Artículo de investigación

Analysis of development trends in the innovation industry of the Russian Federation

Анализ Тенденций Развития Инновационной Отрасли Российской Федерации
Análisis de las tendencias de desarrollo en la industria de la innovación de la Federación de Rusia
Análise das tendências de desenvolvimento na indústria da inovação da Federação Russa

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Abstract

The purpose of this study is to analyze the trends in the development of the innovation industry of the Russian Federation. For this, the following tasks were solved: the dynamics of the industrial production index as a whole, as well as the types of economic activity were analyzed; the dynamics of key indicators of innovation activity of industrial production organizations of the Russian Federation was analyzed; the effectiveness of investment in innovative activities of the Russian industrial sector was evaluated. For this purpose, the methods of logical constructions, system and situational analysis, generalization, analogies, comparisons, included observations were used. It has resulted into conclusion on the development tendency of the Russian Federation innovation industry, the directions for efficiency improvement of industry innovations development in the context of the economy modernization.

Keywords: costs of technological innovation, competitiveness, industrial sector, innovation activity, innovation industry, investment efficiency.

Аннотация

Целью данного исследования является анализ тенденций развития инновационной отрасли Российской Федерации. Для этого были решены следующие задачи: проанализирована динамика индекса промышленного производства в целом, а также видов экономической деятельности; проанализирована динамика ключевых показателей инновационной деятельности организаций промышленного производства Российской Федерации; оценена эффективность вложений в инновационную деятельность российского промышленного сектора. Для этого использовались методы логических построений, системного и ситуационного анализа, обобщения, аналогий, сравнений, были проведены наблюдения. В результате сделан вывод о тенденциях развития инновационной отрасли в России, направлениях повышения эффективности развития отраслевых инноваций в модернизации экономики.

Ключевые слова: инновационная деятельность, инновационная промышленность, конкурентоспособность, промышленный сектор, стоимость технологических инноваций, эффективность инвестиций.

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Resumo

O objetivo desta pesquisa é analisar as tendências no desenvolvimento da indústria de inovação da Federação Russa. Para tal, foram estudadas as seguintes áreas: a dinâmica do índice de produção industrial como um todo, bem como os tipos de actividade económica; a dinâmica dos indicadores-chave da actividade de inovação das organizações de produção industrial russa; e a eficácia do investimento em actividades inovadoras do sector industrial russo. Foram utilizados métodos lógicos de construção, análise de sistemas e situações, generalização, analogias, comparações e observações. Com este estudo várias conclusões foram tiradas sobre a tendência de desenvolvimento da indústria de inovação da Federação Russa e as direções para a melhoria da eficiência do desenvolvimento das inovações da indústria no contexto da modernização da economia.

Palavras-chave: actividade de inovação, competitividade, custos da inovação tecnológica, eficiência do investimento, indústria da inovação, sector industrial.

Resumen

El objetivo de esta investigación es analizar las tendencias en el desarrollo de la industria de la innovación de la Federación Rusa. Para ello se han estudiado las siguientes áreas: la dinámica del índice de producción industrial en su conjunto, así como los tipos de actividad económica; la dinámica de los indicadores clave de la actividad de innovación de las organizaciones de producción industrial de Rusia; y la eficacia de la inversión en actividades innovadoras del sector industrial ruso. Para ello se han utilizado métodos de construcción lógica, análisis de sistemas y situaciones, generalización, analogías, comparaciones y observaciones. Con este estudio se han llegado a diversas conclusiones en relación con la tendencia de desarrollo de la industria de la innovación de la Federación de Rusia y las direcciones para la mejora de la eficiencia del desarrollo de las innovaciones de la industria en el contexto de la modernización de la economía.

Palabras clave: actividad de innovación, costes de innovación tecnológica, competitividad, eficiencia de la inversión, industria de la innovación, sector industrial.

Introduction

The current level of competitiveness of the Russian Federation economy as a whole and of the industrial sector in particular is determined by both depressive and positive factors. The negative impact on the state of competitiveness has a lack of funding for innovation, as well as the inefficiency of financial institutions. The development of national infrastructure and the high capacity of the domestic market can be attributed to potentially strong factors. A strategy built on the balance of these factors can be effectively implemented in the Russian economy. The basis for the implementation of the innovation strategy for the development of the Russian economy is obviously its industry, which is situationally characterized by an average level of factors such as “technological readiness”, “labor market efficiency”, and “innovation”. Modernization of the Russian industry is the key factor in the formation of national competitiveness.

The condition of the Russian industry in 2016 is characterized by the following data: 450.1 thousand functioning enterprises, 13.3 million people employed, 53228 billion Rubles the volume of the shipped goods of own production, executed works and services on their own.

Methodology

In order to assess the development trends of the domestic industry, we will analyze the dynamics of the industrial production index as a whole, as well as by types of economic activity (Figure 1).

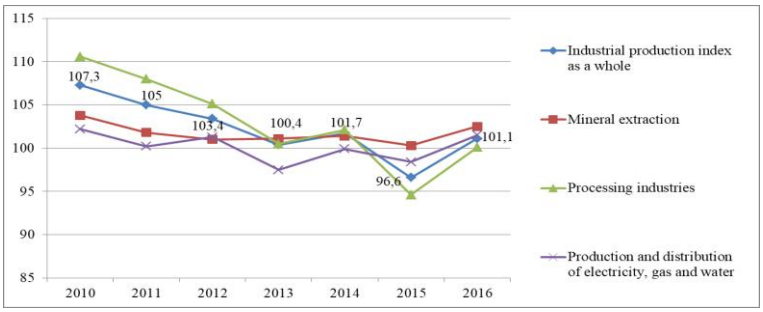

Figure 1. Dynamics of industrial production type of economic activity in 2010-2016, %

The dynamics of industrial production for the analyzed period is characterized by extreme unevenness. If in 2010-2014 there was a positive trend in annual growth in industrial output, in 2015 there was a significant drop in industrial production indexes calculated by types of economic activity “Processing Production” and “Production and Distribution of Electricity, Gas and Water”. In 2016, according to operational data of the Russian Federal Statistics Service (Rosstat), industrial production growth amounted to 1.1% in annual terms. In the extractive sector, industrial output exceeded the index of 2015 by 2.5%, while in the crisis period of 2013-2015, this sector did not leave the zone of positive increment.

In the volume of goods shipped, the share of the extractive industry averages about 25%, processing - 65.0%, electricity, gas and steam - 8%, water supply and discharge - 2%. The mining and processing spheres of industrial production of the Russian Federation have a distinct specificity determined by its historical development.

The analysis of modern scientific publications on the issues of industrial sector development allowed compiling and highlighting its actual characteristics:

- clearly traced the raw material orientation of the economy, manifested in the dominance of the effectiveness of development, investment attractiveness of the extractive industry and primary processing of fuel, raw materials;
- low share of middle and high-tech sectors of processing industry, as well as production oriented on consumer products (end-use goods of the population);
- high proportion occupy the industry and production included in the defense-industrial complex.

These characteristics indicate a lack of balance between the structure of the national industry - integration mechanisms in vertical logistics are poorly expressed, the country's industrial position is vulnerable in the context of international specialization and cooperation. Branches of the fuel and energy complex, metallurgy and military-industrial complex are the main in the Russian industry and determine its face and role in the international system of territorial division of labor. Such a structure of industry cannot be considered effective.

Economic policy at the present stage of social development should be based on the transformation of the national industry through the transition from a "raw materials economy" to the formation of competitiveness of processing industries in the domestic and foreign product markets. From a formal point of view, it is necessary to set the task of ensuring the growth of the volume of processing industries in the structure of the national GNP. And not only the gross volume, but also its qualitative characteristics - the share of innovative products. The growth of innovativeness of the industrial sector and processing industries, in the first place, is considered as an urgent task of the socio-economic development of Russia, requiring scientific and theoretical research and development of organizational and economic methods for its solution (Dmitriev & Novikov, 2017; Grishchenkov, 2008; Novikov & Dmitriev, 2018).

Key indicators characterizing the innovation activities of industrial production organizations of the Russian Federation are summarized and presented in Table 1.

Table 1. Dynamics of key indicators of innovation activities of organizations of industrial production in the Russian Federation for 2010-2016 (Gorodnikova et al., 2018)

Indicators	Year						
	2010	2011	2012	2013	2014	2015	2016
1. The total level of innovation activity, %	10.8	11.1	11.1	10.9	10.9	10.6	10.5
2. The share of organizations implementing technological innovations in the total number of organizations, %	9.3	9.6	9.9	9.7	9.7	9.5	9.2
3. The volume of innovative products, works, million rubles:							
- in current prices	1165748	1847370	2509604	3072531	3037407	3258255	3723693
- per ruble of the cost of technological innovation, rub.	3.3	3.9	4.3	4.1	4.0	4.4	4.8
4. The share of innovative products, works, services in the total volume of goods shipped, works, services, %	4.9	6.1	7.8	8.9	8.2	7.9	8.4
5. The cost of technological innovations, million rubles .:	349763	469442	583661	746778	762774	735758	777519
6. The share of the cost of technological innovation in the total volume of goods, works, services, %	1.5	1.5	1.8	2,2	2,1	1.8	1.8
7. The cost of technological, marketing, organizational innovations, million rubles .:	356163	474587	590342	756184	778263	741284	787232
8. The share of the cost of technological, marketing, organizational innovations in the total share of goods, works, services, %	1.5	1.6	1.8	2,2	2,1	1.8	1.8

9. The share of organizations that operate research and development and design departments in the total number of organizations, %	10.2	10,4	10,9	11,0	11,3	10.9	10,3

Interpretation of the results of the study shows that innovation activity in industry, determined by the share of innovation-active enterprises in their total number in the industry, is quite low in Russia. In 2016, the cumulative level of innovation activity of the national industry was only 10.5%, while the average annual rate of change of the studied indicator for the period from 2010 to 2016 is negative (-0.075%). The maximum indicator of innovation activity of organizations during this period was recorded in 2011-2012. and amounted to 11.1%. In subsequent years, there was a negative trend, by 2016 the figure decreased by 0.6% compared with the 2011 level (Grishchenkov, 2008).

This value of one of the most important indicators of the innovative development of the country's economy is critically low. For comparison, the level of innovation in the industry of European countries is 35-75% (Figure 2).

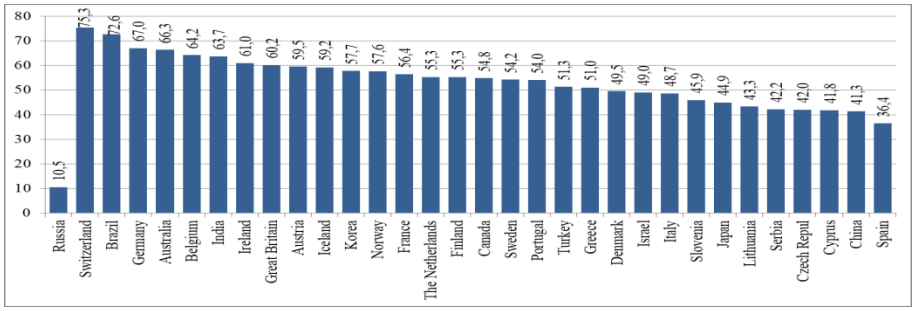

Figure 2. Comparative characteristic of the aggregate level of innovation activity of organizations in the industrial sector by country (2016), %

The levels of innovation in the extraction sector in Russia are relatively low - 7.4%, processing - 13.3%, with a catastrophically low value even for high-tech industries - 8.3%, and the production and distribution of electricity, gas and water - 4.8%.

Table 2. Dynamics of innovation activity of industries of the Russian Federation by type of economic activity and levels of manufacturing in 2010-2016

Indicators	**Year**							**Change 2016 from 2010 (%)**
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	
Total in RF	9.5	10,4	10,3	10,1	9.9	9.3	8.4	-1,1
Total industrial production	10.8	11.1	11.1	10.9	10.9	10.6	10.5	-0,3
By types of economic activity:								
1.1 Extraction of minerals	7.8	8.4	8.2	7,6	7,5	6,9	7,4	-0,4
1.2 processing industries	13,0	13,3	13,4	13,3	13,6	13,3	13,3	0,3
- high-tech industries	29.5	29,6	31,8	31,6	31,9	31,7	30,8	1,3
- high-tech medium-level industries	16.8	17,1	17,7	17,5	17,4	17,2	17,2	0,4
- mid-tech low-level industries	11.2	13,1	13,3	12,7	12,5	12,2	12,3	1,1

- low-tech industry	8.1	8,3	8.2	8.1	8.2	7.8	7.9	-0,2
1.3 production and distribution of electricity, gas and water	5.4	5,6	5,6	5,3	5,1	4.9	4.8	-0,6

In 2016 compared to 2010, an increase in the rate of innovation activity in the processing industry alone is observed - by 0.3% (compared to 2015, the share of innovation-active enterprises remained at the same level - 13.3%). The trend to decrease in 2016 compared to 2010 had the indicators of innovation activity in the following types of economic activity: extraction of minerals of 0.4%, production and distribution of electricity, gas and water by 0.6%.

As of 2016, 10.5% of industrial enterprises carried out innovations of all types, including 9.2% - technological innovations (Table 1). In the late 80s. such enterprises in Russia amounted to 60-70%. In European countries, the innovative activity of industrial enterprises in the field of technological innovation is 30-50% (Figure 3).

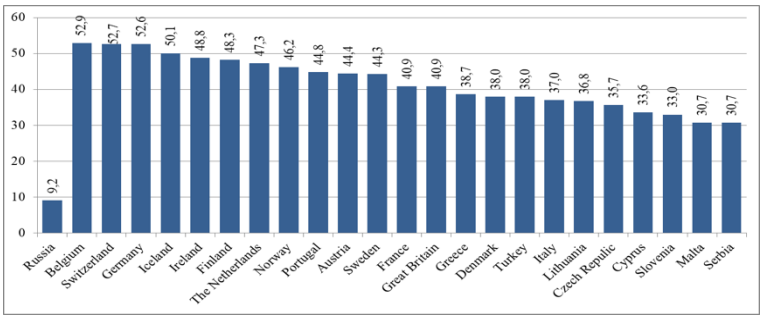

Figure 3. Comparative characteristic of the proportion of organizations implementing technological innovations in the total number of organizations by country (2016), %

Among industrial enterprises engaged in technological innovation, the following types of innovation prevail: the acquisition of machinery and equipment (60.0% of enterprises), the acquisition of software (25.3%), research and development (37.6%), the acquisition of new technologies (9.7%), the acquisition of patent rights (6.1 %), marketing research (5.1%).

In some industrial complexes, there is a clearly positive trend of an acceptable level of innovation activity of enterprises, which is not characteristic of the development of the national economy as a whole (Figure 4).

The largest share among the innovation-oriented enterprises of the manufacturing industry is occupied by the production of electronic components, the production of pharmaceutical products.

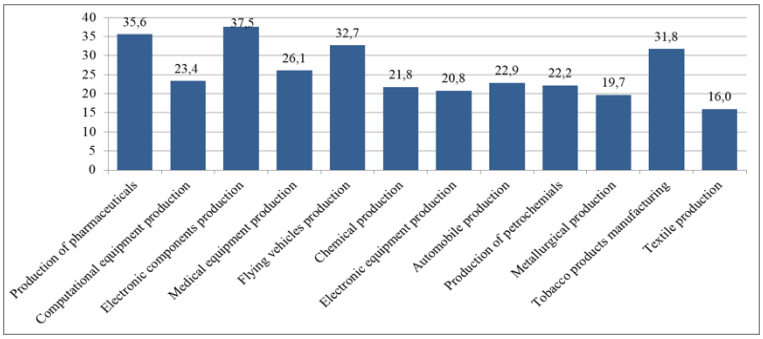

Figure 4. The total level of innovation activity of industrial production organizations of the Russian Federation by type of economic activity (2016)

Enterprises engaged in the production of computers, the production of medical products, the production of automotive products, chemical production and the production of electrical

equipment follow the leaders in innovation-active enterprises (Pinkovetskaia et al., 2019).

It should be noted that the activities of the manufacturing industry with a very low level of innovative activity are also present. Among such activities, the processing of secondary raw materials (2.7%), publishing and printing activities (2.2%).

The positive trends considered, despite their local nature, are encouraging - the Russian economy has the potential for innovative development and there are objective proven models for its implementation. That is why the current research direction in the most general form can be formulated as the identification and transposition of positive national and foreign experience, the development of mechanisms and scientific-theoretical solutions for the organization of innovation activities aimed at increasing the level of innovativeness of the national industry (Pinkovtskaia et al., 2019).

Resource capabilities of enterprises are a serious factor limiting the development of innovation. Figure 5 presents the division of costs for innovative activities by sources of funding.

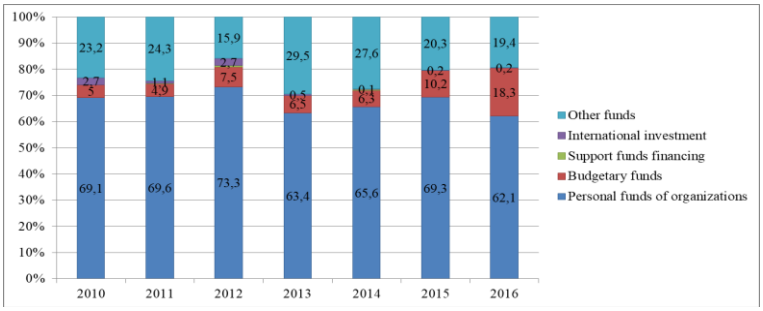

Figure 5. The structure of the costs of technological innovation by source of funding in 2010-2016

In the structure of expenses for technological innovations during the entire period analyzed, the prevailing share of all is taken up by organizations' own funds (62.1% at the end of 2016). This trend is regarded as positive, as entrepreneurs invest their own financial resources in their development and development of the innovation economy as a whole. Also important in my opinion is a significant increase in the share of the Federal budget, the budgets of the Federation constituent entities and local budgets in the structure of financing innovation in Russia (from 5% in 2010 to 18.3% in 2016). With such a share of budget funds for innovation, Russia occupies one of the leading places in state policy in the field of innovation activity. In Russia, the funding of innovation activities from the federal budget is on par with such developed countries as Germany, Japan, the United Kingdom, Belgium and the Netherlands. Attention should be paid to the low proportion of finance received from support funds for scientific, scientific and technical, innovation activities and foreign funds in Russian innovation activities (0.01% and 0.2%, respectively).

Innovation activity can be considered as an economic process at all levels of economic allocation. What does the possibility of analyzing its cost and productive parts, evaluating the effectiveness of the process. The objective of this analysis is to localize the area of dysfunction of the national innovation process, search for the causes of the low level of industrial innovation, the primary determination of the direction of scientific research.

Interpreting the data collected by the Federal State Statistics Service for the Industrial Sector in the period 2010-2016. in accordance with the formula for calculating the output of the volume of innovative products for 1 rub. the cost of technological, marketing, organizational innovations, we obtain an assessment of the effectiveness of investment processes in the national innovation sphere (Table 3). The effectiveness of national innovation processes in industry does not look encouraging: output in the amount of 4.7 rubles of innovative products at 1 ruble of costs.

Table 3. Evaluation of the effectiveness of investing in the innovation activities of the industrial sector in the Russian Federation in the period 2010-2016

Indicators	Year						
	2010	2011	2012	2013	2014	2015	2016
1. The volume of innovative goods, works, services, million rubles:	1165748	1847370	2509604	3072531	3037407	3258255	3723693
2. The chain growth rate of the volume of innovative goods, works, services, %	100.0	158,5	135,8	122,4	98,9	107,3	114,3
3. The cost of technological, marketing, organizational innovations, million rubles .:	356163	474587	590342	756184	778263	741284	787232
4. The chain rate of growth of costs for technological, marketing, organizational innovations, %	100.0	133,2	124,4	128,1	102,9	95,2	106,2
5. The output of the volume of innovative products to 1 rub. costs of technological, marketing, organizational innovations, rub.	3.3	3.9	4.3	4.1	3.9	4.4	4,7

For comparison – Standard, which is regulated by the modern innovative economy of the countries, also falling into the category "with the transition to the innovative platform", makes: PRC - 16.7; India - 18.2.

For clarity, the dynamics (2010-2016) of the development of investment efficiency in the innovation activities of the industrial sector of the Russian Federation are presented in Figure 6.

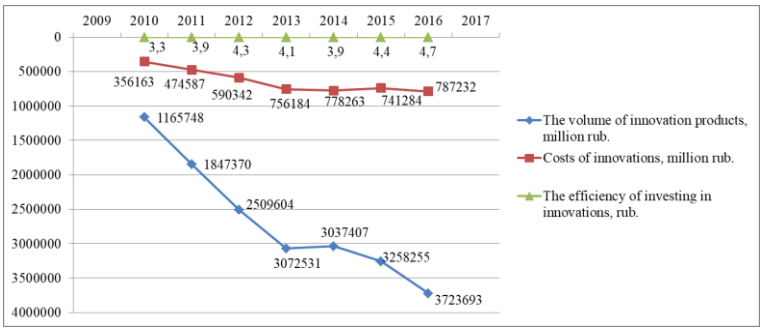

Figure 6. The trend of investment efficiency in the innovation activity of the Russian industrial sector in comparison with the costs of innovation and the volume of innovative products

For six years (from 2010 to 2016), the efficiency of investing in innovations increased only by 1.4 rubles from 3.3 rubles in 2010 to 4.7 rubles in 2016. Note that low efficiency is typical for all industrial sectors. The decline in efficiency in 2014 is not explained by the effects of the economic crisis - according to expert estimates, the growth of industry consolidation in 2014 should have caused just the opposite trend. Competitiveness should have been preserved precisely innovative products, sales of which should not have been reduced. Gross spending on innovation in 2014 is higher than in 2010-2012, while the performance indicator is lower than in 2012 by 0.4 rubles. This underlines once again that the economic crisis of 2014 is not an explanatory factor in the negative dynamics of the efficiency of investments in innovation sphere.

The effectiveness of investment in innovation can be judged by the share of newly introduced innovative products, works, services in the total volume of goods shipped (Figure 7).

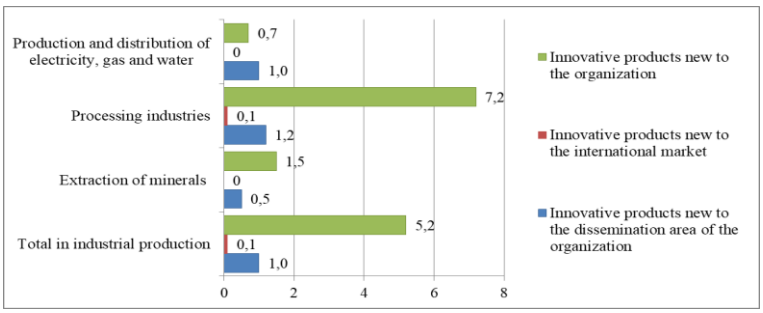

Figure 7. The share of newly introduced innovative product, works, services in the total volume of goods shipped from the industrial sector, 2016, %

In general, in industrial production, the share of innovative products for the world market is negligible - 0.1%, innovative products for the organization's sales market are only 1% and innovative products for the organization are 5.2%. Among the industrial sectors, there are few manufacturing sectors, where the share of innovative products new to the organization has reached 7.2%.

The low overall performance of innovations noticeably weakens the competitive position of Russian producers in foreign markets. The share of innovative goods, works and services in the export of enterprises in the industrial sector in 2016 was only 8.4%, including by sector: Extraction of minerals – 4.4%, processing production – 10.0%, production and distribution of electricity, gas and water – 0%. Russia's share in the global volume of trade in civil science-based products has not exceeded 0.3-0.5% for a number of years (For comparison: the US share - 36%, Japan - 30%, Germany - 17%, China - 6%). The share of high-tech products in exports does not exceed 4-5%, while for China this figure is 22.4%, South Korea - 38.4%, Hungary - 25.2% (Novikov, 2018; Novikov & Veas Iniesta, 2018).

The factors that slow down innovation development in the manufacturing sector also include the low degree of integration of the participants in the innovation process (Figure 8).

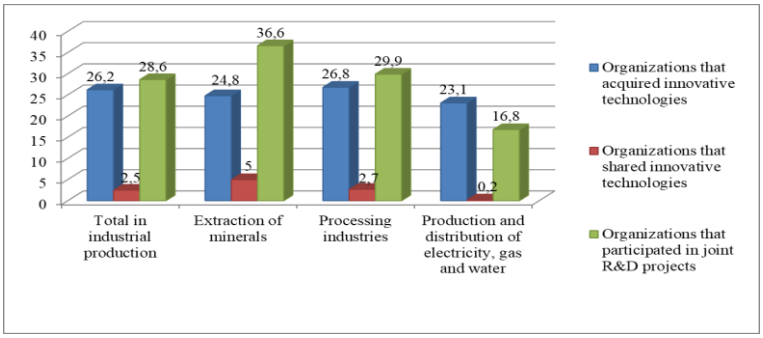

Figure 8. Cooperation links of organizations implementing technological innovations, 2016, %

In 2016, in general, in industrial production, about a third of companies participated in cooperation projects (28.6%). Somewhat higher than in industry as a whole, the share of

organizations that participated in joint projects to carry out research and development in the sectors Minerals' extraction and processing (36.6% and 29.9%). In 90% of cases, joint innovation projects are implemented within the domestic market with the participation of Russian partners. Direct contacts with foreign partners are very rare. At the same time, such partnerships are mainly of an applied nature and do not aim to create fundamentally new products.

Conclusions

The values and dynamics of the indicators of the development of innovative processes in industry discussed above are the pivotal point of reasoning about the problem studied in this paper - improving the efficiency of innovative development of industry in the context of the modernization of the economy. Moreover, the problem is seen not so much in the low level of the indicators themselves, as in the absence of a positive trend of their development and obvious prerequisites for extensive or intensive growth.

Thus, a general analytical conclusion about the development trends of the innovation industry can be formulated as stagnation of the innovation development of the national industry (Pinkovtskaia et al., 2019).

At the same time, the potential of innovations in the industrial sphere is objectively high. But the objects do not turn into innovative products that are in demand on the market, the high scientific and technical potential of the Russian Federation is not realized. And the obvious reason for this negative trend is the imperfection of the organizational and economic mechanisms and methods of managing the innovation process. It can be concluded that the low innovativeness of the industrial sector is associated with the inefficiency of investment processes in the innovation sphere, which, in turn, is due to the lack of relevant and situationally adequate mechanisms for managing innovative processes in the industrial sector (Dmitriev & Novikov, 2018; Glushak, 2011; Novikov, 2018).

References

Dmitriev, ON & Novikov, SV (2017). Conception of managing of fuzzy-institutional meso-level organizational separations in a context of product projects internationalization. European Research Studies Journal, 20(4), 277-289.

Dmitriev, ON & Novikov, SV (2018). Economic Assessment of Federal Scientific Programs. Russian Engineering Research, 38(4), 326-329.

Glushak, OV (2011). Methodological aspects of research innovation // Creative Economy, V. 5, № 6, 44-48.

Gorodnikova, NV, Gokhberg, LM & Ditkovsky, KA (2018). Indicators of innovation: 2018. Statistical collection / National Research University Higher School of Economics. - M.: HSE, 344.

Grishchenkov, AI (2008). Methodology and practices of modern conditions: Monograph. Bryansk: Bryanskoblgoskomstat.

Novikov, SV & Dmitriev, ON (2018). Vision of Genesis of Presentation of Hi-Tech Project during Competitive Selection. Russian Engineering Research, 38 (4), 320-322.

Novikov, SV (2018). Russian Support for Innovation and Export Growth. Russian Engineering Research, 38 (4), 305-308.

Novikov, SV (2018). The features of innovative processes in the Russian federation: analysis of current practices. Espacios, 39(39), 2.

Novikov, SV & Veas Iniesta, DS (2018). State regulation of the development of the connectivity of the Russian territory. Espacios, 39(45), 20.

Pinkovtskaia, IS, Arbeláez Campillo, DF, Rojas-Bahamón, MJ, Gromova, T & Nikitina, I (2019). Female entrepreneurship development in the Russian Federation. Amazonia Investiga, 8(18), 111-118.

Pinkovetskaia, IS, Pustynnikova, EV & Sverdlikova, EA (2019). Turnover of Russian small enterprises: results of modeling. Amazonia Investiga, 8(19), 24-33.

Pinkovtskaia, IS, Balynin, I, Arbeláez Campillo, DF & Rojas-Bahamón, MJ (2019). Small business development in Russia: results of the assessment of sectoral structure and number of employees. Espacios, 40(7), 6.

Zagorodnikov, KA & Novikov, AS (2018). Diversification of activities of innovative enterprises // Issues of management and economics: current state of current problems. collection of articles based on the materials of the XIV International Scientific and Practical Conference - M., Ed. Internauka, 8(14), 47-50.