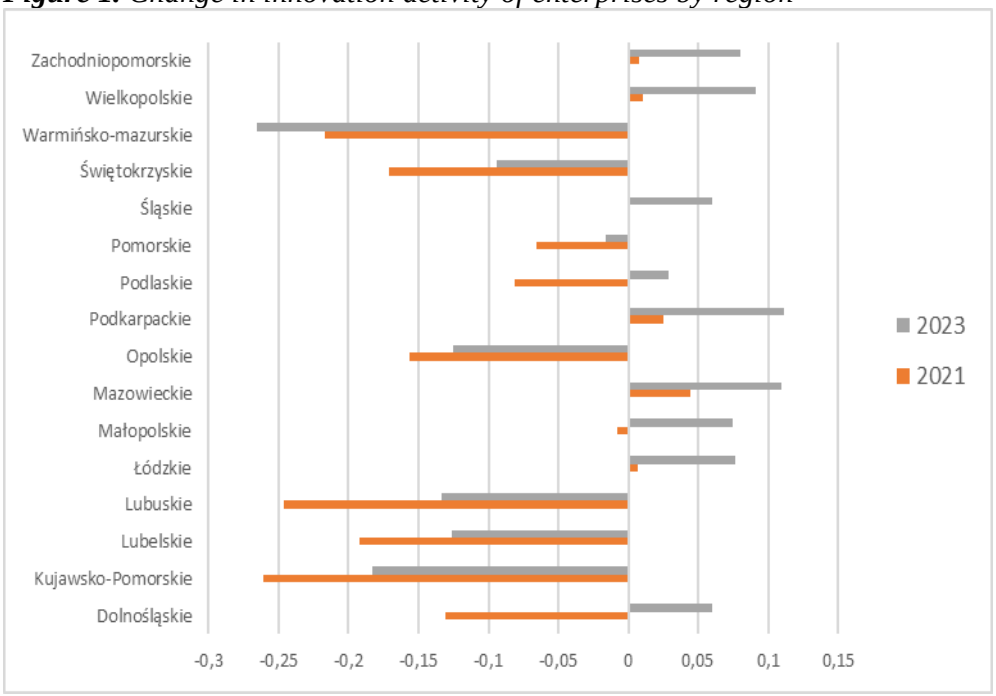
A detailed analysis of the results for individual regions shows an ambiguous picture of changes in the surveyed metrics - there are regions with a large decrease in value and regions with some increase. For the following regions, the reductions in innovation activity were the largest: Kuyavian-Pomeranian innovative activity decreased by 26.11%, Lubuskie decreased by 24.59%, Warmian-Masurian decreased by 21.65%. For the following regions, there was the largest increase in the innovative activity of enterprises: the Mazowieckie increased by 4.42%, the Podkarpackie increased by 2.47% and the Wielkopolskie increased by 1.05%.

For 2023 (compared to 2019), the changes were as follows - for the following regions the reductions in innovation activity were the largest: Kuyavian-Pomeranian innovative activity decreased by 18.35%, Lubuskie decreased by 13.39%, Warmian-Masurian decreased by 2.65%.

For the following regions, there was the largest increase in the innovative activity of enterprises: the Mazowieckie increased by 4.42%, the Podkarpackie increased by 2.47% and the Wielkopolskie increased by 1.05%.

A full summary of changes in the innovative activity of the surveyed enterprises in the surveyed periods presented in Figure 1.

***Figure 1.*** *Change in innovation activity of enterprises by region*




***Source:*** *Own study.*

For the following regions, the reductions in outlays on innovative activities in 2021 were the largest: Kujawsko-Pomorskie decrease by 23.34%, Świętokrzyskie decrease by 24.59%, Warmińsko-Mazurskie decrease by 42.03%.

For the following regions, the largest increase in outlays on innovative activities of enterprises occurred: Mazovia up by 15.09%, Małopolska up by 12.21%, and Zachodnipomorskie up by 10.18%.

For 2023 (compared to 2019), the changes were as follows - for the following regions the decrease in innovation outlays was the largest: Warmian-Masurian a decrease of 41.74%, Świętokrzyskie a decrease of 11.31%, Kujawsko-pomorskie a decrease of 7.13%. For the following regions, the largest increase in outlays on

innovative activities occurred: Małopolskie an increase of 24.16%, Mazowieckie an increase of 23.55% and Łódzkie an increase of 21.93%.

For the following regions, the reduction in innovation activity gains in 2021 was the greatest: Warminsko-Mazurskie a reduction of 45.00%, Lubuskie a reduction of 23.44%, Kujawsko-Pomorskie a reduction of 21.97%. The following regions had the largest increase in innovation activity gains: Wielkopolskie an increase of 7.83%, Mazowieckie an increase of 6.18% and Podkarpackie an increase of 5.74%.
For 2023 (compared to 2019), the changes were as follows - for the following regions, the reduction in profits from innovation activity was the largest: Warmińsko-Mazurskie a decrease of 47.25%, Świętokrzyskie a decrease of 21.70%,Podlaskie a decrease of 11.90%.

For the following regions there was the largest increase in profits from innovative activity: Podkarpackie an increase of 21.40%, Małopolskie an increase of 16.78% and Łódzkie an increase of 16.56%.

## 5. Discussion

The presented result shows that at the level of the whole country (all analysed regions), the Covid-19 pandemic negatively influenced the innovativeness of enterprises of the SME sector - a decrease in all analysed measures of innovativeness.

A detailed analysis of the results obtained allows us to distinguish two groups of regions:

(1) regions that were very strongly affected by the Covid-19 pandemic on the innovativeness of SME enterprises. Examples are the following regions: Kujawsko-pomorskie, Lubuskie, Warmińsko-mazurskie, Świętokrzyskie. The above-mentioned regions recorded a high decrease in all analysed indicators.
(2) Regions where the negative impact of the Covid-19 pandemic was small, or in some cases the analysed metrics were higher than before the pandemic. Examples are: Mazowieckie, Małopolskie, Pokarpackie, Wielkopolskie.

It seems that such a situation results from specific charactersitics of particular regions and the innovation potential shaped by these. Such stimulating charactersitics for innovativeness are: type of business activity (hi-tech industries or advanced IT services were definitely less sensitive to the effects of the pandemic), human capital available in the region, metropolisation of regions. Certainly, the agricultural character of the regions (lower innovation potential), the geographical location of the region and the resulting high sensitivity to the effects of the Covid-19 pandemic (e.g. cross-border regions, tourist regions) may

have been destimulating charactersitic.

The conclusions of the 2023 analysis (the period after most of the restrictions resulting from the Covid-19 pandemic have been lifted) are also relevant. Regions with high innovation potential have returned to pre-pandemic innovation levels and in some cases even increased their innovation. Examples are the regions of: Mazowieckie, Podkarpackie, Wielkopolska, Łódzkie, Małopolskie.

Regions with a low potential for innovation activity have not rebuilt their innovativeness, and for some regions there has been a further reduction in innovativeness. Examples are the following regions: Warmińsko-Mazurskie, Lubuskie, Kujawsko-Pomorskie, Podlaskie.

## 6. Conclusions

The research hypothesis (H1) conducted: The Covid-19 pandemic had a negative impact on the innovativeness of SME enterprises. At the same time, it should be noted that the demonstrated negative impact was small - for full inference, statistical significance tests would be appropriate.

The results of the study indicate that there is an obvious taxonomy of the regions studied: (1) regions with low innovation potential. Regions were most affected by the Covid-19 pandemic in terms of SME business innovation (the largest reduction in the innovation measures examined). These regions also failed to rebuild innovation potential in the final year of the study (2023). (2) Regions with high innovation potential - these regions were less affected by the Covid-19 pandemic.

The conclusions can be used to create innovation policy at the level of regions (building the innovative potential of regions), creating recommendations for changes in the functioning of economic sectors in the event of a repeat of the pandemic. The conclusions can also be used as a basis for building an innovation strategy for individual enterprises - taking into account regional realities.

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