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ESTIMATION OF THE SHARE OF INNOVATIVE GOODS, WORKS AND SERVICES BY RUSSIAN REGIONS AND TYPES OF ACTIVITY

Avaliação da participação de produtos, obras e serviços inovadores nas regiões e atividades russas

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ABSTRACT

Innovative activity of companies provides one of the most important directions of development of modern national economies. The purpose of our research is to assess the specific weights of the production volumes of goods, works, and services classified as innovative in the total production volumes of all organizations located in each of the regions of Russia, as well as those specializing in various types of economic activities. The study was based on official statistical information for all 82 regions of Russia and 45 types of economic activity. Economic and mathematical models describing the share of innovative goods, works, and services in total production volumes by region and industry have been developed. It is proved that the average share of innovative products for the period under review was about 5% of all manufactured products. It is shown that the values of the indicators were significantly differentiated by region and industry. The regions and types of economic activity with the maximum and minimum values of the share of innovative products are identified.
Keywords: Innovative Products; Innovative Organizations; Regions of Russia; Normal Distribution Functions; Estimation of Share of Innovative Products.

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AVALIAÇÃO DA PARTICIPAÇÃO DE PRODUTOS, OBRAS E SERVIÇOS INOVADORES NAS REGIÕES E ATIVIDADES RUSSAS

Estimation of the share of innovative goods, works and services by russian regions and types of activity

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RESUMO

As atividades inovadoras das empresas fornecem uma das áreas mais importantes para o desenvolvimento das economias nacionais modernas. O objetivo do nosso estudo é avaliar a gravidade específica dos volumes de produção de bens, obras, serviços relacionados à inovação, nos volumes totais de produção de todas as organizações localizadas em cada uma das regiões da Rússia, bem como especializadas em vários tipos de atividade econômica. O estudo foi baseado em informações estatísticas oficiais sobre todas as 82 regiões da Rússia e 45 tipos de atividade econômica. Modelos econômicos e matemáticos foram desenvolvidos descrevendo a proporção de bens, obras e serviços inovadores no total de produção por região e indústria. Está provado que a proporção média de inovação de produtos durante o período considerado foi de cerca de 5% de todos os produtos fabricados. Mostra-se que os valores dos indicadores foram significativamente diferenciados por região e indústria. Regiões e tipos de atividade econômica com valores máximos e mínimos de participação de produtos inovadores foram identificados.

Palavras-chave: Produtos Inovadores; Organizações Inovadoras; Regiões da Rússia; Funções de Distribuição Normal; Avaliação da Participação de Produtos Inovadores.

INTRODUCTION

Scientific and technological progress in most countries ensures their economic development by improving the quality of life of the population, improving the production activities of enterprises and organizations, as well as creating high-tech workers through widespread innovation (Siyanbola et al., 2013; Gocer et al., 2016; Bartelsman et al., 2019). Innovation is aimed at creating new products, processes and services based on the use of new or existing knowledge (Kusiak, 2009; Expósito, Sanchis-Llopis, 2019; Mtar, Belazreg, 2020). Innovation Provides National Economies with a Competitive Advantage in Modern Conditions (Abhyankar, 2014; Lopes et al., 2018). At the same time, it is innovation processes that are of fundamental importance for ensuring the competitiveness of companies in regional and international markets. The release of innovative products is motivated by entrepreneurial intentions, the implementation of new market needs, improving the quality and increasing the consumer value of products, and the desire to make people's lives more comfortable (Kotsemir, Meissner, 2013).

In recent years, Russia has formed high expectations for the growth of innovation in the economy. Based on the introduction of innovations, it is planned to move to more technological and efficient forms and methods of activity of enterprises and organizations. Thus, in accordance with the Decree of the President of the Russian Federation of May 7, 2018 No. 204 "On National Goals and strategic objectives of the development of the Russian Federation for the period up to 2024", it is planned to increase the number of enterprises that have introduced technological innovations to 50% of their total number. In 2019, the share of innovative enterprises in Russia reached 21% (Federal State Statistics Service, 2021). Therefore, an urgent problem is the consideration in modern economic scientific research of the patterns and trends of changes in the volume of innovative products produced by organizations and enterprises.

In modern research, there are persistent calls for a more systematic consideration of regional problems (Gössling, Rutten, 2007; Rondé, Hussler, 2005; Oksanen, Hautamäki, 2014) and industry (Gault, 2018; Zillner et al., 2015; Aboal, Garda, 2016) features of innovation activity. Our article contributes to the study of these problems on the example of the Russian economy.

The purpose of our research is to assess the specific weights of the production volumes of goods, works, and services classified as innovative in the total production volumes of all organizations located in each of the regions of Russia, as well as those specializing in various types of economic activities.

1 THEORETICAL REFERENCE

1.1 Innovation concepts

Innovation is associated with the development of new products and services designed to meet the needs of the population and legal entities or the creation of public values. From the point of view of manufacturers, innovations are aimed at generating additional profit through the release of new products and services, the use of more efficient technological and managerial processes (Crossan, Apaydin, 2010).

Currently, both in research and in practice, two main classes of innovation are considered (Norman, Verganti, 2014). The first class includes incremental innovations, which are associated with small changes in the products produced, aimed at increasing the functionality and benefits of goods and services. Despite the slight improvement in the parameters of the products, in cases where such changes occur frequently, the company can ensure stable progress. The second class includes radical innovations that involve fundamental changes in the products produced. At the same time, the new products or services created are not related to the natural evolution of existing ones. This class of innovations is aimed at significant product transformation, which provides, among other things, one of the following parameters: performing new functions, reducing price, ease of use, affordability, reducing operating costs, improving maintainability (Scaringella et al., 2017).

Growing competition forces firms to develop new innovative products (Hu, Aziz, 2016). This situation is also due to dynamic changes in the markets, where more and more innovative products (services) appear and it is difficult for enterprises with traditional products to meet the current market conditions (Dereli, 2015). Innovative products act as drivers of firm success and customer satisfaction (Reguia, 2014). Innovation gives companies a

sustainable competitive advantage in a dynamic environment (Damanpur, Aravind, 2012). In general, innovation can play a major role in ensuring the sustainable development of firms ' competitiveness and ensuring the importance of their positions in the domestic and global market (Shankar, Narang, 2020; Zakshevskaya-Belyavskaya, 2012). It should be noted that innovation also ensures the longevity of firms (Leiponen, Helfat, 2010).

The creation of innovative products by firms involves five main stages (Ulrich, Eppinger, 2004; Rosenfeld et al., 2006): study of new ideas and production technologies; development of fundamentally new or improved products and services; testing of new products; implementation of new products on the market and analysis of the results obtained.

The importance of innovation for modern firms is due to the following factors (Okumu et al., 2019; Szopik-Depczyńska et al., 2020):

- innovations allow you to create products that are not yet on the market;
- innovation contributes to the development of new product or technology niches for firms;
- position of leaders, even in narrow areas, provides increased efficiency;
- innovations provide improved communication with consumers of products;
- prestige of firms in the regions and national economies is associated with the development of innovations.

Firms are forced to respond to external challenges caused by globalization, increasing demands from consumers, as well as the need to maintain market positions. This leads to the need to create new products or modernize existing goods and services (Mompo, Redoli, 2009; Gunday et al., 2011). Creating innovative products according to a number of authors (Beauregard et al., 2017; Anderson et al., 2016; Gupta, 2018). As reasons for the appearance of new products in research (Bilgili et al., 2011; Woschke, Haase, 2016) indicates the improvement of technological processes, marketing aspects, as well as the limited service life of previously purchased goods.

The innovation ecosystem of regions depends on the main actors of innovation activity, regional government bodies, the existing innovation environment, public organizations, research institutes (Fusco et al., 2017). Studies conducted (e.g., Prajogo, McDermott, 2014) showed that the size of organizations does not have a significant impact on the effectiveness of innovation implementation. That is, innovative efficiency is characteristic not only for large companies, but also for small and medium-sized enterprises.

Innovation in products, services, or processes consists of developing improvements, new concepts, and new technologies aimed at differentiating in markets and, consequently, a competitive advantage for companies (Thakura, Hale, 2013; Carlborg et al., 2014).

Some industries provide high innovation activity. Activities with a high level of innovative products include electronics, mechanical engineering, manufacturing, and the production of new materials (Zhelyazinsky et al., 2019; Zuhdi, 2015).

1.2 Review of publications in Russia

A number of scientific publications are devoted to the issues of the production of innovative goods by organizations and enterprises, the performance of such works and the provision of services in Russia. Let's look at the most interesting of them, which were published in 2019-2021. A brief description of these publications is given in table 1.

Table 1. Scientific publications on the volume of innovative products in Russia

Authors	Problems under study	Period, years	Objects of innovation	Type of indicators
1	2	3	4	5
Marenkov (2019)	Assessment of the state of Innovation and investment in the Russian industry	2005-2016	Industrial enterprises of Russia	Absolute and specific
Semenova (2019)	Key innovation indicators	2000-2017	Organizations in Russia	Absolute and Specific
Strizhakova and Strizhakov (2019)	Production volumes of innovative products	2010-2017	Organizations in Russia	Absolute and specific
Karpunina et al. (2019)	Factors influencing Innovative Production	2010-2018	Enterprises of the Central Federal District	Absolute
Emelyanova and Kharchikova (2019)	Dynamics of the index of innovative products 2016-2017	2016-2017	Enterprises of the regions of the Central Federal District	Indices
Arkhipova and Sirotin (2019)	Modeling of innovative production volumes	2014-2016	Spatial data by region	Absolute
Zvyagintsev (2020)	Analysis of the activities of innovative companies of various forms of ownership	2013-2018	Organizations in Russia	Specific units
Zakharova (2020)	Dynamics of growth of indicators of innovative activity	2015-2019	Innovative enterprises of the Orel region	Absolute and specific
Yezhov (2020)	Dynamics of innovation activity indicators	2014-2018	Organizations in Russia	Specific indicators
Makhova and Gruzdeva (2021)	Production volumes of innovative products	2000-2017	Organizations in Russia	Specific

Source: The table is compiled by the author on the basis of the information provided in the Russian science citation index.

Based on the information given in Table 1, it can be stated that the problem of studying the volume of innovative products was given some attention by Russian scientists. Most of the work they did looked at the country-wide indicators. At the same time, in theoretical and applied research to date, unjustifiably little attention has been paid to the comparative analysis of the share of products classified as innovative products in the regions of Russia. At the same time, for a comparative analysis by region, it seems logical to use specific indicators, since the regions differ significantly in the number of economic entities, population, size and location. Given this, it seems appropriate to study the share of innovative products by organizations operating in each of the regions.

2. RESEARCH METHOD

To date, the theoretical aspects of innovation activities of organizations are presented in detail in the document (OECD, 2018). At the same time, innovations are understood as the release of new or improved products (goods and services) that differ significantly from previously produced products, as well as the

introduction of new or more advanced production processes in organizations that differ significantly from those that were previously used. Accordingly, innovations can be of two types. The first type of innovation, which includes better products, works and services, is discussed in our article. At the same time, both the previously mentioned classes of innovative products were considered: incremental and radical.

The analysis of previous studies, including those listed in Table 1, showed the feasibility of using the share of innovative products as an indicator that characterizes the innovative activity of an organization in the regions, as well as types of economic activity.

The research process included three stages. At the first stage, initial empirical data describing the share of innovative products in the total volume of goods shipped, works performed, services rendered by organizations operating in each of the regions of Russia, as well as various types of economic activity were formed. At the second stage, the distribution of the values of these specific indicators by the regions of the country and the types of economic activity under consideration was evaluated. At the third stage, a comparative analysis was carried out, during which the regions of the country and the types of economic activity in which the minimum and maximum values of specific indicators were noted were established.

As the initial information, the study used official statistics for 2017-2019 on the share of innovative products in 82 regions of Russia and 45 types of economic activity (Federal State Statistics Service, 2021).

In the course of the study, four indicators were evaluated:

- the share of products classified as innovative, produced by organizations located in the regions in 2017;
- the share of products classified as innovative, produced by organizations located in the regions in 2018;
- the share of products classified as innovative, produced by organizations located in the regions in 2019;
- the share of products classified as innovative, produced by organizations specializing in various types of economic activities in 2019.

The economic and mathematical modeling used to estimate each of the four indicators was based on normal distribution functions. The methodology for using these functions is briefly described below.

Sets of enterprises formed on a territorial basis include their significant number of business structures. This, as well as the presence of various factors that affect the performance of enterprises, suggest the probabilistic (stochastic) nature of the formation of the values of indicators describing the totality of enterprises.

Formed indicators are influenced by two factor types. First of which determines similarity in values of indicators for sets of enterprises in the regions. Second type shows differentiation (Pinkovetskaia, 2015). First type of factors causes indicators in grouping the vicinity of medium value of all regions. Second type of factors determines degree of dispersion in values of indicators. Deviations of indicators for certain regions from medium value can increase or decrease. This assumption is based on factors of second type have multidirectional action. Density function of normal distribution can be confirmed as a function approximating frequency of distribution indicators, characterizing totality of enterprises in the country regions. The upper phenomenon prove the possibility of considering such functions.

With the use of normal distribution law research of economics processes, which parameters are determined as a result of combined influence some factors acting together and independently (Orlov, 2004).

As mentioned in Chebyshev's theorem (Kramer, 1999) individual random variables can have various values and their medium values are relatively stable. Thus, average value of big items independent random variables loses the character of a random variable. It is known that on Lyapunov's theorem, sum of independent random variables in many cases can be described by normal distribution law. Exactly these conditions correspond to the performance indicators of innovative activity sets of enterprises situated in regions. In the work by Gmurman (2003) was made conclusion that distribution of sum independent random indexes is approaching to normal fast enough.

Approximation with distribution functions can be used during modeling both continuous and discrete quantities (Wentzel, 2010). The distribution density function contains complete information about the random variable. The main numerical characteristics that describe a particular random variable are:

- characteristics of the position of a random variable on the numerical axis (mode, median, mathematical expectation). It should be noted that for the density functions of the normal distribution, these three characteristics are equal to each other;

- the characteristic of the spread of a random variable near the mean value is called the mean square deviation. The variance of a random variable is used for its calculation;

- the coefficients of skewness and kurtosis, which are equal to zero for a normal distribution (Mathematical Encyclopedia, 1977).

The graph of the density function of the normal distribution is a symmetric unimodal bell-shaped curve, the axis of symmetry of which is the vertical drawn through the point, that is the center of symmetry of the density function of the normal distribution.

The development of mathematical models describing the distribution of indicators that characterize the totality of enterprises using the density functions of the normal distribution is based on the construction of the corresponding histograms. With a large number of empirical source data (more than 40), it is advisable to group these data into intervals for the convenience of information processing. To do this, the range of indicator values is divided into a certain number of intervals. The number of intervals should be chosen so that, on the one hand, the variety of values of the indicator is taken into account, and on the other hand, the regularity of the distribution depends to a small extent on random effects.

When considering the distribution density functions that describe the indicators of sets of enterprises in the regions of Russia, the number of intervals is from 7 to 9. Each interval must contain at least five elements, and only two elements are allowed in the extreme intervals.

Based on the constructed histograms, models are developed, that is, the density functions of the normal distribution are estimated. It seems reasonable to perform calculations with different number of intervals during the computational experiment.

In the course of computational experiments must be solved the problems of approximating the results of empirical observations (official statistics) and the parameters (characteristics) of the distribution functions of random variables were estimated.

The normal distribution function contains complete information about the random variables under consideration. In our study, the specific weights of innovative products in each of the regions and types of economic activity are considered as random variables. The developed functions allow you to easily determine their characteristics, such as the average values, as well as the average square deviations. The frequency of the values of the indicators that fit into the range determined by the two mean square deviations (that is, the difference between the average value and this deviation, as well as the sum of the average value and the deviation) corresponds to 68.3% of all observations. In our case, this range includes indicators for most regions and types of economic activity.

The study included testing the following three hypotheses:

- hypothesis 1 - the share of innovative products is relatively small in most regions of Russia;
- hypothesis 2 - the values of the share of innovative products by organizations in 2015, 2017 and 2019 have a significant differentiation in different regions of the country;
- hypothesis 3 - the territorial location of the country's regions does not significantly affect the maximum and minimum values of each of the three indicators;
- hypothesis 4 - the values of the shares of innovative products by organizations in 2019 have a significant differentiation by different types of economic activity;
- hypothesis 5 - the maximum values of the share of innovative products by organizations were noted in high-tech types of economic activity.

3. RESULTS AND DISCUSSION

In the course of the computational experiment, economic and mathematical modeling was carried out on the basis of empirical data. The models that describe the distribution (y) of the specific weights (x, %) of the three indicators for different years are listed below:

- the share of products classified as innovative produced by organizations located in the regions in 2017

$$y_1(x_1) = \frac{259.67}{4.42 \times \sqrt{2\pi}} \cdot e^{-\frac{(x_1 - 5.03)^2}{2 \times 4.42 \times 4.42}}; \quad (1)$$

- the share of products classified as innovative produced by organizations located in the regions in 2018

$$y_2(x_2) = \frac{328.00}{4.52 \times \sqrt{2\pi}} \cdot e^{\frac{-(x_2 - 4.85)^2}{2 \times 4.52 \times 4.52}}; \quad (2)$$

- the share of products classified as innovative, produced by organizations located in the regions in 2019

$$y_3(x_3) = \frac{257.71}{4.07 \times \sqrt{2\pi}} \cdot e^{-\frac{(x_3 - 4.53)^2}{2 \times 4.07 \times 4.07}}; \quad (3)$$

- the share of products classified as innovative, produced by organizations specializing in various types of economic activities in 2019

$$y_4(x_4) = \frac{142.57}{3.80 \times \sqrt{2\pi}} \cdot e^{-\frac{(x_3 - 4.53)^2}{2 \times 3.80 \times 3.80}}. \quad (4)$$

The quality of the developed models was evaluated using three criteria: Kolmogorov-Smirnov, Pearson, Shapiro-Wilk. The calculated values of the criteria are shown in Table 2.

Table 2. Calculated values of the criteria

Function Number	Criteria		
	Kolmogorov-Smirnov	Pearson	Shapiro-Wilk
1	2	3	4
1	0.11	7.17	0.94
2	0.09	4.85	0.95
3	0.07	4.67	0.96
4	0.10	3.37	0.95

Source: The data in the table is based on the results of a computational experiment.

The analysis of the data given in column 2 of Table 2 showed that all calculated values are less than the critical value of the Kolmogorov-Smirnov agreement criterion (0.174) at a significance level of 0.05. Similarly, the data in column 3 is less than the table value of the Pearson consensus criterion (9.49). The calculated values of the Shapiro-Wilk agreement criterion exceed the table value of 0.93 with a significance level of 0.01. Thus, the computational experiment showed that all four developed functions are of high quality.

At the next stage of the study, patterns were identified that characterize the distribution of the considered indicators. Column 2 (Table 3) shows the data describing the average values of the indicators. The ranges in which the values of the indicators for most countries are located are shown in the third column of the table.

Table 3. Values of indicators share of innovative goods, works and services, %

Indicator	Average values	Values for most regions
1	2	3
share of production attributable to the innovation produced by the organizations located in the regions in 2017	5.03	0.61-9.45
share of production attributable to the innovation produced by the organizations located in regions in 2018	4.85	0.33-9.37
share of production attributable to the innovation produced by the organizations located in the regions in 2019	4.53	0.46-8.60
share of production attributable to the innovation produced by organizations specializing in various types of economic activity in 2019	4.53	0.73-8.33

Source: The calculations are carried out by the author on the basis of functions (1)-(4).

The data shown in table 3 describe that average values share of products classified as innovative, produced by organizations located in each of the regions, were in the range from 5.03% to 4.53% in 2017-2019. At the same time, for the period under review from 2017 to 2019, there was a decrease in indicators by 0.5%. It is interesting to note that in 2019, the values of the considered indicators at a level below the average (4.53%) occurred in 45 regions of the country. The intervals of change in indicators for most regions over these years were as follows: the lowest value was 0.33%, and the highest was 9.45%. That is, the share of innovative products in most regions did not exceed one tenth of the total volume of products produced. The above allows us to conclude that the first hypothesis has been confirmed.

To test hypothesis 2 on the differentiation of indicators by region, an analysis of the scope variation of each indicators presented in table 2 was carried out. The variation indices were: 88% for the first indicator, 93% for the second indicator, and 90% for the third indicator. This analysis showed a significant differentiation in the considered regions of the values of each of the three indicators. Therefore, hypothesis 2 was confirmed.

At the next stage, the regions where the maximum and minimum values of each of the indicators were noted in 2019 were identified. At the same time, the maximum and minimum values are those that correspondingly exceed the upper limits of the ranges shown in the third column of Table 3 and are smaller than the lower limits of the ranges. The results of this analysis are shown in Table 4. Along with the lists of regions, this table also shows the division of the identified regions by their geographical location and the specific weights of innovative organizations in the regions, which are given in parentheses.

Table 4. Regions with maximum and minimum values of indicators

Indicator	Maximum values	Minimum values
1	2	3
share of production attributable to the innovation produced by the organizations located in the regions in 2019	Republic Mordovia (23.76%), republic Tatarstan (18.11%), Belgorod region (of 13.93%), Nizhny Novgorod region (13.69%), territory Perm (12.04%), republic Udmurtia (10.39%), republic Adygea (11.08%), Ulyanovsk region (11.02%), territory Khabarovsk (10.95%), republic Mari El (10.58%), city St. Petersburg (of 10.54%), Kirov region (9.82%), Ryazan region (9.73%). Two regions are located in the Central, seven regions in the Volga, and one region in each the North Caucasus, Ural, Northwestern and Far Eastern Federal Districts.	Republic Dagestan (0.41%), republic North Ossetia-Alania (0.39%), republic Ingushetia (0.38%), Karachay-Cherkess republic (0.34%), Astrakhan region (0.27%), republic Khakassia (0.23%), Kaliningrad region (0.17%), Trans-Baikal territory (0.15%), republic Tyva (0.14%), republic Crimea (0.10%), Chechen republic (0.04%). Located in the Southern (two regions), North Caucasus (five regions), Siberian (two regions), Northwestern (one region) and Far Eastern (one region) Federal Districts.

Source: Developed by the author on the basis of data from Table 3 and official statistical information.

Table 4 provides information on the geographical location of regions with high (column 2) and low (column 3) values of the share of innovative organizations in 2019. The analysis of this information showed that there was no correlation between the values of the indicators for the regions and their territorial location. Thus, we can state the confirmation of the third hypothesis.

The data shown in the last row of table 2 shows that the average value of the share of products classified as innovative, produced by organizations related to various types of economic activity was 4.53% in 2019. It is interesting to note that in 2019, the values of the considered indicators were below the average (4.53%) in 27 types of economic activity. And above the average value-in 18 types of activities. The intervals of change in indicators for most types of activities in 2019 were as follows: the lowest value was 0.73%, and the highest was 8.33%. To test hypothesis 4 on the differentiation of indicators by type of economic activity, an analysis of the scope of variation for this indicator was carried out. The variation index was 84%. Therefore, hypothesis 4 was confirmed.

The minimum values of the share of products (less than the lower limit of the interval given in column 3 of Table 3) related to innovation produced by organizations were in 2019 in the following types of economic activity:

- publishing activity - 0.23%;
- clothing production - 0.26%;
- construction - 0.38%;
- auxiliary activities in the field of crop production and post-harvest processing of agricultural products - 0.52%;
- transportation and storage - 0.54%;
- production of tobacco products - 0.60%;
- activities in the field of health and social services - 0.66%;
- architecture and engineering design - 0.71%.

The maximum values of the share of products (greater than the upper limit of the interval given in column 3 of Table 3) related to innovation produced by organizations were in 2019 in the following types of economic activity:

- production of medicines and materials used for medical purposes - 9.91%;
- production of electrical equipment – 10.15%;
- production of rubber and plastic products – 10.33%;
- production of machinery and equipment - 10.58%;
- computer software development, consulting services in this area and other related services - 11.54%;
- production of finished metal products, except machinery and equipment - 13.03%;
- advertising activities and market research - 14.87%;
- production of computers, electronic and optical products - 16.62%;
- production of other vehicles and equipment – 18.21%;
- production of motor vehicles, trailers and semi-trailers - 19.47%.

The maximum values refer to high-tech types of economic activity. Thus, hypothesis 5 was confirmed.

CONCLUSION

The study showed that innovative products have been produced in Russia in recent years in all 82 regions and 45 types of economic activity.

The purpose of the study, which was to assess the share of products classified as innovative, produced by organizations located in the regions of Russia for 2017-2019, was achieved. The conclusions that have scientific novelty and originality include:

1. The article presents a methodology for assessing the share of products classified as innovative, produced by organizations located in all regions of Russia and specializing in various types of economic activities.

2. The distribution of the considered indicators by regions and types of economic activity is modeled using the normal distribution functions.

3. It is proved that there is a decrease in the average values of the share of innovative products in the regions for the period from 2017 to 2019 by 0.5%.

4. It is shown that the average share of innovative products for the period under review was about 5% of all products produced in the regions of Russia.

5. It is shown that the values of the indicators were significantly differentiated by region.

6. The regions with the maximum and minimum values of the share of innovative products are identified.

7. It is proved that there is no influence of the territorial location of the regions on the minimum and maximum values of the considered indicators.

8. It is shown that the values of the indicators were significantly differentiated by types of economic activity.

9. The types of economic activities with the maximum and minimum values of the share of innovative products in the total volume of manufactured products in 2019 were identified.

The results of our work have a certain theoretical and practical significance. The methodological approach presented in the article to assess the share of innovative organizations in the share of innovative products in the total volume of products produced by regions of Russia and types of economic activity can be used in further research.

The methodological approach and tools proposed in the article for assessing the share of innovative products based on the density functions of the normal distribution can be used in the process of monitoring the level of these indicators, as well as justifying programs for the development of innovative activity in Russia and other countries. The methodology and tools that were used in the research process can be applied in similar studies in countries with a significant number of territorial (administrative) units.

The results of the work can be applied in the current activities of state structures and public organizations, when justifying measures to support innovation activities. In addition, the information obtained can be used to solve problems of increasing the share of innovative products in regions where such products have not been widely developed. The results of the work are of interest to leasing companies that ensure the introduction of new equipment and advanced technologies.

The practical significance of the study lies in the possibility of using the results obtained to justify the resources needed to increase innovation activity. The conducted research provides the government, regional government bodies and other administrative structures with information on possible ways to develop innovations. The government and regional authorities can apply the results of the study in the development and implementation of public policies for the development of innovation.

The new knowledge gained is of interest and can be used in the educational process at universities.

Further research can be carried out to assess the industry characteristics characteristic of the production of innovative products. In the course of the study, there were no restrictions on empirical data, since information was considered for all 82 regions of Russia.

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