The Impact of COVID-19 on the Development of Innovation in the Regions of the Russian Federation

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Abstract: Consideration of COVID-19 as a crisis phenomenon actualizes the need to assess its impact on various aspects of economic activity and determine the list of management tools to minimize negative consequences. Regional aspects play an important role in the innovative development of the Russian Federation. The purpose of the article is to identify the main trends that have been formed under the influence of the pandemic. Analysis of statistical data, consideration of spatial and resource features of economic entities, determined the prospect of changes in Russian economic map as a consequence of the heterogeneity of regional development.

1 INTRODUCTION

The COVID-19 pandemic acted as a catalyst for the restructuring of social, economic and other relations. The deterioration of economic conditions and negative forecasts for the development of GDP, the emergence of new consumer behavior patterns, the strengthening of the role and importance of online services, changes in approaches and sales models, a new view of the education system and many other factors make the issues of innovation approach even more relevant. The pace of innovation development in Russia is lower compared to foreign countries. The proportions in the global market of innovative products clearly demonstrate the superiority of the USA, Japan and Germany, which occupy significant shares of this market - 39%, 30% and 16%, respectively (Tereshkina, 2021). The Global Innovation Index in 2021 shows that, despite the COVID-19 pandemic and the subsequent medical, economic and social crises in the world, investment in innovation is still highly resilient; Switzerland, Sweden, the United States, the United Kingdom and South Korea are among the innovation leaders, China is close to the top ten, and Russia currently ranks 45th (The Global Innovation Index, 2022).

During the pandemic, the Government of the Russian Federation developed and implemented operational measures aimed at localizing current problems. After the acute phase was over, adjustments were made to the previously planned vector of innovative development (improvement of the Concept of Technological Development of Russia until 2030, changes to national projects and state programs, etc.). The development of innovative technologies and the stimulation of innovative projects can help diversify the economic structure of regions and increase their competitiveness in the market.

2 METHODOLOGY

An appeal to modern scientific literature has shown that the consequences and impact of COVID-19 on the economy are considered in domestic and foreign sources in different aspects.

The issue of the efficiency of state support measures during the pandemic are within the sphere of interest of N.E. Bondarenko (Bondarenko, 2021, p. 628-631). In the work "Measures to support small and medium-sized businesses in Russia during the

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coronavirus pandemic: a critical analysis" Epanchintseva A.V. (Epanchintseva, 2020, p. 17-22) examines the problems in a single segment. Interim estimates of the pandemic impact on the Russian economy are given in the articles by Zimovets A.V., Khanina A.V. (Zimovets A.V., Khanina A.V., 2021).

The need to make adjustments to management processes in conditions of limited implementation of full-fledged business processes is reflected in the research results of the McKinsey consulting company (Bar Am, Furstenthal, Jorge, Roth, Haas, McClain, McInerney, Timelin, 2020). The data obtained from the survey on "The impact of the pandemic on innovative business communications" conducted by the Central Economic and Mathematical Institute of the Russian Academy of Sciences and the UN Scientific Council of the Russian Academy of Sciences "Problems of integrated development of industrial enterprises" indicate the development of innovative communications of domestic enterprises (The impact of the pandemic on innovative business communications, 2021).

The economic and social pressure caused by the pandemic has increased the relevance of intensifying innovation activities. This aspect is widely considered in foreign sources. The works of Javaid M., O'Leary D. E (Javaid, 2020; O'Leary, 2020) provide examples of implementing solutions in the field of everyday life and maintaining stability during a crisis, the possibility of autonomous production of goods based on the use of artificial intelligence and wireless communication. Sarkis J, Heinonen K., Strandvik T. (Heinonen, Strandvik, 2020) point out the need to develop new products and services, to develop new sales channels.

In the domestic literature, the impact of COVID-19 on innovative development is mainly considered from a general perspective (Ivanova, Orlov, 2022), in the context of enterprises' innovative activity (Zarifullina, 2022). There are practically no studies reflecting the impact on the level of innovative development in a spatial format.

The purpose of the article is to identify the main trends in the level of innovation activity in the regions of the Russian Federation as a result of Covid-19 influence.

The author's hypothesis consists in the assumption that the development of innovation activities due to the impact of Covid-19 will lead to a change in the strategic directions of the innovation processes development in the regions and a change in the economic map.

Research methodology: statistical analysis, synthesis and comparative analysis.

3 THE THEORETICAL PART

The innovative vector of development in modern conditions acts as an objective factor in ensuring competitiveness. In the Russian Federation, state support is provided in various directions: the creation of world-class scientific and educational centers, the creation of innovative scientific and technological centers ("technological valleys"), the development of digital platforms, the development of innovative infrastructure, etc. COVID-19 created the conditions in which these measures were to determine the priorities of innovative research that would ensure the economic security of the state and become a catalyst for accelerating dynamics. Russia's spatial characteristics and the multiplicity of its subjects require taking into account the potential available in the regions and highlighting the prospects for the activation of innovation processes.

Considering the dynamics of the volume of innovative goods and services sold by federal districts in absolute terms (Table.1), we highlight the positive vector of the all-Russian trend.

Table 1: Dynamics of the volume of innovative goods, works and services by federal districts of the Russian Federation in 2012-2022, in billion rubles.

Federal District	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Central	938	1164	1091	1492	1678	1120	1181	1426	1653	1981
2. North-West	298	410	354	376	337	459	488	592	676	940
3. Southern	52	70	103	149	247	305	208	197	173	210
4. North- Caucasian	27	24	28	41	37	35	41	44	44	77
5. Privolzhsky	951	1129	1180	1199	1418	1446	1779	1717	1606	1861
6. Uralsky	149	189	169	216	364	508	527	501	501	485
7. Siberian	100	138	167	217	198	202	176	249	382	312
8. Far Eastern	359	384	488	153	85	94	117	139	153	138

9. Russian Federation	2873	3508	3580	3843	4364	4167	4516	4863	5189	6003

Source: (Science, Innovation and Technology)

During the period under review, the Central, North-Western and Volga federal districts maintained their leading positions. Their combined share is about 80% of the total volume of innovative products sold by the end of 2021. The factors determining the leadership include the development of internal and external markets of demand for innovative products. The concentration of research centers and higher educational institutions determines, among other things, higher rates of production of innovative products.

A qualitative characteristic can be given based on the analysis of the share of innovative goods and services in the total volume of sales (Table 2).

Table 2: The share of innovative goods, works and services by constituent entities of the Russian Federation for 2012-2022, in %.

Federal District	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Central	10,2	11,4	9,6	12,8	11,6	6,9	6,2	5,0	5,2	4,6
2. North-West	7,3	9,3	8,1	6,3	5,1	6,3	5,8	5,6	6,3	6,5
3. Southern	3,0	3,4	4,7	5,9	8,4	9,0	5,6	2,7	3,3	3,6
4. North- Caucasian	7,8	6,4	7,6	8,9	6,4	5,8	4,4	5,3	5,1	7,1
5. Privolzhsky	12,7	14,2	13,8	13,0	14,1	13,3	13,3	11,3	11,3	10,3
6. Uralsky	2,1	2,6	2,3	2,7	4,4	5,2	4,3	3,3	3,8	2,6
7. Siberian	2,4	3,2	3,3	4,1	3,5	3,0	2,2	2,6	3,7	2,4
8. Far Eastern	21,3	21,5	23,3	6,8	3,3	3,3	3,4	3,0	3,1	2,3
9. Russian Federation	8,0	9,2	8,7	8,4	8,5	7,2	6,5	5,3	5,7	5,0

Source: (Science, Innovation and Technology)

The presented data reflect the persistence of multidirectional dynamics of innovation activity indicators: a positive trend is observed in the Southern and Ural federal districts, while in all other federal districts of the Russian Federation there is a negative dynamics in the share of innovative goods, works and services. Nevertheless, the overall dynamics of the specific weight of innovative goods and services in the Russian regions has a negative trend. A decrease in the share of innovative goods and services is observed in the Central, Volga, Ural, Siberian and Far Eastern Federal Districts. The raw material specialization of the economy influences this trend.

The impact of restrictive measures caused by COVID-19 has given an impetus to the growth of the number of enterprises carrying out technological innovations (Fig. 1).

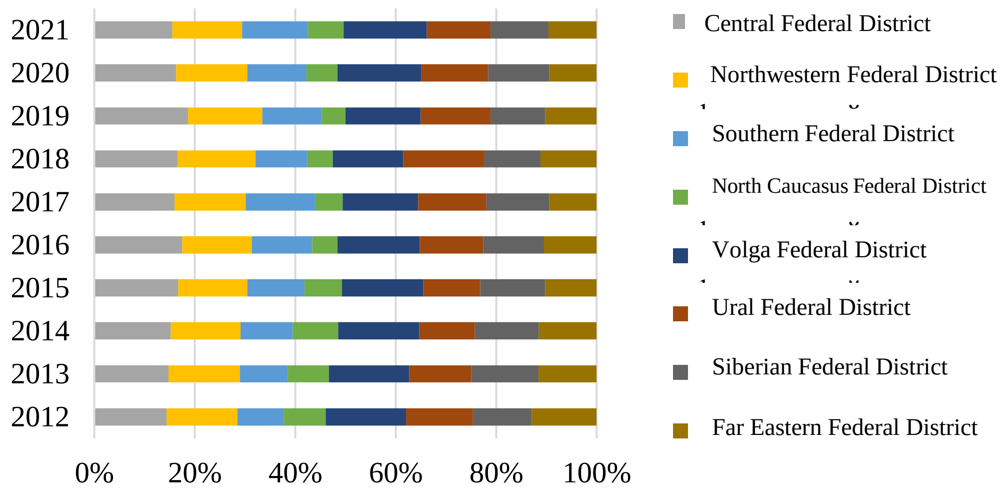

Figure 1: Structure of the share of organizations that implemented technological innovations in the total number of surveyed organizations in the constituent entities of the Russian Federation in 2012-2021, %.

The graphical data illustrate the increase in the share of organizations that carried out technological innovations in the total number of surveyed organizations in the constituent entities of the Russian Federation, starting from 2018. The lowest value of the indicator is fixed in the North Caucasus Federal District throughout the entire time interval. In 6 out of 8 federal districts, the indicator value is below the all-Russian level. The pandemic also served as an incentive for the creation of innovative enterprises in almost all territories except for the Central Federal District.

The restrictions imposed in the context of the pandemic did not have the same impact on the innovation activity of the regions. Federal districts with a lower population density (Siberia, the Far East), where, unlike more densely populated territories, the measures provided were selective, did not show significant growth (Table 3).

Table 3: Dynamics of the level of innovation activity of the Federal districts of the Russian Federation for 2012-2022., %.

Federal District	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Central	10,9	10,7	10,9	10,9	10,3	9,9	16,2	10,8	12,5	12,6
2. North-West	11,0	10,7	10,3	9,6	8,3	8,6	15,9	10,1	10,8	11,0
3. Southern	7,4	7,2	7,7	7,6	7,1	8,4	9,5	7,5	8,0	11,9
4. North- Caucasian	6,4	5,9	6,5	4,7	2,9	3,2	4,4	1,7	3,5	4,6
5. Privolzhsky	11,9	11,7	11,4	10,6	9,4	9,1	13,3	11,6	15,5	16,7
6. Uralsky	10,6	9,6	8,9	7,9	8,2	8,2	14,9	9,3	10,2	11,1
7. Siberian	8,7	9,6	9,0	8,3	7,0	7,6	9,9	7,5	9,8	9,3
8. Far Eastern	9,8	8,5	8,5	6,9	6,2	5,9	8,9	6,0	6,9	7,7
9. Russian Federation	10,3	10,1	9,9	9,3	8,4	8,5	12,8	9,1	10,8	11,9

Source: (Science, Innovation and Technology)

There is a positive dynamics in the Central, Southern, Volga, Ural and Siberian Federal districts. In recent years, the highest level of innovation activity in Russia has been observed in the Volga and Central Federal Districts. In the Volga Federal District, innovations are developed in such sectors as industrial production, transport, education and healthcare. The innovative development of the company "Motorika" in the field of medical prostheses can be cited as examples of the effectiveness of innovative activities; an innovative product developed by Cognitive Technologies with government support represents a significant breakthrough in the field of agricultural machinery (a computer vision system capable of detecting dangerous objects in front of machinery, such as rocks, poles and other obstacles) (Gerasimov, 2023), etc.

The shortage of highly qualified personnel was most affected in the regions of the North Caucasus (the predominance of micro-businesses with low profitability and a high share of self-sufficiency in basic products and services) and the Far East (high migration activity and low concentration of scientific resources), the least - in the Central and Volga Federal Districts. The general pattern remains the same: the processes are more intensive in regions with coastal port zones, research and educational centres, high-end industry and service economy.

The availability of financial support measures is one of the important factors in boosting and ensuring innovation activity. Funding is increasing, both in the form of direct government injections and through development institutions (the Innovation Promotion Fund programmes targeting young researchers, business start-ups and high-tech projects). During the pandemic and post-pandemic period, the Fund provided financing for more than 29 billion rubles (Official website of the Innovation Promotion Fund, 2022). Statistical data shows that the availability of substantial state support has not had a decisive impact on the increase in the level of innovation activity (tab. 4).

Table 4: Dynamics of the share of expenditures on innovation activities in the total volume of shipped goods, performed works, and services by constituent entities of the Russian Federation for 2012-2022, %.

Federal District	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Central	3,3	3,0	3,3	3,5	3,7	2,8	2,6	3,0	2,8	2,4

2. North-West	2,0	3,7	2,1	1,5	1,7	2,0	1,6	1,8	1,7	1,5
3. Southern	2,2	2,2	3,1	3,1	2,3	2,5	1,1	1,1	2,4	1,3
4. North- Caucasian	0,8	1,5	2,7	1,3	1,4	1,5	0,8	0,6	0,6	0,7
5. Privolzhsky	3,3	3,6	3,9	3,2	2,6	3,1	3,0	2,9	3,6	3,3
6. Uralsky	1,5	1,8	1,7	1,5	1,8	1,9	1,2	0,7	0,9	0,9
7. Siberian	1,9	3,0	2,9	2,6	1,7	1,9	2,1	1,8	1,7	1,3
8. Far Eastern	2,6	2,5	2,9	3,1	2,3	2,2	2,5	2,5	2,4	2,2
9. Russian Federation	2,5	2,9	2,9	2,6	2,5	2,4	2,1	2,1	2,3	2,0

Source: (Science, Innovation and Technology)

The relatively low all-Russian level of the indicator as a whole (2.0%) is largely determined by the availability and structure of funding sources. The possibility of attracting bank capital is limited by the high level of interest rates. The resources of development institutions (the Skolkovo Foundation, a Russian venture company) are distributed to a greater extent in the Moscow region, and the efficiency of their activities in the regions remains extremely low. The focus on state support of universities (federal programs "5-100", federal and supporting universities), as centers of innovative development, does not give the planned effect due to the weak development of university science in the regions.

4 RESULTS

COVID-19 has revealed the need to intensify the development of certain industries, providing the opportunity not only to promptly regulate economic processes in terms of providing responses to new challenges and threats, but also to adjust strategic goals and objectives. The country's leadership has successfully coped with the tasks set. As a result of the measures taken during this period, growth was recorded in the sectors of services related to information technology activities (double growth - 10.2% against 5.5% in 2019), healthcare (8.6% against 5.3%), software development (13.2% against 11.1%). In industrial production, the corresponding value reached 16.2% (15.1% in 2019). In 2020, there was an increase in investment in innovation: the total expenditure on the development of innovation activities reached RUB 2.1 trillion, i.e. an increase of 8.2% (in constant prices) compared to the previous year. The share of innovation in total sales increased, which allowed Russia to gain a foothold in the top 10 European countries by this indicator (Official Channel of the TASS Agency,2022).

In the regional context, there is a differentiation of levels and multidirectional innovation activity. The revealed trends and patterns are formed both in the historical aspect and in the real format. The former include geographical and climatic peculiarities of the regions' development; their resource and natural potential, which is an objective condition for the implementation of innovation processes (raw material industries, as a rule, make less demand for innovation); the level of socio-economic development (demand depends on income, the needs of the population and businesses in new goods and services). The real format takes into account the sufficiency of the regulatory framework (development of the regulatory field, intellectual property rights regime); availability and development of innovation infrastructure (institutional context determines the interest of entry into innovation activities); concentration of scientific, technological and educational resources (the formation and accumulation of skills and knowledge to build interaction networks, the formation of a favorable socio-cultural background and business climate; ensuring the sustainability of entrepreneurial ecosystems); the breadth of tools for state support measures (the possibility of obtaining external financing).

It is obvious that in order to ensure more effective and sustainable development of the innovation sphere in the regions of the Russian Federation, coordination of interests and efforts of stakeholders is required.

5 CONCLUSION

The issue of assessing the impact of Covid-19 on the development of innovation activities in the regions of the Russian Federation will be relevant for quite a long period. This is due to the presence of various methodological aspects, including:

- with implicit results of business processes, which have a delayed horizon of manifestation of consequences and determination of their performance;
- the long time lag between the innovation initiation stage and the commercialization stage.

At the same time, it is obvious that:

-global economic changes, political decisions, internal economic problems, which acted as constraints in the acute phase of the pandemic, simultaneously served as a stimulus for the intensification of innovation activities;

- the emergence of new threats and challenges has determined the priority and strategic directions of development of innovation processes. However, the stability of the existing spatial and sectoral trends will not allow overcoming them in the near future;

- pandemic events have determined the need for regionalization of policy: educational, scientific and technological, entrepreneurial and regional policies need to be interfaced based on the ecosystem approach and the principles of inclusiveness (rules "for all"), interconnectedness and coherence ("think small first"), publicity, locality and priority (Zemtsov, 2020);

- the experience of anti-crisis measures gained in the conditions of the pandemic allows us to expand the management tools that promptly respond to the impact of new threats and challenges;

- the need to improve the strategy of Russia's spatial development in terms of the location of new production and innovative developments based on the activity and success of regions in adapting to new conditions and the ability to attract investment and technology has been determined.

The implementation of the gained experience and adjustments in the regulation of the innovation sphere will serve as an impetus for the emergence of new growth points and the loss of leading positions by some regions. Regions that will be able to successfully adapt to the new situation and actively develop innovations will be able to occupy more attractive positions.

REFERENCES

Bondarenko, N.E., 2021. Small and medium-sized entrepreneurship during the pandemic COVID-19: losses, government support, prospects for recovery. *Economics and entrepreneurship*. № 1(126). c. 628-631.

The impact of the pandemic on innovative business communications. Results of the survey of the UN Scientific Council of the Russian Academy of Sciences "Problems of integrated development of industrial enterprises". Access mode: https://russianenterprises.ru/innovation-survey/

Gerasimov, K.B., 2023. The current state and prospects for the development of innovative activity in Russia and in the world. *Economics and management: problems, solutions*, Vol. 3, No. 1 (133). p. 70.

Epanchintseva, A.V., 2020. Measures to support small and medium-sized businesses in Russia during the coronavirus pandemic: a critical analysis. *The economy of the new world*, 1-2(17). 17-22.

Zarifullina, A.R., 2022. Influence of COVID-19 on innovative activity of enterprises. *Universum: economics and jurisprudence: electron. scientific. journal*, 8(95).

Zimovets, A.V., Khanina, A.V., 2021. One year of fighting the coronavirus pandemic COVID-19: analysis of results. *Economics, Entrepreneurship and Law*, Volume 11. No. 5. pp. 1035-1046.

Ivanova, N.M., Orlov, M.A., 2022. Innovative development of Russian business in the context of the COVID-19 pandemic. *Issues of innovative economy*, Volume 12. No. 2. pp. 771-784.

Science, innovation and technology. Federal State Statistics Service of the Russian Federation [Electronic resource]. URL: https://rosstat.gov.ru/folder/154849?print=1 (accessed: 08.08.2023).

Official website of the Innovation Promotion Fund // Access mode: URL: https://fasie.ru/fund /(accessed: 11/26/2023).

The official channel of the TASS agency. The pandemic turned out to be one of the reasons for the growth of innovations in industry and the service sector in Russia. //[Electronic resource]. URL: https://nauka.tass.ru/nauka/12380133 (date of application: 10.11.2023).

Tereshkina, N.E., 2021. The impact of the pandemic on the development of innovations in the world. *Issues of innovative economy*, Volume 11. No. 4. pp. 1289-1300.

Javaid, M., 2020. Industry 4.0 technologies and their applications in fighting COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, № 4. p. 419–422.

O'Leary, D. E., 2020. Evolving information systems and technology research issues for COVID-19 and other pandemics. *Journal of Organizational Computing and Electronic Commerce*, № 1. p. 1–8.

Bar Am, J., Furstenthal, L., Jorge, F., Roth, E., 2019. Innovation in a crisis: Why it is more critical than ever. Mckinsey.com.

Haas, S., McClain, J., McInerney, P., Timelin, B., 2020. Reimagining consumer-goods innovation for the next normal. Mckinsey.com.

Heinonen, K., Strandvik, T., 2020. Reframing service innovation: COVID-19 as a catalyst for imposed service innovation. *Journal of Service Management.*

The Global Innovation Index [Electronic resource]. [electronic resource]. URL:http://www.globalinnovationindex.org.

Zemtsov, S., 2020, New technologies, potential unemployment and 'nescience economy' during and after the 2020 economic crisis. *Regional Science Policy & Practice*, 12(4), 723–743.

Zemtsov, S., Chepurenko, A., Mikhailov, A., 2021. Pandemic Challenges for the Technological Startups in the Russian Regions. Foresight and STI Governance, 15(4), 61–77.