

## INNOVATION IN INDUSTRIAL ENTERPRISES IN POLAND IN 2017-2019

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**Purpose:** The main purpose of the article is to present, based on the literature on the subject, the essence of the innovative potential and innovative activity of a company as generators of innovative processes.

**Design/methodology/approach:** The study used the methodology developed by Eurostat and OECD, as presented in the Oslo Manual.

**Findings:** The empirical part presents, using statistical data, the innovative activity of Polish industrial enterprises in the years 2017-2019.

**Originality/value:** The survey of industrial and service enterprises was conducted between 2017 and 2019, and its results were published in 2020. The results of the study can be used in strategic decisions of enterprises in the field of innovative activities of Polish industrial enterprises.

**Keywords:** innovative potential of the enterprise, innovative activity of industrial enterprises.

**Category of the paper:** research paper.

### 1. The innovative potential of an enterprise as a generator of innovative processes

In Polish and foreign-language literature on the subject, the concept of the innovative potential of an enterprise has been given many different definitions. Thus, one can notice the development of this concept over the last several decades, especially in the Polish literature on the subject in the period after the systemic transformation of the country's economy.

The concept of the innovative potential of an enterprise is always associated with its internal conditions and, increasingly, with many external conditions in which these companies operate.

According to K. Poznański, there is a direct and close relationship between the innovative potential of an enterprise and the phenomenon of resistance to innovation posed by the company's staff and the environment (Poznań, 1998). Internal resistance in an enterprise is proportional to the level of risk related to the implementation of innovations and resulting changes, such as job security or the current position and the associated comfort of employees. External risk related to innovation may result, for example, from the lack of acceptance of the innovation by the market or negative actions on the part of competitors. Therefore, it must be assumed that the implementation of innovations by an enterprise may disturb its internal balance.

According to K. Poznański, the specific innovative potential of an enterprise translates into its ability to effectively introduce innovations, for example in the form of new products, new technologies, better organizational methods and innovations in the sphere of strategies, activities and marketing tools. The author defines the innovative potential through four basic and key elements of the company's operation (Poznański, 1998):

- material potential (including, in particular, the quality level of the production apparatus),
- financial potential (own funds and the ability to obtain funds from external sources),
- human potential (the number of employees, their structure and their competence level, qualifications, skills and professional experience),
- knowledge (especially technical, technological and market information).

In the era of developing globalization and digitization of economy, the influence of the environment on individual elements of the innovative potential of the enterprise, both further (macro-environment) and closer (micro-environment) of the enterprise, is rapidly increasing. Based on this assumption, one can differentiate the internal and external innovative potential of the enterprise (Poznański, 1998). The latter is created by such factors as: the labour market, resources of technical knowledge and scientific innovation, or the system of financial institutions ready to support innovative undertakings.

A similar approach to the concept of the innovative potential of an enterprise can be observed in the works of A. Żoźniewski. The author argues that it is determined by internal elements and access to external sources of information (Żoźniewski, 2005). He lists the following internal components of the innovative potential: staff, research and development, technology. In turn, the basic external sources of innovation are: universities, R&D units, competitive enterprises, final consumers and intermediaries.

R. Sitkowska (Sitkowska, 2006) presents a more extensive concept of the elements of the company's innovative potential. The author, however, like her predecessors, is of the opinion that the company's innovative potential is determined by two spheres of the enterprise, namely the internal and external ones.

When analyzing the proposed theories and models of innovative activity of an enterprise appearing in the literature on the subject, it is apparent that the recommended development of an enterprise should be based on both the internal and external elements of innovations. For example, the theory of the absorption capacity of an organization emphasizes the importance of the company's environment (external environment) in addition to the elements of the internal environment of the organization (Cohen, Lewinthal, 1990). In turn, in the interactive model of R. Rothwell and W. Zegveld, it is indicated that the innovative potential of an enterprise should be based on three key cells such as: R&D, production and marketing, which guarantee an effective innovation creation process (Rothwell, Zegveld, 1985).

## **2. Innovative activity of Polish industrial enterprises in 2017-2019**

### **2.1. Methodology of empirical research**

Innovations introduced in the enterprise help to achieve a competitive advantage and success on the market. They are the basis of economic growth. The implementation of innovations requires effective action spread over time and incurring considerable investment. The results of the study presented in the article were taken from the Statistical analysis of the Central Statistical Office entitled: "Innovative activity of enterprises in the years 2017-2019", GUS, Warsaw-Szczecin, 2020. The study of industrial and service enterprises was carried out in 2017-2019, and its results showed in 2020. The study used the methodology developed by Eurostat and OECD, presented in the Oslo Manual (Oslo Manual, 2008).

According to the definition adopted in the European Union and OECD presented in the Oslo Manual, innovation is the implementation of a new or improved product, service or business process in economic practice, workplace organization or in business relations with the surroundings. A new or improved product is implemented when it is introduced to the market. New business processes are implemented when they are actually used in the company's operations.

Product and business processes do not have to be new to the market in which the company operates, but they must be new at least for the company itself. They do not have to be developed by the enterprise itself, they may be developed by another enterprise or by an entity of a different nature (e.g. a research institute, research and development centre, university, etc.).

Innovative activities include all development, financial and commercial activities undertaken by the enterprise, the intended goal of which is innovation. Some of these activities are innovative, while others are not new, but are necessary for the implementation of innovation. Innovation activities also include research and development (R&D) activities that

are not directly related with the creation of a specific innovation. The innovative activity of an enterprise may be:

- successfully completed with the implementation of innovation (but it does not necessarily have to be associated with commercial success),
- ongoing in progress, which has not led to the implementation of innovations so far,
- abandoned prior to the implementation of innovations.

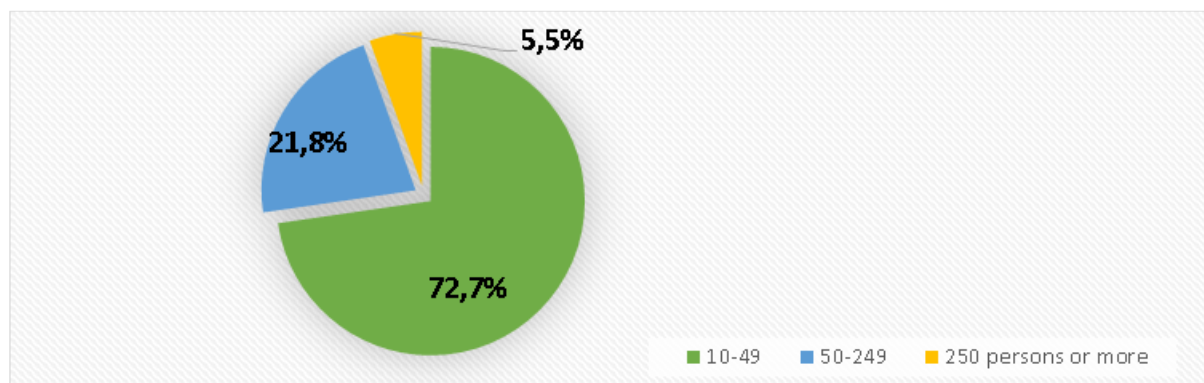
Industrial enterprises are the subject of research on innovative activities and service. The units for the research were selected using the Polish Classification of Activities (PKD) 2007, consistent with the Statistical Classification of Economic Activity of the European Union (NACE Rev. 2). The research covered industrial enterprises operating in the PKD sections listed below. Industrial enterprises: Section B (mining and quarrying), Section C (manufacturing), Section D (generation and supply of electricity, gas, steam, hot water and air-conditioning systems), Section E (water supply, waste water management) and waste and remediation activities).

The research on innovative activity carried out using the PNT-02 form covered enterprises employing more than 9 people. In 2019, this study in industry was carried out on the full population of enterprises employing 50 people and more and a representative sample of enterprises employing 10-49 persons, amounting to approx. 25% of the frame. The survey is prepared on the basis of the above-described subjective scope. Units in a small number of sections may be included in the sample as a whole, due to the later ensuring that the results are representative for these sections. The remaining part of the sample is allocated according to PKD divisions and provinces. The allocation of the sample uses the results of the previous study to estimate the variance of the most important examined characteristics in the defined sections. Estimation of the variance for the most important features determined is performed using standard statistical procedures, i.e. with the data from the previous year from the conducted study, it is possible to estimate the variance of a given feature in the studied population (taking into account the weights). Quantities determined in this way are used for optimal sample allocation to a new study; Thanks to this, in the resulting cross-sections with greater variability of the examined feature, a correspondingly larger sample will be allocated, which will allow for better precision in the next year of the study. Such an approach gives results with the natural assumption that the distributions of the examined features are similar in the following years. On the basis of the determined allocation, a part of the sample is drawn according to the simple drawing scheme, without return, independently in the sections considered.

## **2.2. The structure of the surveyed group of industrial enterprises**

As in previous years, in 2019 the vast majority of the analyzed industrial and service enterprises were companies employing 10-49 people. Over the year, their share in the total number of enterprises increased (industrial – by 0.6 percent, service – by 1.7 percent). Compared to 2018, the percentage of enterprises employing 50-249 people (industrial –

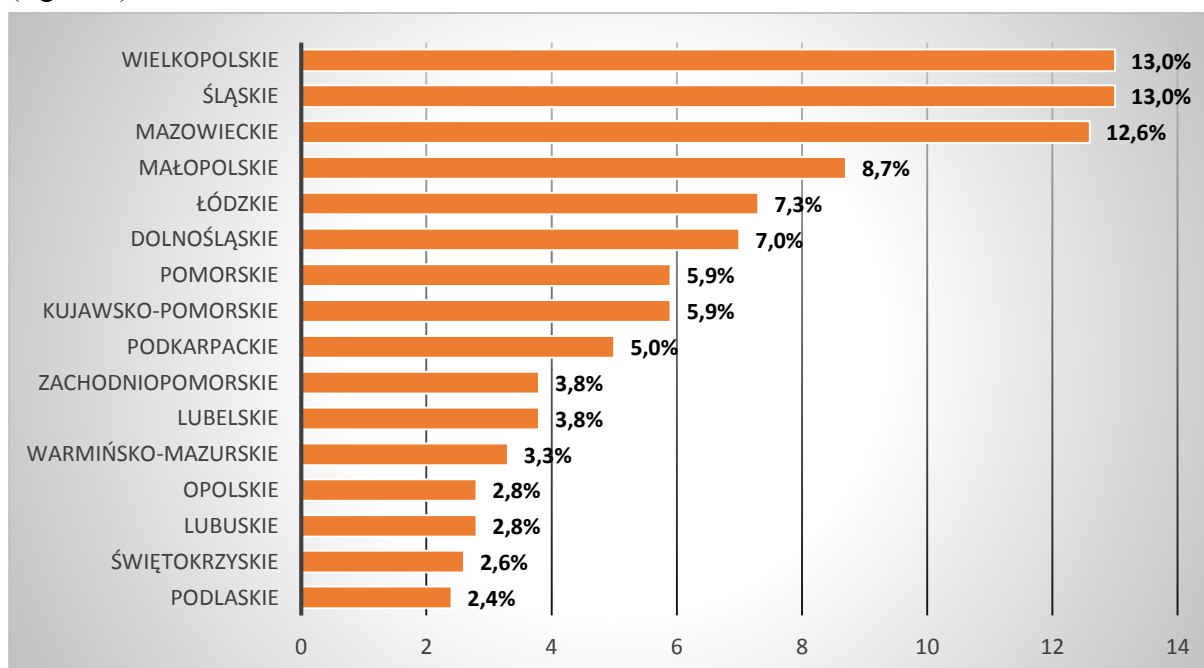
by 0.6 percentage points, services – by 1.5 percentage points) has decreased. The share of enterprises employing 250 people and more remained at a similar level as in the previous year and amounted to 5.5% in the industrial sector and 2.8% - in the service sector.



**Figure 1.** Structure of industrial enterprises by the number of employees in 2019 (%). Source: Innovative activity of enterprises in 2017-2019, GUS, Warsaw-Szczecin, 2020.

In 2019, every sixth industrial enterprise was active in the production of metal products (16.4% of the respondents). Among all the surveyed enterprises in industrial processing, the smallest number of entities were operating related to the mining of crude oil and natural gas (0.0% of the respondents), the mining of metal ores (0.0% of the respondents) and the production of tobacco products (0.0% of the respondents).

Taking into account the territorial division of the country, the following provinces were characterized by the highest number of surveyed industrial enterprises in 2019, as in the previous year: Śląskie (13.0%), Wielkopolskie (13.0%) and Mazowieckie (12.6%), while the smallest – Podlaskie (2.4%), Świętokrzyskie (2.6%), Lubuskie (2.8%) and Opolskie (2.8%). (figure 2).



**Figure 2.** Structure of the surveyed industrial enterprises by voivodships in 2019 (%). Source: as above.

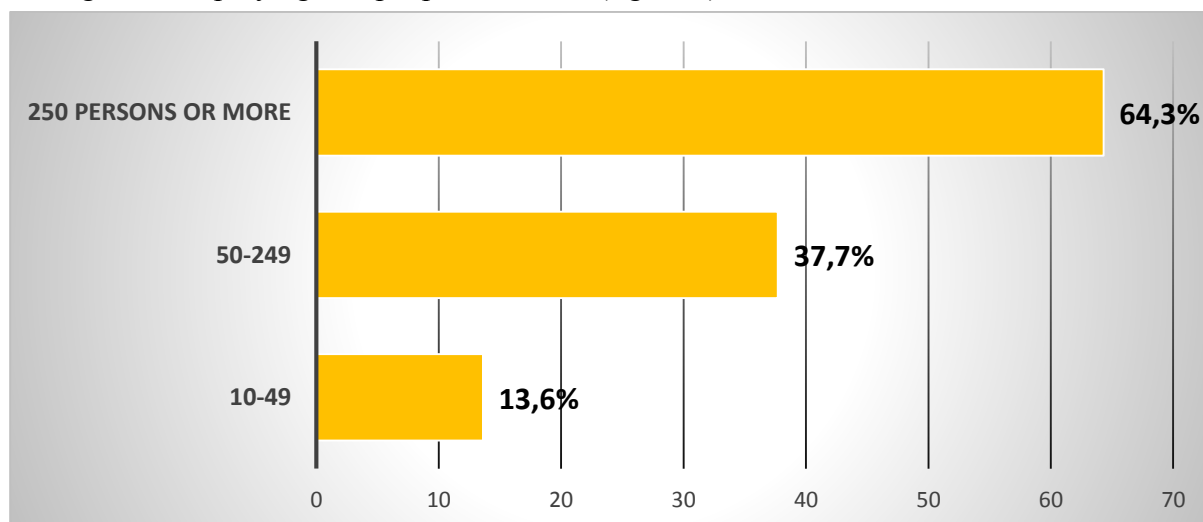
### 2.3. Innovative activity of industrial enterprises

In the research conducted by the Central Statistical Office, it was assumed that an innovatively active enterprise is one that: in the analyzed period, introduced at least one product or business process innovation or implemented at least one innovative project during this period, which was interrupted or abandoned during the period under examination (not successfully completed) or was not completed by the end of this period (i.e. it is continued).

An innovative enterprise in the field of product innovations and business processes is an enterprise that in the analyzed period introduced to the market at least one product or business process innovation (a new or improved product or a new or improved business process).

#### a) Innovatively active industrial enterprises

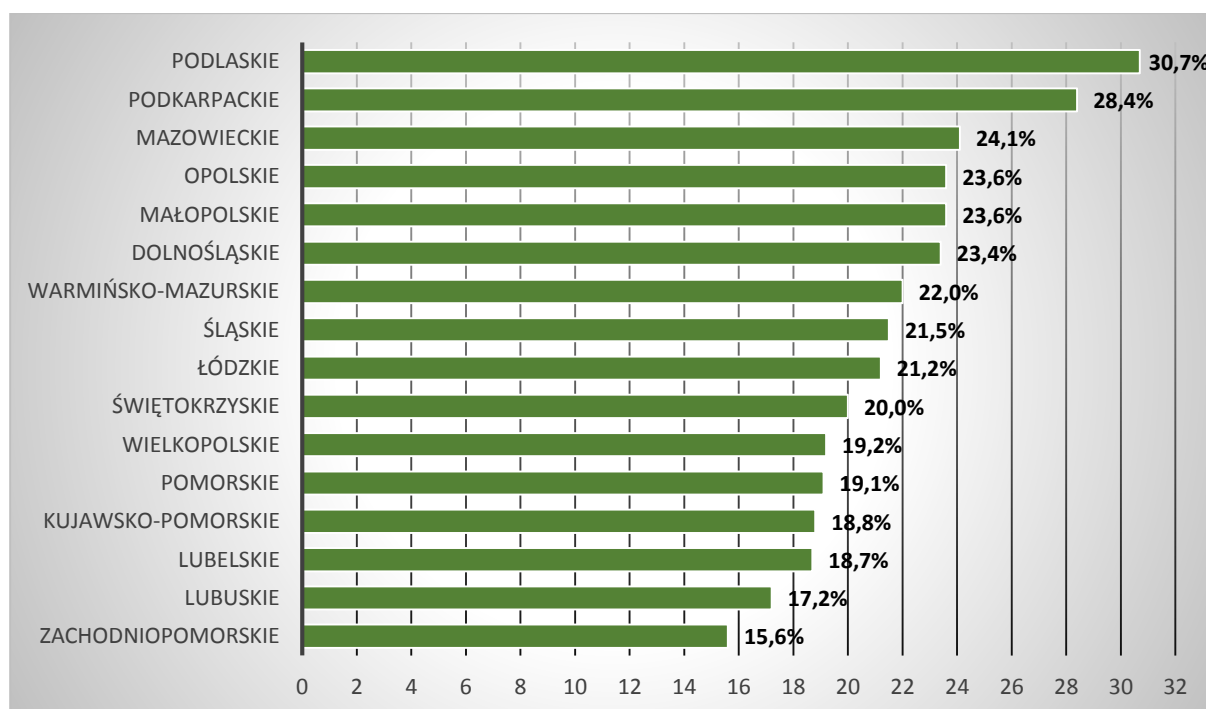
In the years 2017-2019, the share of innovatively active enterprises in the industrial enterprise sector was 21.7%. Taking into account the size classes of industrial enterprises, the highest percentage of innovation active entities, as in the previous years, was recorded among units employing 250 people and more (figure 3).



**Figure 3.** Innovatively active industrial enterprises in 2017-2019 by the number of employees (%). Source: as above.

In Industrial processing, the highest percentage of innovatively active enterprises was recorded in the section Production of coke and refined petroleum products (55.1%). The lowest innovative activity in Industrial processing was shown by companies producing clothing (8.2%).

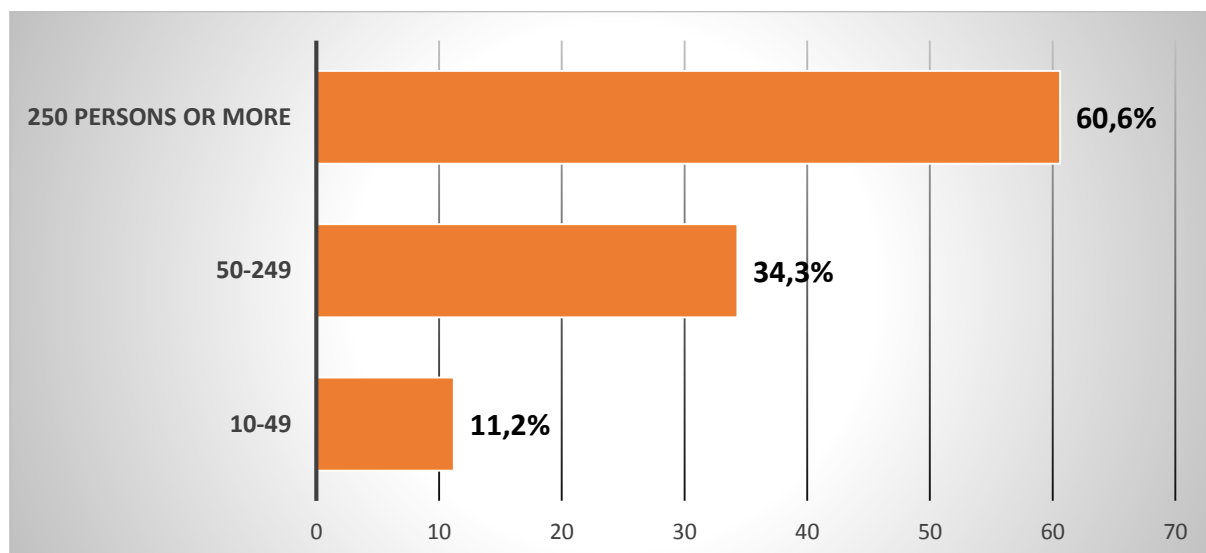
Taking into account the territorial division of the country, the largest concentration of innovatively active industrial enterprises occurred in Podlaskie (30.7%) and Podkarpackie (28.4%) provinces. The lowest values of the percentage of innovation active entities in industry it was recorded in the Zachodniopomorskie (15.6%) and Lubuskie (17.2%) provinces (figure 4).



**Figure 4.** Innovatively active industrial enterprises in 2017-2019 by province (%). Source: as above.

#### b) Innovative industrial enterprises

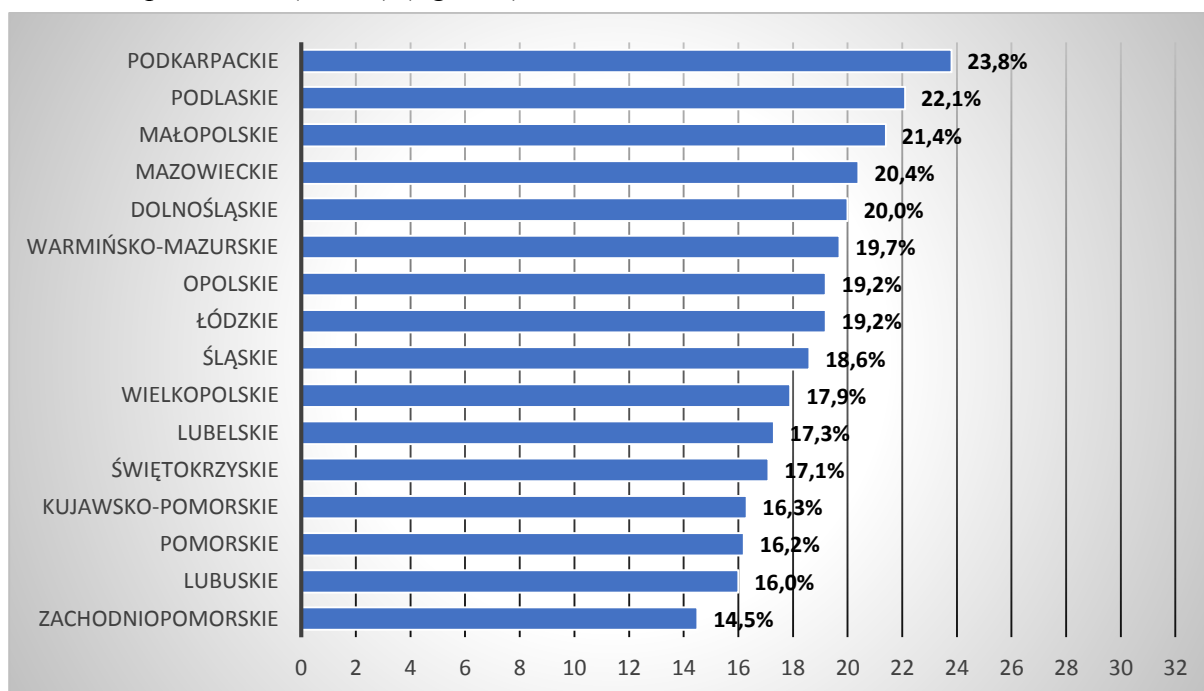
The share of innovative industrial enterprises in the years 2017-2019 in the total number of these enterprises was 18.9%. Most often, product or business process innovations were introduced by entities employing 250 people or more (60.6% of industrial enterprises) (figure 5).



**Figure 5.** Innovative industrial enterprises in 2017-2019 by the number of employees (%). Source: as above.

In the analyzed period, the relatively largest number of innovative enterprises in industry was in the section Production of coke and refined petroleum products – 55.1%, while the smallest – in the section Production of clothing – 8.0%.

When analyzing innovation in territorial terms, it can be noticed that among industrial enterprises, the highest percentage of entities that introduced innovations in 2017-2019 occurred in the Podkarpackie (23.8%) and Podlaskie (22.1%) provinces, and the lowest – in Zachodniopomorskie (14.5%) (figure 6).



**Figure 6.** Innovative industrial enterprises in 2017-2019 by province (%). Source: as above.

The higher the technology advancement level, the greater the percentage of enterprises implementing innovations. The share of enterprises from the innovative industrial processing section in 2017-2019 classified as high technology was three times higher than that of low technology enterprises. In the analyzed period, the percentage of entities in the Industrial processing section which were innovatively active was higher than the innovative ones, especially in the case of high technology (by 6.0 percentage points) and medium-high technology (by 4.9 percentage points). The smallest difference was in low-tech enterprises (by 1.4 percentage point).

### c) Innovative industrial enterprises by type of innovation

Product innovation is the introduction to the market of a product or service that is new or improved in terms of its features or applications. This includes significant changes in terms of technical specifications, components and materials, embedded software, ease of use, or other functional characteristics. Product innovation may result from the application of new knowledge or technology, or from new applications or a combination of existing knowledge and technology.



A new product is a product or service that significantly differs in terms of its features or purpose from the products previously manufactured by the enterprise.

Improvements to existing products consist of changes to materials, components and other features that make these products work better.

Business process innovation is the introduction of new or improvement of business processes in an enterprise as part of one or more business functions that significantly change the business processes used so far.

Production methods are technologies, devices and software used to produce (manufacture) products or services.

Enterprise logistics, supply, or distribution methods include equipment, software, and techniques used to acquire inputs, allocate resources within an enterprise, or deliver end products.

Business process innovations also include new or improved techniques, devices and software in ancillary activities such as accounting, IT support, procurement or maintenance. Business process innovations also include new organizational methods, such as: principles of operation within the company or in relation to the environment, division of tasks, decision-making powers and human resources management, as well as marketing methods in the field of packaging visualization, price shaping, promotion techniques, product placement or after-sales services.

The results of the research on innovative activity indicate that in industrial enterprises the share of enterprises that introduced business process innovations (new or improved business processes) in 2017-2019 was higher than product innovations (new or improved products).

Business process innovations introduced in 2017-2019 by industrial enterprises most often concerned new or improved methods of manufacturing (producing) products (including the development of products or services) – 9.9% of enterprises (figure 7).

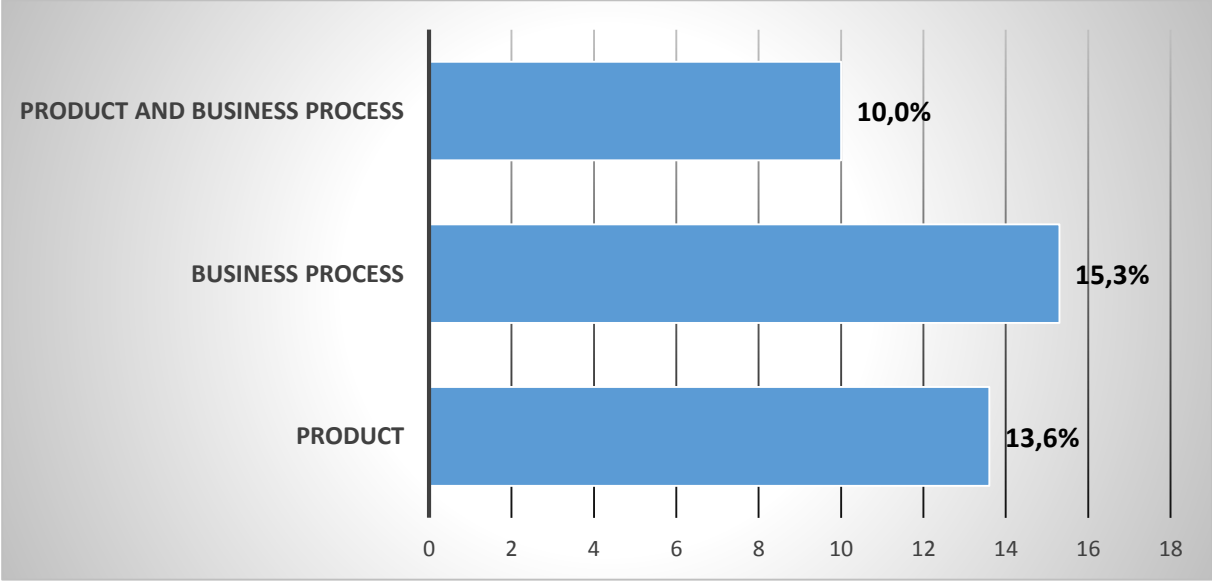
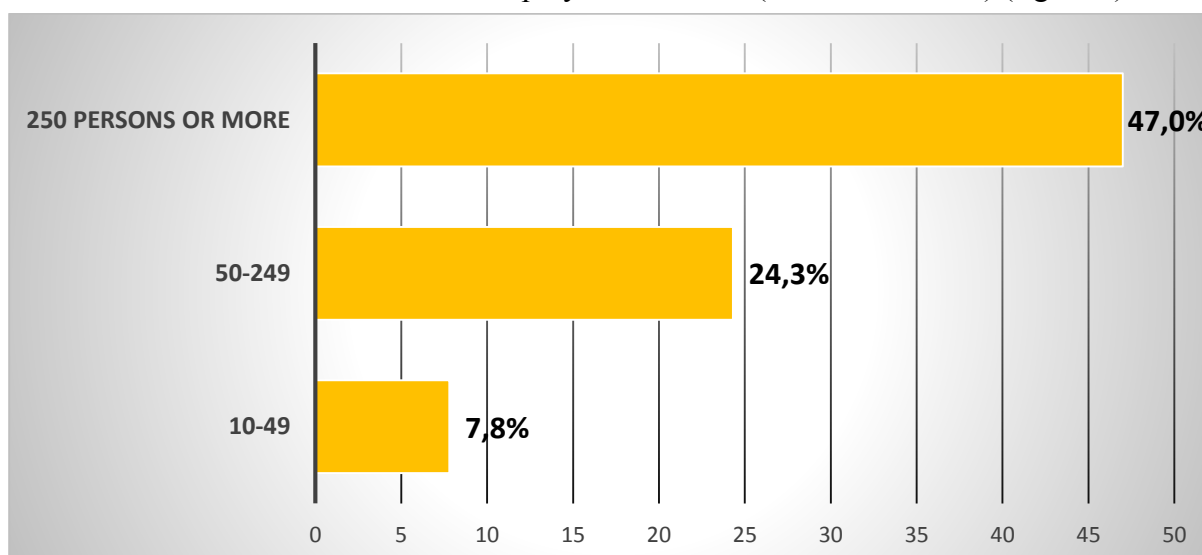


Figure 7. Innovative industrial enterprises in 2017-2019 by type of innovation (%). Source: as above.

Among industrial enterprises that introduced product innovations in 2017-2019, the largest percentage was recorded in the section Production of coke and refined petroleum products (49.0%). Business process innovations were also most often implemented by entities from the Production of coke and refined petroleum products division – 51.0%. The smallest share in industrial enterprises introducing new or improved products was in the section Water collection, treatment and supply (2.8%), while business process innovations were least frequently implemented in enterprises in the section Manufacture of wood, cork, straw and wicker products (7.1 %).

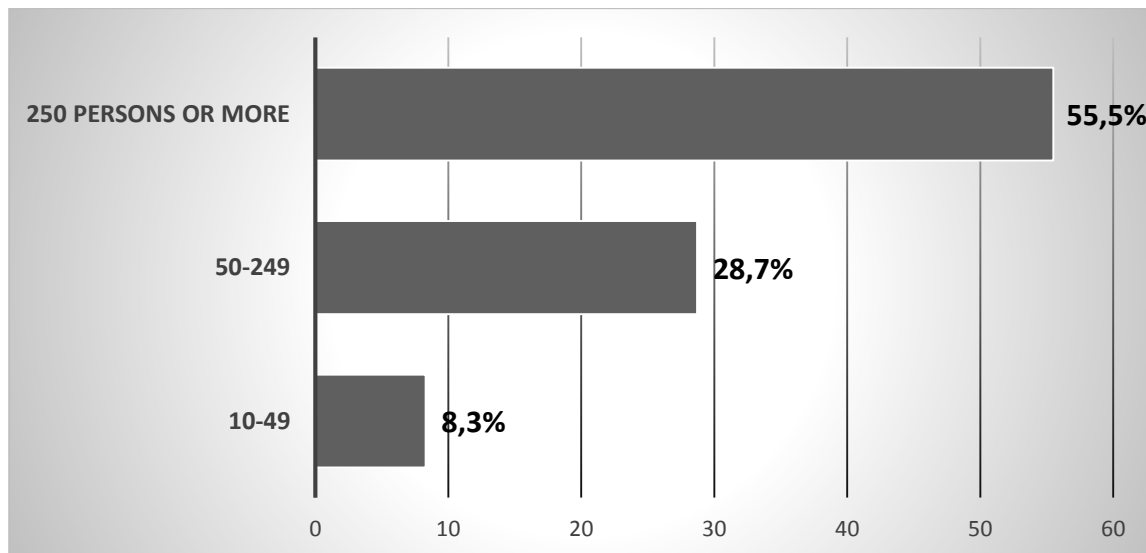
In enterprises from the Industrial processing section, analyzed according to the technology levels, it can be noticed that enterprises classified as high technology most often introduced product innovations (36.1%), while enterprises classified as other levels of technology – new or improved business processes.

In 2017-2019, product innovations were implemented by 13.6% of industrial enterprises. The highest percentage of industrial enterprises that introduced product innovations in 2017-2019 was recorded in units with 250 employees and more (47.0% of entities) (figure 8).



**Figure 8.** Industrial enterprises that introduced product innovations in 2017-2019 by number of employees (%). Source: as above.

In 2017-2019, business process innovations were implemented by 15.3% of industrial enterprises. The largest percentage of industrial enterprises that introduced business process innovations in 2017-2019 was recorded in units employing 250 people and more (55.5%) (figure 9).



**Figure 9.** Industrial enterprises that introduced business process innovations in 2017-2019 by number of employees (%). Source: as above.

Taking into account the territorial division of the country, the highest percentage of industrial enterprises that introduced product innovations in 2017-2019 was recorded in the Podkarpackie (20.0% of enterprises) and Mazowieckie (15.6%) provinces, and the smallest – in Zachodniopomorskie (9.5%) and Pomorskie (10.5%).

Taking into account the territorial differentiation, the highest percentage of industrial enterprises that introduced business process innovations in 2017-2019 was recorded in the Podkarpackie (18.6%) and Małopolskie (18.3%) provinces, and the lowest – in Zachodniopomorskie (11.3%) and the Kujawsko-Pomorskie province (11.8%).

The comparison of the implementation of product innovations in Poland with other countries showed that in 2016-2018, in selected European countries, the highest percentage of industrial enterprises that introduced product innovations occurred in Estonia (50.8%), and the lowest – in Romania (12.5%). In Poland, the percentage of industrial enterprises that introduced product innovations was 16.8%.

### 3. Summary and main conclusions

The following conclusions can be drawn in the summary of this article, whose main purpose was to present the essence of the innovative potential and innovative activity of an enterprise as generators of innovative processes:

- When analysing the literature on the subject, it can be concluded that the proposed theories and models of innovative activity of an enterprise most often recommend basing the development strategy through the implementation of innovation on its key internal and external elements (resources).

- In 2017-2019, innovation-active industrial enterprises were 21.7% of the total number of these entities. The highest percentage of innovatively active entities occurred among units employing 250 people and more. In 2017-2019, the share of innovative industrial enterprises was 18.9%.
- Product or business process innovations were most often introduced by entities employing 250 people or more (60.6% of industrial enterprises).
- In the analyzed period, the relatively largest number of innovative enterprises in industry was in the section Production of coke and refined petroleum products – 55.1% and Extraction of hard coal and lignite – 52.9%, while the smallest – in the section Clothing production – 8.0%.
- Taking into account the territorial division, the highest percentage of innovatively active industrial enterprises was recorded in the Podlaskie province (30.7%), and the innovative ones – in the Podkarpackie province (23.8%).
- The presentation of the results confirms the differentiation in the voivodeship level of innovation among enterprises. The distance between the highest and the lowest value of the percentage of innovative industrial enterprises in provinces was 9.3 percentage points.
- The results of the research on innovative activity indicate that in industrial enterprises the share of entities that introduced business process innovations (new or improved business processes) in 2017-2019 was higher than product innovations (new or improved products).

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