

Innovative and technological development of the regions during the period of economic instability

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Abstract. Currently, the world economy has entered a period of unsteady development, characterized by the aggravation of problems that cannot be solved within the framework of existing equipment, technologies, management methods, etc. These problems are caused by the completion of the 5th technological order and the birth of the 6th, as well as the beginning of the 4th Industrial Revolution. The existing world experience convincingly proves that during periods of economic transformations caused by changes in technological structures, innovative development in the direction of innovative advance is a priority. The countries that have embarked on the path of advanced innovative development are the leaders of economic growth, ensuring the economic well-being and high quality of life of their peoples. For the enterprises of the domestic industry, which retains a significant innovative potential, the strategy of advanced innovation is virtually no alternative. The article examines the state of innovation and technological development of Russian regions during the period of economic instability. Attention is paid to the peculiarities of innovative growth of regions. Based on statistical data, the analysis of the main indicators reflecting the innovative activity of enterprises in the country's industry is carried out. The main regional problems hindering innovative development are identified and a number of priority measures necessary for decision-making in the field of innovation promotion are proposed.

1 Introduction

Ensuring high indicators of socio-economic development of regions is possible under the condition of the development of domestic production, which directly depends on the introduction of innovative and technological development.

Therefore, in the conditions of the global financial crisis and the aggravation of internal crisis phenomena, the development and provision of conditions for the implementation of priority areas of innovation activity becomes an urgent task of regional development. In solving these issues, the processes of innovation activity of the regions are of particular importance.

Currently, the situation has developed in such a way that most large industrial enterprises and organizations in the regions of Russia have realized the need for an innovation policy. In this case, despite the difficult economic situation, imperfect legislative and regulatory framework in the field of

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regulation of activities in the scientific and innovation sphere, protracted reforms, uncertainty during the period of economic instability, industrial enterprises show tendencies to strengthen their innovation activity, especially in the field of commodity and technological innovations [14].

The study of the role of innovation and technological development in the economic system of regions has found one of the leading places in the modern works of domestic and foreign economists. The issues of the development of innovation activity in Russia and the regions, overcoming imbalances and their promotion are considered in the works of R.A. Abramov, V.Yu. Katasonov, O.V. Stroeve, A.M. Nosonov, V.S. Zharov, I.E. Ilyina, etc.

However, despite the presence of author's opinions and judgments in the field of the identified issues, a number of issues have not been resolved and require further research.

Thus, the purpose of the study is a systematic study and analysis of the innovative and technological development of the regions of Russia.

Among the tasks identified are: 1) identification of positive and negative aspects of innovative and technological development of regions; 2) improvement of scientific and methodological approaches to state regulation of innovative development in the conditions of instability of the market economy.

The article reveals the features of the formation of a regional innovation institutional system with the identification of the main problems that manifest themselves in the process of innovation by industrialists in the regions and remain the main task of scientific research of many domestic and foreign scientists.

2 Materials and methods

In the course of the research, the key methods were the analysis of literary sources, systematization, grouping, abstraction in order to determine the essence of the concept of "regional economy", methods of statistical and strategic analysis for the study and evaluation of a number of indicators of socio-economic potential and strategic vision of the prospects for the development of regions in a period of economic instability.

3 Results

The main part. The financial and economic crisis, the burden of socio-economic problems, the severity of regional imbalances are the current realities that cause the need to overcome them with the mandatory activation of innovation activities at the national and regional levels.

Innovation and technological development is the process of functioning of the education-science-production system, aimed at turning into applied developments suitable for industry, serving as the basis for innovation and their subsequent transformation into technologies that are practically implemented in order to ensure sustainable economic growth [2].

Over the past decades, the so-called "regional revolution" has taken place in developed countries, which caused the transformation of the internal structure of the economy.

International practice has recognized the fact that it is the regions that are the "engine" of economic development based on research, technology and innovation [1].

The most famous examples of regional innovative development in Europe are the Baden-Württemberg complex in Germany, Catalonia in Spain, whose projects are supported by the EU structural fund within the framework of the special program Regional Programs of Innovative Action. Outside of Europe, the analogues are: Silicon Valley in the USA, Ontario province in Canada, Toyota City in Japan, Zhongguancun in China, etc. [13]

Practice shows that if the share of innovative products in a country's GDP is less than 20%, then national products lose competitiveness. It should be noted that the average European indicator is 25-35%, and in China it has reached 40%. In Russia, 1% of GDP is invested in science and innovation with a return of 22.6% at the beginning of 2023 (Fig. 1). [3]

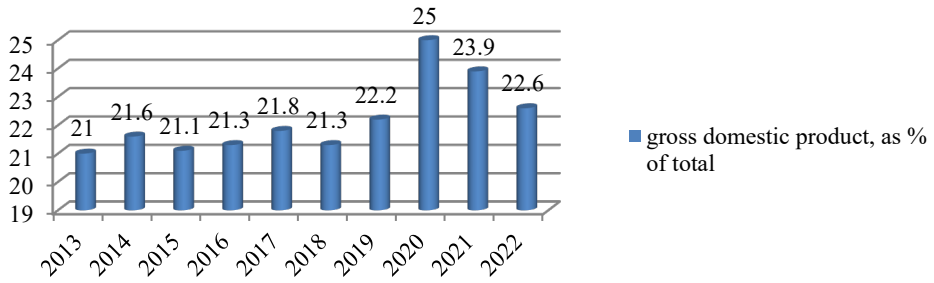


Fig. 1. The share of high-tech and knowledge-intensive industries in the GDP of the Russian Federation, 2013 - 2022. (in % of the total)

*Compiled by the author according to

4 Discussion

Despite the difficult economic period of the 90s of the twentieth century, by 2010 Russia retained its scientific and scientific-technical potential, which formed the main basis of innovative development for the subsequent period [4].

Nevertheless, the dynamics of this development remains unstable and disproportionate across regions. In particular, innovative and active industrial enterprises in 2022, for example, in the Central Federal District accounted for 24.6% of the number of all operating economic entities. In the North Caucasus region, this indicator was only 11.3%. The highest indicators of the development of technological innovations in the context of enterprises over the past five years have been observed in the Volga Federal District, where their number has increased by 7.6 percentage points (Table 1).

Table 1. The share of organizations implementing technological innovations in the total number of surveyed organizations, by federal districts of the Russian Federation 2018-2022., %

Federal District (FD)	years					Deviation (+;-) 2022-2018
	2018	2019	2020	2021	2022	
Central'nyj	23.9	28.1	26.5	25.5	24.6	0.7
Severo-Zapadnyj	22.3	22.2	23.0	22.8	23.0	0.7
YUzhnyj	14.8	17.8	19.1	21.5	21.8	7.0
Severo-Kavkazskij	7.3	7.1	10.1	11.6	11.3	4.0
Privolzhskij	20.2	22.5	27.1	27.2	27.8	7.6
Ural'skij	23.3	20.9	21.7	20.8	20.2	-3.1
Sibirskij	16.0	16.4	19.6	19.0	18.9	2.9
Dal'nevostochnyj	16.1	15.4	15.4	15.7	15.4	-0.7

*Compiled by the author according to

Noteworthy is also the change of the leading regions in this indicator, which, in addition to the traditionally Central Federal District with Moscow and St. Petersburg, positive dynamics is observed in the Southern Federal District, the North Caucasus and Siberian districts [6].

There is an ambiguous situation in the regions and with the number of industrial enterprises in Russia introducing innovations. For example, if in 2010 in the Central Federal District their share in the total number of scientific, technical and industrial enterprises accounted for about 8.2%, and in the Volga region 5.7%, then by 2023 the growth shifted towards the Volga region (9.9%), indicating the emergence of new leaders in the formation of the innovation environment of the regions [8].

There is also the fact that the process of updating the technological base of the industry does not have a steady growing dynamics. In particular, Russian business began to use advanced technologies less often — in three years (from 2018 to 2022), the number of such companies decreased by 24%, despite the growth in the number of organizations performing research and development (Table 2).

At the same time, the situation with the introduction of innovative products remains low in a number of regions, for example, in the North Caucasus region – four regions (Republic of Dagestan (0.41%), Republic of North Ossetia –Alania (0.39%), Republic of Ingushetia (0.38%), Karachay-Cherkess Republic (0.34%), Chechen republic (0.47%)) [5].

When assessing the level of innovation and technological development of the regions, it is impossible not to mention the Kaluga region, the development of industry and innovation cluster of which indicates the presence of processes of qualitative transformation of technologies. The main positive trend is to achieve high growth rates of industrial production. There are about 12 technoparks in the region over the past ten years, more than 30 thousand jobs have been created, and GRP growth in 2022 compared to 2021 amounted to 16%.

Table 2. The number of organizations that carried out research and development by sectors of activity of the Russian Federation, 2018-2022, units.

<i>indicator</i>	<i>years</i>					<i>Deviation (+;-) 2022-2018</i>
	2018	2019	2020	2021	2022	
<i>Number of R&D organizations, total</i>	3950	4051	4175	4175	4195	245
<i>including by activity sectors</i>						
<i>State</i>	1511	1479	1501	1462	1522	11
<i>Entrepreneurial</i>	1304	1374	1426	1437	1394	90
<i>Higher education</i>	998	1057	1080	1096	1088	90
<i>Non-profit organizations</i>	137	141	168	180	191	54

*Compiled by the author according to [11]

The organizational measures taken in recent years to intensify scientific, technical and innovative activities in the Kaluga Region have significantly improved the situation in the innovation sphere. A similar situation is observed in the Nizhny Novgorod region, where only in 2019, along with the already existing innovation clusters (4), three new industrial parks appeared.

Consequently, according to statistical observation, since 2007, the number of innovation-active areas in Russia has been gradually increasing, the mechanism of development of which is based on regional innovation activity and currently acts as one of the most priority national and regional interests of the state [7].

Nevertheless, financial instability and internal crisis phenomena in Russia have necessitated the adaptation of the innovation sphere to radical changes, when the innovative policy of the state can lead the economy out of the crisis [12].

The deficit of own funds, and insufficient financing of a number of areas of scientific research by the state (Table. 3), the low technological level of the industrial production base, the backwardness of the technological structure prevent the full development of most regions of Russia from developing on their own innovative and technological basis, when scientific and development developments turn into a basic element of production.

Table 3. Financing of science from the federal budget, 2018-2022, (billion rubles)

<i>indicator</i>	<i>years</i>					<i>Deviation (+;-) 2022-2018</i>	
						(+;-)	%
	2018	2019	2020	2021	2022		
<i>Expenditures on civil science from the federal budget</i>	420.4	489.2	549.6	626.6	631.7	211.3	150.2
<i>Including:</i>							
<i>for basic research</i>	149.5	192.5	203.2	225.2	247.3	97.8	165.4

<i>For applied scientific research</i>	270.9	296.6	346.3	401.4	384.4	113.5	141.8
<i>As a percentage</i>							
<i>Federal budget expenditures</i>	2.52	2.69	2.41	2.53	2.51	-	-
<i>To GDP</i>	0.40	0.44	0.51	0.48	0.41	-	-

*Compiled by the author according to

Consequently, on a regional scale, there is a need to form appropriate incentive mechanisms aimed at investing innovative technological processes, with the restoration of domestic production capable of creating competitive products, especially since the regions have great potential (Table 4)

Table 4. Internal research and development costs by federal districts of the Russian Federation 2018-2022, (billion rubles)

<i>Federal District (FD)</i>	<i>years</i>					<i>Deviation (+;-) 2022-2018</i>	
	<i>2018</i>	<i>2019</i>	<i>2020</i>	<i>2021</i>	<i>2022</i>	<i>(+;-)</i>	<i>%</i>
<i>total for the Russian Federation</i>	1028.2	1134.7	1174.5	1301.4	1435.9	407.7	139.6
<i>Central'nyj</i>	524.4	576.5	621.8	671.9	758.0	233.6	144.5
<i>Severo-Zapadnyj</i>	143.0	165.1	155.7	171.9	187.2	44.2	130.9
<i>YUzhnyj</i>	25.9	29.2	29.8	33.9	33.5	7.6	129.3
<i>Severo-Kavkazskij</i>	5.2	5.3	5.8	6.5	7.1	1.9	136.5
<i>Privolzhskij</i>	164.8	186.2	180.9	215.2	228.2	63.4	138.4
<i>Ural'skij</i>	69.1	68.6	74.5	85.4	91.7	22.6	132.7
<i>Sibirskij</i>	77.2	85.9	86.5	95.3	107.7	30.5	139.5
<i>Dal'nevostochnyj</i>	18.6	17.8	19.4	21.2	22.4	3.8	120.4

*Compiled by the author according to [11]

Other "... the most significant factors hindering the implementation of innovations are the high costs of their production, high economic risk, imperfection of the legislative framework, long payback period of innovations, lack of funds from the customer, lack of information about new technologies and sales markets, lack of opportunities for cooperation with other enterprises and scientific institutions, lack of qualified personnel, lack of demand for products, the immunity of enterprises to innovations" [9].

Another area that can form a high-quality innovation environment in the regions is the availability of engineering, technical and working personnel. In this case, most of the existing innovative and active enterprises need to pay attention to the adaptation of students to production conditions, conclude targeted contracts with specialized educational institutions [11].

It should be noted that the analysis of innovative and technological activities in the regions requires methodological and methodological improvement, quantitative and qualitative assessment of individual components of the innovation process.

5 Conclusion

The construction of a mechanism for the development of regional innovation activity is currently one of the most priority national and regional interests of the state.

Thus, the principles of a new approach to the management of regional innovation activities should be:

- formation of an effective mechanism for selecting priority areas, and providing them with comprehensive organizational and economic support. The key elements of this mechanism are institutions for long-term forecasting of scientific and technological development; organization of

project competitions in the conditions of competition of alternative industries; independent examination of projects and program documentation; close interaction of authorities and the scientific and technical community in the formation and implementation of priorities; constant specification and clarification of priorities.

– development and application of mechanisms for the implementation of certain priorities of innovation activities, including direct impact on business entities through a system of government orders, targeted subsidies, grants, soft loans, as well as indirect stimulation of technical development of production on the basis of various tax and price benefits, accelerated depreciation.

Nevertheless, the successful implementation of regional policy is possible only taking into account the peculiarities and specifics of the regions, improving the nature of relations between central and local state authorities, the availability of institutions capable of constant monitoring and analysis of the socio-economic situation in order to timely identify problems and identify ways, forms and methods of solving them, the implementation of promising development projects.

In conclusion, it should be noted that in order to increase the level of innovative culture, it is necessary: the presence of highly qualified teachers in educational institutions, access to operational information, involvement of students in research and development.

These measures will contribute to the internal readiness of both industrialists with their mass production and the population for changes, allowing entry into the market and the spread of innovative products.

References

1. A. N. Asaul, N. I. Posyada, *Investicionnaya privlekatel'nost' regiona*, (SPb.: SPbGASU, 2014) 120. (In Russ.)
2. L. A. Gamidullaeva, *Science, education, society*, **1 (3)**, 10–17 (2015) DOI: 10.17117/no.2015.01.010 (In Russ.)
3. S.A. Dzhavadova, L.A. Molchanova, *Journal of Applied Research*, **2**, 46-54 (2021) (In Russ.)
4. V. S. ZHarov, *Regional'naya ekonomika: teoriya i praktika*, **7 (238)**, 2–8 (2012) (In Russ.)
5. I. E. Il'ina, S. P. Burlankov, E. N. ZHarova, *Izvestiya vysshih uchebnyh zavedenij. Povolzhskij region. Obshchestvennye nauki*, **4**, 33–47 (2017) (In Russ.)
6. Lizunov, V. V. (2015) *Rol' klasterov v strategicheskom planirovanii, innovacionnom razvitii i konkurentosposobnosti regionov* [The role of clusters in strategic planning, innovative development and competitiveness of regions]. *Nacional'nye priority Rossii*. [Russia's National priorities]. Vol 3 (17).- pp 97–108. (In Russ.)
7. S. Yu. Glaz'ev [et. all.] *Nanotekhnologii kak klyuchevoj faktor novogo tekhnologicheskogo uklada v ekonomike* (M.: «Trovan», 2009) 304. EDN: QUAADZ (In Russ.)
8. D.L. Napol'skih, *Ekonomicheskie i social'nye peremeny: fakty, tendencii, prognoz*, **6**, 248–263 (2017) DOI: 10.15838/esc.2017.6.54.16 (In Russ.)
9. A. M. Nosonov, *Regionology*, **4 (89)**, 22–31 (2014) (In Russ.)
10. M. A. Ponomareva, *Sovershenstvovanie ekonomicheskogo mekhanizma upravleniya ustojchivym razvitiem v rossijskih regionah* (Rostov n/D: Sodejstvie – XXI vek, 2011) 245. (In Russ.)
11. N. A. Skvorcova, O. A. Lebedeva, E. A. Sotnikova, *Fundamental research*, **2**, 1265–1268 (2015) (In Russ.)
12. Trifonov, E. O (2013) *Vybore modeli rossijskoj ekonomiki* [About choosing a model of the Russian economy]. *Obshchestvo i ekonomika*. [Society and economy] Vol 9. pp. 86–91. (In Russ.)
13. A.N. SHichkov, *Ekonomika i menedzhment innovacionnyh processov v regione: monografiya* (M.: ID «FiK», 2008) 360. (In Russ.)
14. J.A. SHumpeter, *Teoriya ekonomicheskogo razvitiya* (M.: Direkt-Media, 2007) 400. (In Russ.)