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ECONOMIC AND SOCIAL CHANGES: FACTS, TRENDS, FORECAST

A peer-reviewed scientific journal that covers issues of analysis and forecast of changes in the economy and social spheres in various countries, regions, and local territories.

The main purpose of the journal is to provide the scientific community and practitioners with an opportunity to publish socio-economic research findings, review different viewpoints on the topical issues of economic and social development, and participate in the discussion of these issues. The remit of the journal comprises development strategies of the territories, regional and sectoral economy, social development, budget revenues, streamlining expenditures, innovative economy, and economic theory.

Founder: Vologda Research Center of the Russian Academy of Sciences

Federal State Budgetary Institution of Science Vologda Research Center of the Russian Academy of Sciences (VolRC RAS) is the only unit of the Academy on the territory of the Vologda Oblast. The history of the Center started in 1990 from a Department of the Institute for Economic Studies of the Kola Science Centre of RAS on studying the problems of socio-economic development of the Vologda Oblast. Since then the Center has undergone manifold transformations. In 1993 it became an independent subdivision – the Vologda Scientific Coordinating Center of RAS. In 2009 it transformed into the Institute of Socio-Economic Development of Territories of RAS (ISEDT RAS).

In 2017 the socio-economic research was supplemented by agricultural issues. ISEDT RAS was joined by the Northwestern Dairy and Grassland Farming Research Institute, and was reorganized into the Vologda Research Center of the Russian Academy of Sciences.

In 2019 the Center continued expanding having launched the Laboratory of Bioeconomics and Sustainable Development within the framework of the national project "Science". The Laboratory is engaged in scientific research aimed at introducing biotechnologies into the practice of agriculture.

The VolRC RAS Director is Aleksandra A. Shabunova (Doctor of Economics). The Academic Leader of the Center is Vladimir A. Ilyin (RAS Corresponding Member, Doctor of Economics, Professor, Honored Worker of Science of the Russian Federation).

MAIN RESEARCH DIRECTIONS

In accordance with the Charter, the Vologda Research Center carries out fundamental, exploratory and applied research in the following fields:

- problems of economic growth, scientific basis of regional policy, sustainable development of territories and municipalities, and transformations of socio-economic space;
- regional integration into global economic and political processes, problems of economic security and competitiveness of territorial socio-economic systems;
- territorial characteristics of living standards and lifestyle, behavioral strategies and world view of different groups of the Russian society;
- development of regional socio-economic systems, implementation of new forms and methods concerning territorial organization of society and economy, development of territories' recreational area;
- socio-economic problems regarding scientific and innovative transformation activities of territories;
- elaboration of society's informatization problems, development of intellectual technologies in information territorial systems, science and education;
- development of scientifically based systems of dairy cattle breeding in the conditions of the North-Western region of Russia;
- development of new breeding methods, methods and programs for improving breeding work with cattle;
- development of scientifically based feed production systems, norms, rations and feeding systems for cattle in the conditions of the North-Western region of Russia;

- development of zonal technologies for the cultivation of agricultural crops;
- development of technologies for the creation, improvement and rational use of hayfields and pastures in the conditions of the North-Western region of Russia;
- development of technologies and technical means for agricultural production in the North-Western region of Russia;
- assessment of biodiversity in the North-Western region of Russia;
- development and implementation of biotechnologies in agricultural production;
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2008 – Memorandum of agreement is signed with Alexander's Institute at the Helsinki University (Finland, 2008).

2009 – Cooperation agreement is signed with Center for System Analysis of Strategic Investigations of NAS (Belarus, 2009).

2010 – Cooperation agreement is signed with the Institute of Economics of the National Academy of Sciences of Belarus (Minsk, Belarus, 2010).

2011 – Cooperation agreements are signed with National Institute of Oriental Languages and Civilizations (Paris, France, 2011), Institute of Business Economy at Eszterhazy Karoly College (Hungary, 2011), Republican research and production unitary enterprise "Energy Institute of NAS" (Belarus, 2011). Memoranda of understanding are signed with Jiangxi Academy of Social Sciences (China, 2011), Research and Development Center for Evaluation and Socio-Economic Development and the Science Foundation of Abruzzo region (Italy, 2011).

2012 – Cooperation agreement is signed with Center for Social Research at the Dortmund Technical University (Germany, 2012).

2013 – Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2013). July 2013 – The application for research performance by international consortium involving ISEDT RAS within the 7th Framework Programme of European Community.

2014 – Cooperation agreement is signed with Center for System Analysis and Strategic Research of the National Academy of Sciences of Belarus (Belarus, 2014). Memoranda of understanding are signed with Jiangxi Academy of Social Sciences (Mao Zhiyong, China, 2014), National Institute for Oriental Studies INALCO (Julien Vercueil, France, 2014).

2015 – Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2015). Cooperation agreement is signed with the Institute of Sociology of the National Academy of Sciences of Belarus (Belarus, 2015).

2016 – Cooperation agreements are signed with the Center for the Study of Industrialization Modes of the School of Advanced Studies in the Social Sciences (EHESS) (Paris, France, 2016); Institute of Philosophy, Sociology and Law of NAS RA (Yerevan, Armenia, 2016); Yerevan Northern University (Armenia, 2016), Yerevan State University (Armenia, 2016). Memoranda of understanding are signed with Jiangxi Academy of Social Sciences (China, 2016).

2018 – Cooperation agreements are signed with the Department of Agrarian Sciences of the National Academy of Sciences of Belarus (Belarus, 2018); the Republican Unitary Enterprise "Scientific and Practical Center of the National Academy of Sciences of Belarus for Agricultural Mechanization" (Belarus, 2018). Memorandum of understanding is signed with the European School of Social Innovation (ESSI) (Germany, 2018).

2019 – Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2019).

2020 – Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2020).

CONTENT

GLOBAL EXPERIENCE

MONITORING STUDIES

EDITORIAL

DOI: 10.15838/esc.2026.2.104.1
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Russia's Spatial Policy in the 21st Century: Problems of Effective Public Administration in the Face of Growing Threats to National Security

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Abstract. In the context of escalating geopolitical confrontation and increasing dynamism of the external environment, ensuring Russia's national security largely depends on the effective use of internal development factors, which include a significant, but currently insufficiently utilized spatial potential. This article, based on official statistics, our own monitoring studies, the results of all-Russian and regional sociological surveys, an analysis of the results of the practical implementation of strategic documents in this area, as well as the opinions of leading experts, presents an assessment of the effectiveness of public management of spatial development in Russia. It is shown that the market reforms of the 1990s, as well as the country's development in the following decades within the framework of the liberal model, led to the locational compression of developed socio-economic space, depopulation and degradation

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of the potential of small / medium-sized cities, rural areas, a decrease in the quality of life in peripheral territories, which poses a serious risk to national security. The objective facts presented in the work and subjective assessments of residents indicate an urgent need to improve the effectiveness of strategic public management of spatial development. This primarily concerns abandoning the approach of understanding the country's space as a "burden" and the need to increase the accountability of government bodies at all levels for achieving the targets of state strategies and development programs. The paper substantiates key areas for improving federal and regional public policy and demonstrates that their effective implementation requires the "nationalization" of the ruling elites. Their activities should be guided by the pursuit of a sovereign development course amidst intensifying economic, military, and sociocultural confrontation, thereby ensuring the consolidation of power and society in the face of emerging challenges. The author's contribution lies in expanding approaches to assessing the country's spatial development in the context of the growing role of territorial communities in these processes and substantiating strategic priorities for transforming Russia's state spatial policy in the context of intensifying contemporary challenges.

Key words: geopolitical turbulence, spatial development, locational compression of space, liberal model, ruling elites, national security.

The boundless spaces were easily acquired by the Russian people, yet organizing them into the world's greatest state, and maintaining and protecting order within it, proved far from easy. This endeavor consumed the greater part of the nation's energies.

Berdyaev N.A. (1990). The Fate of Russia. Moscow: Philosophical Society of the USSR. 240 p.

The current stage of global development is marked by an intensifying crisis of the global capitalist (neocolonial) system, which has escalated into an open confrontation between countries and their blocs along the "West versus Non-West" divide[1].

The hot phase of this confrontation has included the events in Ukraine[2], the military clash between the United States, Israel, and Iran (June 2025, February–April 2026), as well as a series of other regional military conflicts (2024–2026: Venezuela, Cuba, and Latin American countries).

"...the events of 2022, when the United States launched a proxy war with Russia on the territory of Ukraine, triggered the the gradual destruction of the modern system of neocolonialism. The resulting confrontation initiated the creation of geopolitical alliances of countries, and delimited the zones of influence of such regional centers of power as the United States, China, Russia, Iran, etc. These processes have disrupted the original neocolonial model and launched the formation of a multipolar world model"[3].

[1] Balatsky E.V. (2022). Russia in the epicenter of geopolitical turbulence: Signs of eventual domination. Economic and Social Changes: Facts, Trends, Forecast, 15(5), 33–54. DOI: 10.15838/esc.2022.5.83.2

By the **West**, the author means the following coalition of countries: the United States, Australia, Canada, New Zealand, Japan, and the countries of the European Union. By the **Non-West**: Russia, China, Iran, Turkey, Saudi Arabia, India, and others.

[2] Korovin V. Drive the Anglo-Saxon devil onto his stone. Available at: https://zavtra.ru/blogs/zagnat_anglosaksonskogo_d_yavola_na_ego_kamen_?ysclid=mnzkhkckbe3501299

[3] Balatsky E.V. (2025). Evolution of colonial and neocolonial models in geopolitical dominance. Economic and Social Changes: Facts, Trends, Forecast, 18(1), p. 55.

It is essential to understand that, despite their regional nature, we are now dealing with *global tectonic shifts*: this is not merely a geopolitical clash but a global *civilizational conflict over the shape of the emerging world order*[4]. According to experts, Russia's current special military operation is only an episode in this broader confrontation (the Arctic could become the next flashpoint of geopolitical tension)[5].

These tectonic changes in the world order have an objective foundation, linked to the emergence of new global centers of power over the past three decades. In 1992, the G7 countries[6] accounted for 45.7% of global GDP (at purchasing power parity), while the BRICS nations (even without accounting for its expansion)[9] represented just 16.5%. By 2022, the G7 share had fallen to 30.3%, while the BRICS share had risen to 31.5%. Projections suggest that by 2028 the balance will shift further in BRICS' favor: this bloc is expected to account for 36.6% of global GDP, against 27.8% for the G7[10].

According to experts[11], a new *multipolar world* is taking shape in the course of this confrontation. Russia, as a historically formed Civilization-State (as it was during the Russian Empire and the USSR), can and must – alongside China and India – aspire to the *role of an organizing center for one of these emerging macro-zones*, i.e., spatial complexes of production and exchange with a population of no less than 250–300 million people[12].

"The present political turbulence continues to shape the coming decades through a confrontation between Russia and the West at all levels—from geopolitical to spiritual and moral. The current Special Military Operation (SMO) is merely one episode in this large-scale civilizational conflict. This must be understood"[7].

"Many analysts now suggest that a Third World War has already begun and that we are in its first stage... This is a war between unipolarity and multipolarity over a new world architecture—over whether sovereign decision-making centers will be located exclusively in the West or distributed among rising civilization-states"[8].

"A multipolar world is being created by default, as a matter of fact. We can accelerate this process, or someone may try to slow it down... But its creation is inevitable. It is happening on its own, driven by the growing potential of many countries – not least the rising potential of the People's Republic of China. India is growing in Asia, Indonesia is growing, and many other states as well; in Latin America, Brazil; Russia is getting back on its feet and gaining strength"[13].

[4] Poturemsky V. A civilizational conflict is now underway that will decide how the new world will be arranged. Available at: https://kazanfirst.ru/interviews/585064?ysclid=m92d04qzo327985344

[5] What will the war in the Arctic be for and what will it be like? Available at: https://mosregdata.ru/article/arctic-war-what-will-it-be-like

[6] The Group of Seven: United States, United Kingdom, Germany, Italy, Canada, France, Japan.

[7] Kukhmirov P. International turbulence: The special military operation is only an episode in a great conflict of civilizations. Available at: https://sevastopol.su/news/mezhdunarodnaya-turbulentnost-svo-lish-epizod-bolshogo-konflikta-civilizaciy

[8] Dugin A. The geopolitics of the Third World War. Available at: https://ria.ru/20260326/geopolitika-2082902877.html

[9] Composition of BRICS: 2009 – Brazil, Russia, India, China; 2011 – Brazil, Russia, India, China, South Africa; 2024 – Brazil, Russia, India, China, South Africa, Egypt, Iran, UAE, Ethiopia; since 2025 – Brazil, Russia, India, China, South Africa, Egypt, Iran, UAE, Ethiopia, Indonesia.

[10] Address of the President of the Russian Federation to the Federal Assembly. February 29, 2024. Available at: http://www.kremlin.ru/acts/bank/50431

[11] On the contours of the long-term forecast... and what it means for the Arctic. CMASF, March 2025; Dugin A. State-Civilization. Available at: https://izborsk-club.ru/22879

[12] Fursov A., Titov I. At the turn of epochs: On the special operation, the European Union, and the influence of the Anglo-Saxons. Available at: https://zavtra.ru/blogs/na_perelome_epoh_fursov

[13] Interview of V. Putin with China Media Corporation. October 16, 2023. Available at: http://www.kremlin.ru/events/president/news/72508

To meet this challenge, however, Russia must become a strong and developing economic and socio-cultural center for friendly nations. This task has been strategically significant throughout modern Russia's history. As early as his first pre-election article, "Russia at the Turn of the Millennium" (1999), President Vladimir Putin stressed the need to pursue a course toward building a strong state capable of ensuring security and defending national interests on the international stage. In his view, this requires the consolidation of state power and all strata of Russian society, the achievement of civic accord and unity, and the formation of an effective national economy.

"Russia needs strong state power and must possess it. For a Russian, a strong state is not an anomaly, not something to be fought against, but rather a source and guarantor of order, an initiator and the main driving force of any change"[14].

Delivering on these strategic priorities remains crucial given the specific nature of the current historical moment: a great turning point of an *acute, pivotal, and fateful character for our country*, which leading experts, in our view, rightly compare to the state of the global community on the eve of the First and Second World Wars. This is a time of intensified ideological confrontation, the erosion of international law, and the formation of opposing blocs of countries asserting their interests by force.

"We proceed from the premise that there are deep parallels between the approaching era and the 1930s–1940s. Observing such parallels, one sometimes cannot help thinking that the world system is somehow doomed to repetitions, becoming bogged down in obsessive 'eternal returns'"[15].

"We are living in wartime – a double wartime... Alongside the hot war, parallel to it and sometimes intertwined with it, another form is unfolding and gaining strength: organizational warfare... It is precisely this sphere that is gradually becoming the main theater of action..."[16]

For contemporary Russia, the acuteness of this moment has an additional dimension: it is not merely a transition from a unipolar to a multipolar world, with all the attendant consequences, but a struggle for sovereignty, which the country largely lost in 1991 with the dissolution of the USSR – the final act that symbolized the West's victory in the Cold War and the establishment of a unipolar world order.

"Above all, it must be acknowledged – and I have said this before – that the collapse of the Soviet Union was the greatest geopolitical catastrophe of the century. For the Russian people, it became a genuine drama"[17].

"...after the collapse of the USSR in 1991, the country fell into a direct, albeit not total, dependence on the United States, essentially becoming a neocolonial state, unable to fully pursue its own developmental path[18]".

[14] Putin V. Russia at the turn of the millennium. Available at: https://www.ng.ru/politics/1999-12-30/4_millenium.html

[15] Averyanov V. The new 1930s and the threat of transnationalism. Available at: https://izborsk-club.ru/25367

[16] Fursov A. The psychohistorical war. Available at: https://izborsk-club.ru/2439

[17] Address of the President of the Russian Federation to the Federal Assembly. April 25, 2005. Available at: http://www.kremlin.ru/events/president/transcripts/copy/22931?ysclid=mnskt67a8n212761081

[18] Balatsky E.V. (2025). Evolution of colonial and neocolonial models in geopolitical dominance. Economic and Social Changes: Facts, Trends, Forecast, 18(1), p. 52.

To secure a rightful place in the emerging vision of the future, Russia must ensure its *internal resilience*, since the country simply cannot survive in a "semi-colonial" state. Such resilience is determined not only by military might but also by an effective economy, technological sovereignty, and a high standard and quality of life for its population.

Amid external geopolitical confrontation, Russia's sustainability as the world's largest country by territory also depends, to a great extent, on the effective use of other internal development factors, chief among them its immense *spatial potential* – which, however, remains insufficiently harnessed in the context of national security and the development of a robust domestic market.

In our understanding, and drawing on the views of leading Russian experts, the country's spatial potential should be interpreted broadly, *encompassing not only the degree of economic and settlement development and habitability of the territory but also the population, with its historical experience, traditions, and other civilizational and socio-cultural characteristics*[19]. Thus, A.S. Panarin, one of Russia's foremost specialists and critics of globalism and consumer society, regarded the country's spatial potential as a "*synthesis of geopolitical position, civilizational identity, and human capital*"[20]. A similar position was held by V.L. Tsymbursky, who noted that Russia's geopolitical and spatial potential is determined "*not only by control over vast territories but also by a unique combination of civilizational identity, historical experience in mastering 'difficult spaces', and socio-cultural specificity*". Thus, the population, with its historical experience, traditions, and value-based passionarity, is viewed as a key component of the country's spatial potential[21].

History itself attests to the same pattern: the growth of our country's might as a Civilization-State (under Peter the Great, Catherine the Great, Alexander II, etc.) has always proceeded in parallel with the expansion of its developed space, population growth, and the formation of stable territorial communities[22]. During its period of rapid growth in 1860–1910, the Russian Empire ranked first in Europe in terms of population growth (the number of inhabitants increased from 74 million to 165.7 million; the urban population grew especially rapidly, *Fig. 1*).

However, this positive vector of development was "broken" by the First World War, the 1917 Revolution, and the subsequent Civil War, as a result of which the country not only suffered millions of human losses but also lost its western borderlands – Finland, Estonia, Latvia, Lithuania, the western part of Belarus, Poland, and Bessarabia – whose population in 1914 had numbered 35.9 million people.

During the Soviet period, the population overall once again grew quite rapidly (the population of the RSFSR increased from 92.7 million in 1926 to 147 million in 1990), but market reforms reversed this vector of development. As a result, in the 1990s mortality in the Russian Federation came to exceed the birth rate by a factor of 1.5, and for the first time since the Great Patriotic War, natural population growth gave way to population decline.

[19] Leksin V.N., Porfiryev B.N. (2018). Territorial fragmentation of the unified legal space of Russia. Federalism, 1, 173–190; Nikiforov L.V. (Ed.). (2011). Spatial Potential in the Strategy of Socio-Economic Development of Russia. Moscow: Institute of Economics RAS. 385 p.

[20] Panarin A.S. (1995). Russia in the Civilizational Process (Between Atlanticism and Eurasianism). Moscow: Institute of Philosophy RAS. 262 p.

[21] Tsymbursky V.L. (2007). Island Russia: Geopolitical and Chronopolitical Works. 1993–2006. Moscow: ROSSPEN. 544 p.

[22] Kotlyakov V.M., Shvetsov A.N., Glezer O.B. (Eds). (2020). Challenges and Policies of Russia's Spatial Development in the 21st Century. Moscow: KMK Scientific Press. 365 p.

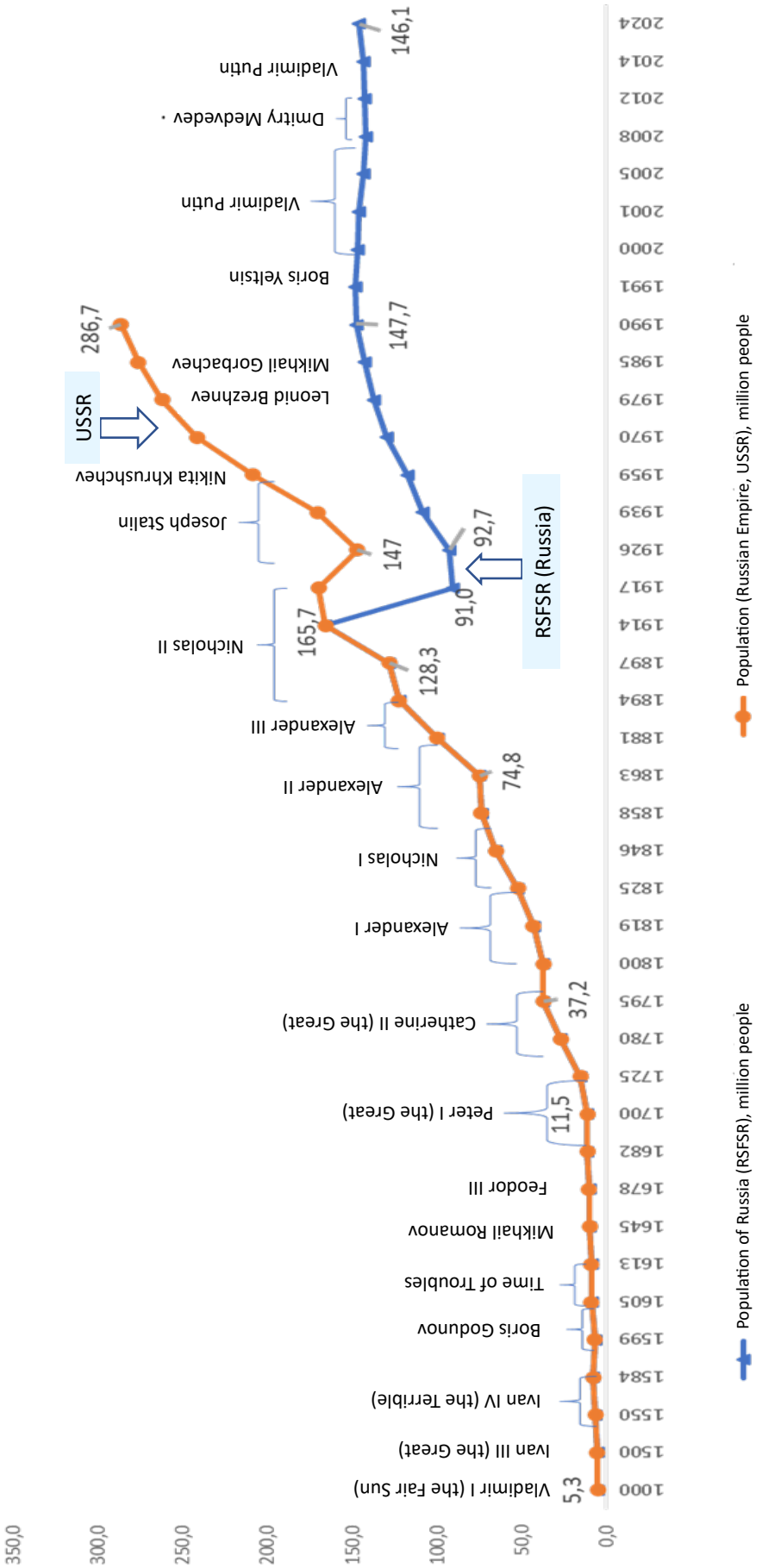


Figure 1. Russia's population dynamics at various historical stages

Compiled from: Historical Materials. Available at: https://istmat.org/node/72; Rosstat data.

During the planned-economy period, the development of vast spaces was ensured by the comprehensive nature and scale of state programs and projects. However, the collapse of the USSR became a turning point that triggered negative economic and demographic processes across the country.

"The concentration of economic activity in a limited number of urban agglomerations implies a compression of the space of human activity; under such an approach, the territory of the Russian Federation truly becomes a burden rather than a factor of development"[23].

"The spatial 'compression' of Russia is not a natural process but the result of policies that have ignored the spatial factor as an autonomous category of governance"[24].

"Post-Soviet transformations, combined with depopulation trends, have brought the problem of the "shrinking" of developed space to the forefront. The liberal model has offered no instruments for curbing this process"[25].

The approach to Russia's spatial development has changed, becoming "***point-focused***" – oriented toward the growth of a limited number of economic centers that are poorly integrated both with one another and with the country's spatial periphery, a problem that has not been fully resolved to this day[26] (*Insert 1*).

At the same time, it should be noted that most of the documents adopted during this period contained no quantitative development targets, which not only makes it difficult to conduct an objective assessment of their implementation but also testifies to a formal approach to strategizing, without assigning responsibility to participants for fulfilling the tasks set. For example, the General Scheme of Settlement on the Territory of the Russian Federation (approved by the Government of the Russian Federation, Protocol 31 dated December 15, 1994) only identified the task of stabilizing the population size in the Far East, without specifying a target value. In practice, however, the population of the Far Eastern Federal District shrank from 8.1 million to 5.9 million people between 1994 and 2024.

In Presidential Decree 803 of June 3, 1996 "On the Basic Provisions of Regional Policy in the Russian Federation" (the document was repealed by Presidential Decree 13 of January 16, 2017), one of the benchmarks was the reduction of the interregional gap in GRP per capita. Yet in reality, this gap between the ten leading and ten lagging regions widened from 4.9 times to 12.3 times between 1995 and 2017.

The ambitious targets for innovative socio-economic development set forth in the Concept for the Long-Term Socio-Economic Development of the Russian Federation to 2020 (approved by RF Government Resolution 1662-r dated November 17, 2008) proved overall unattainable, owing to the global financial and economic crisis, subsequent sanctions, and the absence of effective mechanisms for practically implementing the declared priorities. Specifically, annual GDP growth was expected to average around 6–7%, so that GDP would have risen by a factor of 2.25 over the period 2008–2020. In reality, however, the economy grew by only 15.1% in comparable terms over this period. This was largely due to weak investment activity: the real increase in fixed capital investment over the period amounted to just 19.5% (*Tab. 1*).

[23] Kryukov V.A., Klistorin V.I., Kolomak E.A., Melnikova L.V. On the key problems of spatial development of the Russian Federation and the role and place of the research and expert community in developing approaches to overcoming them. Available at: https://www.sbras.ru/files/news/docs/2023_12_08_kryukovva_o_klyuchevyh_problemah_prostranstvennogo_razvitiya_rf.pdf

[24] Leksin V.N., Porfiryev B.N. (2018). Territorial fragmentation of the unified legal space of Russia. Federalism, 1, 173–190.

[25] Druzhinin A.G., Kuznetsova O.V. (2024). The problem of shrinkage of the active space in Russia and the possibilities of its' solution. Social Sciences and Contemporary World, 4, 114–127. DOI: 10.31857/S0869049924040094

[26] Ilyin V.A., Kozhevnikov S.A. (2022). Spatial and sociocultural transformation of Russia: A view from the region. Municipality: Economics and Management, 4, 16–29.

Insert 1

Key milestones in state spatial development policy in post-Soviet Russia

Document / Decision	Year	Conceptual regulatory priorities	Negative consequences for Russia's spatial development
1. "Shock therapy" program (Decree of the President of the RSFSR 172 dated November 6, 1991 "On Organizing the Work of the Government of the RSFSR in the Conditions of Economic Reform"; Decree of the President of the RSFSR 297 dated December 3, 1991 "On Measures to Liberalize Prices", etc.), including the abandonment of sectoral territorial planning	1991	Elimination of Gosplan and the system of sectoral distribution of productive forces; radical price liberalization, privatization, and market opening without regard to regional specificities.	In the context of incomplete reforms, the liberalization of foreign trade and investment and the dismantling of spatial forecasting mechanisms produced a narrow regional specialization and increased the mobility of capital, which contributed to growing regional differentiation, the concentration of resources in a limited number of growth centers, the deindustrialization of single-industry towns and the periphery, and the acceleration of migration outflows from northern and eastern regions.
2. General Scheme of Settlement on the Territory of the Russian Federation (approved by the Government of the Russian Federation, Protocol 31 dated December 15, 1994)	1994	Transition from a policy of permanent residence to a policy of temporary stay for the non-indigenous population in the North; it was considered advisable to limit the growth of cities in the Far North as much as possible. Curbing rural depopulation and developing the Far East.	The practical implementation of liberal socio-economic policy in the northern regions, based on a reduced state role and the dismantling of many compensatory mechanisms, led to significant rates of depopulation in the North.
3. Presidential Decree 803 dated June 3, 1996 "On the Basic Provisions of Regional Policy in the Russian Federation" (repealed by Presidential Decree 13 dated January 16, 2017)	1996	Declaration of the principles of "equalization" of regional development without practical implementation mechanisms.	The document was framework-oriented and rather declarative in nature, lacking effective instruments for spatial regulation, which led to increasing center-periphery polarization of the country's socio-economic space and growing disparities in the investment attractiveness of regions.
4. Reform of local self-government (Federal Law 154-FZ dated August 28, 1995 "On the General Principles of Organizing Local Self-Government in the Russian Federation"; Presidential Decree 1370 dated October 15, 1999 "On Approving the Fundamentals of State Policy in the Sphere of Developing Local Self-Government", etc.)	1995–2003	Decentralization of powers while preserving the financial dependence of municipalities.	The municipal reform conferred significant powers on municipalities without adequate resource provision, which led to the weakening of local development centers, the degradation of infrastructure in small towns and villages, and the expansion of an "inner periphery" even within central regions.

Окончание вкладки 1

Document / Decision	Year	Conceptual regulatory priorities	Negative consequences for Russia's spatial development
5. Concept for the Long-Term Socio-Economic Development of the Russian Federation to 2020 (approved by RF Government Resolution 1662-r dated November 17, 2008)	2008	Emphasis was placed on stimulating "growth centers" and attracting private business to their accelerated development.	The reliance on "locomotive regions" intensified the concentration of investment and population in large urban agglomerations, increased interregional inequality, and led to the compression of developed socio-economic space across the country and the depopulation of peripheral areas.
6. Russia's Accession to the WTO (Federal Law 126-FZ dated July 21, 2012 "On Ratifying the Protocol of the Russian Federation's Accession to the Marrakesh Agreement Establishing the World Trade Organization")	2012	Opening of markets without protectionist defense of domestic producers.	Trade liberalization hit regions with manufacturing industries, exacerbated deindustrialization in peripheral regions, and increased import dependence and the vulnerability of regional economies.
7. Presidential Decree 13 dated January 16, 2017 "On Approving the Fundamentals of State Regional Development Policy of the Russian Federation for the Period up to 2025"	2017	Balanced socio-economic development of all the country's regions, as well as creating conditions for improving citizens' quality of life regardless of their place of residence.	In practice, private investors were attracted, migration was encouraged, and infrastructure was developed primarily in economically strong regions. This reinforced the "capital-city bias", increased internal migration flows, and led to the socio-economic "desertification" of the periphery.
8. Strategy for the Spatial Development of the Russian Federation to 2025 (approved by RF Government Resolution 207-r dated February 13, 2019)	2019	Focus on supporting the development of 42 largest (population over 1 million) and large (over 0.5 million) urban agglomerations. In later versions of the document, support was additionally extended to 23 urban agglomerations of the "second tier" with populations below 500,000.	A forced centripetal vector in the spatial development of Russia and its regions, which accelerated the outflow of population from small towns and rural areas, increased the demographic burden on the working-age population in most subjects, and sharpened intraregional contrasts.
9. Strategy for the Spatial Development of the Russian Federation to 2030 (approved by RF Government Resolution 4146-r dated December 28, 2024)	2024	Creation of a balanced system of settlement and economic organization in the Russian Federation through the development of key settlements.	Among the potential risks is the degradation of the potential of key settlements due to insufficient attention to the modernization of their economies.

Table 1. Target and actual values of Russia's socio-economic development in 2008–2020, according to Concept-2020

Indicator	Base period (2007)	Planned value by period (2008–2020) and cumulative totals	Actual value (2008–2020)
1. Population, million people	142.1	2008–2010: 141.8; 2011–2015: 142.2; 2016–2020: 143.4	147.4 (2020)
2. Average annual GDP growth rate, %	8.1	2008–2010: 6.8%; 2011–2015: 6.4%; 2016–2020: 6.3%. Planned total growth over period: 2.25 times	Increase of 15.1% over the entire period
3. Average annual growth rate of real disposable household income, %	10.1	2008–2010: 10%; 2011–2015: 7%; 2016–2020: 6.7%. Planned total growth over period: 2.29 times	Increase of 12% over the entire period
4. Average annual growth rate of investment, %	21.1	2008–2010: 14–14.8%; 2011–2015: 10.3%; 2016–2020: 10%. Planned total growth over period: 3.9 times	Increase of 19.5% over the entire period
5. Average annual growth rate of retail trade turnover, %	16.1	2008–2010: 12.8%; 2011–2015: 7.5%; 2016–2020: 6.4%. Planned total growth over period: 2.8 times	Increase of 22.9% over the entire period
Source: own calculations based on Rosstat data.			

Moreover, the Concept-2020 was repeatedly and justifiably criticized by leading experts (S.Yu. Glazyev, M.G. Delyagin, and others) for its weak elaboration: the document was developed during the economic upswing of 2006–2008 and did not account for the possibility of systemic crises, which made it unrealizable from the very start; its forecasts were based on econometric extrapolation of existing trends rather than on modeling a qualitative transition to an innovative trajectory; the opportunities for breakthrough growth through the assimilation of new technologies were underestimated; and there was a fundamental mismatch between the document's declared goals and actual budgetary policy.

A new stage in state spatial development policy began in 2019 with the adoption of the Strategy for the Spatial Development of the Russian Federation to 2025 (approved by RF Government Resolution 207-r of February 13, 2019). While the initial versions of the document focused on supporting the development of only 42 largest (population over 1 million) and large (over 0.5 million) urban agglomerations, later revisions added 23 urban agglomerations with populations below 500,000 (the "second tier").

> "The loudly and widely advertised ... 'new growth policy', in its macroeconomic part, is identical to the restoration of the bankrupt methods of the 1990s, guaranteeing a slowdown in economic growth, stagnation of investment and innovation activity, and the continuation of trends of national economic degradation"[27].
>
> "What was the pitiful Strategy-2020 worth, whose authors could not even work out the mechanisms for achieving arbitrarily assembled, uncoordinated, and unsubstantiated goals! Its developers saved themselves from criticism by expanding the document to nearly a thousand pages, rendering it unreadable. The developed ... Strategy-2020 became a symbol of the liberals' intellectual bankruptcy"[28].

[27] Glazyev S.Yu. (2012). Evolution of the new economic system. "Strategy 2020" – an anti-modernization document. Russian Economic Journal, 2, 3–9.

[28] Delyagin M. Mauism as the highest stage of liberalism. Available at: https://izborsk-club.ru/6476

For the country's lagging regions, individual development programs (IDPs) were drawn up and implemented. Thus, a certain mechanism was created to counteract the negative processes of forced resource concentration in cities of over one million. However, these IDPs demonstrated insufficient effectiveness. In particular, a total of 49.4 billion rubles from the federal budget and 1.7 billion rubles from regional budgets were allocated to their implementation over 2020–2024. Yet, according to the Accounts Chamber of the Russian Federation, *36.4% of total federal budget expenditures did not lead to the planned results, and the planned targets for 37 out of 120 IDP measures (30.8%) were not achieved*[29].

At the same time, despite certain difficulties, the target values for two of the three indicators under the inertial scenario of the Strategy for the Spatial Development of Russia to 2025 were, on the whole, achieved (*Tab. 2*).

According to experts, one of the key reasons for the low effectiveness of strategic documents at the federal, macroregional, and regional levels is the weak practical implementation of the fundamental provisions of the federal law on strategic planning[30]. Among the main problems are the poor alignment of the documents being developed in terms of goals, objectives, and indicators; a low level of involvement of economic actors in strategic planning, which therefore remains formal in nature, with no real accountability for achieving the stated goals.

> "Today, despite having more than 60,000 adopted strategic planning documents, they do not exert a noticeable influence on economic development because they contain no accountability measures for their fulfillment..."[31]
>
> "...the law has not been fully transposed into the practice of public administration to this day. It has not been possible to create a unified, effectively functioning strategic planning system or to implement the planning principles enshrined in the law, which significantly limits the state's ability to set and achieve national development goals"[32].

Table 2. Indicators of the implementation of the Strategy for the Spatial Development of the Russian Federation to 2025

Target indicator	Scenario for 2025		Actual (2023)
	inertial	target	
Average annual GRP growth rates in the subjects of the Russian Federation where promising large centers of economic growth are located, % in 2017–2025	102.6	103.7	**102.8**
Ratio of per capita GRP of the subjects of the Russian Federation classified as priority geostrategic territories (excluding the Arctic Zone) to the national average, %	66	70	**67**
Transport mobility of the population by all transport modes, thousand passenger-km per person per year	9.4	9.7	**8.0**
Compiled from: Concept of the Strategy for the Spatial Development of the Russian Federation to 2030 with a Forecast to 2036. Available at: https://www.economy.gov.ru/material/file/85fb48440f79df778539e0b215af5345/koncepciya_strategii_prostranstvennogo_razvitiya_rf_na_period_do_2030_goda.pdf?spm=a2ty_o01.29997172.0.0.737b55fblq3N9v&file=koncepciya_strategii_prostranstvennogo_razvitiya_rf_na_period_do_2030_goda.pdf			

[29] Report of the Accounts Chamber of the Russian Federation "Audit of the Implementation of Individual Programs of Socio-Economic Development of the Subjects of the Russian Federation Aimed at Creating an Effective Economy in 2020–2024". Available at: https://ach.gov.ru/upload/iblock/954/r8bgp7kakm1pjxkogf26xftkv11jllf2/Otchet_IPR.pdf

[30] Federal Law 172-FZ "On Strategic Planning in the Russian Federation" dated June 28, 2014.

[31] Glazyev S. The crisis funnel. Available at: https://glazev.ru/krizisnaja-voronka/

[32] Lenchuk E.B. (2021). Strategic planning as a tool to accelerate social and economic development in Russia. Economic Revival of Russia, 3(69), 25–30. DOI: 10.37930/1990-9780-2021-3-69-25-30

All of this prevents the successful alignment of the interests of regions and private business for the effective implementation of macroregional development strategies.

> "Strategic documents are fine. They provide some idea of the directions of development... But there is an immense distance between an idea and practical implementation. The previous strategy was simply a conglomerate of local visions and proposals from the regions. A comprehensive Siberian-wide focus was barely discernible in it"[33].

In particular, Academician V.V. Kryukov, describing the problems with the practical implementation of the Strategy for the Socio-Economic Development of Siberia to 2020, notes that the document was effectively a "conglomerate" of local visions and proposals from the regions, poorly linked to solving the strategic tasks of developing Siberia as a vast socio-economic space of critical national-economic and geostrategic importance in the context of ensuring the country's national security.

At the same time, it should be noted that with the approval of the new Strategy for the Spatial Development of the Russian Federation to 2030, with a forecast to 2036 (approved by RF Government Resolution 4146-r of December 28, 2024), new institutions and mechanisms of state regulation of spatial development have appeared in the areas of productive force location, settlement, and improving the infrastructural connectivity of territories. Considering both internal and external challenges, this is certainly a positive step.

One of the key mechanisms for implementing spatial policy until 2036 is the Unified List of Key Settlements, more than half of which are small towns, urban-type settlements, and villages. In our view, if the development programs for these key settlements are effectively implemented in practice, objective prerequisites can be created for overcoming negative trends in the country's spatial development.

It must be acknowledged, however, that despite all the measures taken at the federal level (some of which, in our view, are indeed appropriate), the practical implementation of reforms has so far been unable to reverse the negative trends of *depopulation and the forced peripheralization of Russia's* developed socio-economic space at all levels (federal, regional, and municipal).

Thus, in the post-Soviet period, the population has grown only in the regions of the Central Federal District (from 37.9 to 40.2 million people, an increase of 6.1%, *Tab. 3*), the Southern Federal District (to a significant extent due to the incorporation of Crimea and Sevastopol: from 13.3 to 16.6 million people, an increase of 25.5%), and the North Caucasus Federal District (from 7.3 to 10.2 million people, an increase of 40.4%, owing to traditionally high birth rates). In contrast, since 1989, the Far East has lost 25.5% of its population (a decline from 8.0 to 5.9 million people), Siberia—nearly 12% (from 21.1 to 18.6 million people), and the Volga Federal District—10% (from 31.8 to 28.6 million).

[33] Academician Valery Kryukov on what the new development strategy for Siberia should be. Available at: https://rg.ru/2023/01/11/v-sibir-po-dobroj-vole.html?utm_referrer=https%3A%2F%2Fwww.ieie.su%2F

Table 3. Population size in the Russian Federation by federal district, 1989–2023, million people

Territory / Year	1989	2002	2012	2014	2023	2012 to 1989, %	2014 to 1989, %	2023 to 1989, %
Russian Federation (1989 – RSFSR)	147.0	145.3	143.4	146.5**	146.3***	97.5	99.7	99.5
Central FD	37.9	38.0	38.8	39.3	40.2	102.2	103.5	106.1
Northwestern FD	15.2	14.0	13.7	13.8	13.9	89.9	90.7	90.9
Southern FD	13.3	13.9	13.9	16.3**	16.6***	104.9	123.2	125.5
North Caucasus FD	7.3	8.9	9.5	9.7	10.2	131.0	132.9	140.4
Volga FD	31.8	31.2	29.8	29.7	28.6	93.7	93.5	90.0
Ural FD	12.5	12.4	12.2	12.3	12.3	97.1	97.8	97.9
Siberian FD (within 1989 boundaries)*	21.1	20.1	19.3	19.3	18.6	91.5	91.6	88.1
Far Eastern FD (within 1989 boundaries)*	8.0	6.7	6.3	6.2	5.9	78.7	78.2	74.5

* Until 2018, the Republic of Buryatia and the Trans-Baikal Territory were part of the Siberian FD; since 2018 they have been part of the Far Eastern FD.
** Including the Republic of Crimea and the City of Sevastopol.
*** Excluding the Lugansk and Donetsk people's republics and the Kherson and Zaporozhye regions.
For reference: before the start of the special military operation, an estimated 6.16 million people lived in these territories. Source: What is known about the regions joining Russia. Available at: https://www.rbc.ru/politics/03/10/2022/632d6cd89a79476454bb5d08
Compiled from: Rosstat data.

Moreover, these negative trends have affected a significant share of cities (primarily small and medium-sized ones) in the majority of the country's federal districts. At present, 75.6% of cities in the Far Eastern Federal District, 64% in the Siberian Federal District, and 62.8% in the Northwestern Federal District are classified as significantly depopulating (i.e., with population declines of over 15% between 1989 and 2024)[34].

As a result, these negative processes have led to the further *destruction of the supporting settlement framework and the "denudation" of vast spaces*, which represents a threat to national security. This is especially vividly illustrated by data from the Northwestern Federal District. Between 1989 and 2023, practically 90% of the macro-region's municipalities (168 out of 188 entities) recorded a negative population trend. Moreover, in almost half of these depopulating territories, the decline over this period ranged from 25 to 50% (*Insert 2*).

In turn, population growth was observed in only 10.6% of municipal formations, primarily municipalities of the Leningrad Region located close to Saint Petersburg – a manifestation of agglomeration processes – as well as a number of territories in the Kaliningrad Region.

[34] Calculations based on: Change in the Population of Cities from 1989 to 2024. Available at: https://mojgorod.ru/cities/popc2024_1989_4.html

Insert 2

Grouping of municipal formations in the Northwestern Federal District by population dynamics, 1989–2023

Population size, % of 1989 level*	Number of municipal formations in group, units (% of total for NWFD)	Region and number of municipal formations
20.0–49.9	44 units (23.4%)	Arkhangelsk Region (11), Republic of Karelia (8), Komi Republic (7), Pskov Region (7), Murmansk Region (6), Novgorod Region (4), Kaliningrad Region (1)
50.0–74.9	94 units (50.0%)	Vologda Region (21), Pskov Region (16), Novgorod Region (16), Komi Republic (10), Arkhangelsk Region (10), Republic of Karelia (7), Murmansk Region (6), Leningrad Region (5), Kaliningrad Region (2), Nenets Autonomous Area (1)
75.0–99.9	30 units (15.9%)	Vologda Region (6), Leningrad Region (6), Kaliningrad Region (5), Republic of Karelia (3), Komi Republic (3), Arkhangelsk Region (3), Pskov Region (2), Nenets Autonomous Area (1), Novgorod Region (1)
Total: decline in population in 168 out of 188 municipal formations (89.4% of the total)		
100.0–124.9	12 units (6.5%)	Kaliningrad Region (5), Leningrad Region (4), Vologda Region (1), Pskov Region (1), Novgorod Region (1)
125.0–149.9	3 units (1.6%)	Kaliningrad Region (2), Leningrad Region (1)
150.0–174.9	1 unit (0.5%)	Kaliningrad Region (1)
175.0–199.9	1 unit (0.5%)	Leningrad Region (1)
twofold and more	3 units (1.6%)	Kaliningrad Region (2), Leningrad Region (1)
Total: increase in population in 20 out of 188 municipal formations (10.6% of the total)		

*The table presents a grouping of municipal formations by population dynamics between 1989 and 2023. For example, the group "20.0–49.9" includes 44 municipal formations of the NWFD whose population in 2023 ranged from 20 to 49.9% of the 1989 level.
Source: calculated from Rosstat data.

Alongside depopulation, another key problem of Russia's spatial development is the *persistent – and in some socio-economic indicators, even increasing – interregional differentiation*. Thus, in the post-Soviet period, the ratio of per capita gross regional product (GRP) of the top 10 subjects to that of the bottom 10 subjects rose from 4.9 to 12.8 times (with a particularly substantial increase in differentiation occurring in 2000–2010); in terms of per capita fixed capital investment, interregional disparities grew from 6.7 to 17.9 times (*Tab. 4*).

The situation with social indicators is somewhat better as a result of the state's "redistributive" policy. Thus, the differentiation between the top 10 and bottom 10 regions in terms of per capita household income declined from 5.0 to 3.4 times. Since 2000, there has been a reduction in regional differentiation in per capita consolidated budget revenues (from 13.1 to 5.9 times).

At the same time, differences between the leader region and the laggard region in terms of per capita GRP are substantially greater: in 2024, the gap was **69.6 times** (Nenets Autonomous Area / Republic of Ingushetia).

For reference:

Differences between maximum and minimum values of per capita GRP:

- India – 10 times (28 states, 8 union territories),
- Brazil – 5.7 times (26 states, 1 federal district),
- China – 4.5 times (34 provincial-level units),
- United States – 2.2 and 5.3 times (excluding and including the District of Columbia; 50 states)[35].

Table 4. Differentiation of RF constituent entities by key socio-economic indicators

1. GRP per capita, thousand rubles					
	1995*	**2000**	**2010**	**2021**	**2024**
National average	9566.3**	39.5	263.8	830.8	1276.5
Average among top 10 regions (Group 1)	16980.7	81.2	1026.7	3442.5	5397.7
Average among bottom 10 regions (Group 2)	3437.8	12.2	88.1	254.9	419.1
Group 1 / Group 2, times	**4.9**	**6.6**	**11.7**	**13.5**	**12.8**
2. Fixed capital investment per capita, thousand rubles					
	1990	**2000**	**2010**	**2021**	**2024**
National average	1.7	7.9	64.1	157.3	273.2
Average among top 10 regions (Group 1)	6.46	44.5	311.1	788.3	1376.1
Average among bottom 10 regions (Group 2)	0.96	1.7	22.7	51.0	80.1
Group 1 / Group 2, times	**6.7**	**26.3**	**13.7**	**15.4**	**17.9**
3. Per capita household income, thousand rubles per month					
	1995*	**2000**	**2010**	**2021**	**2024**
National average	0.5	2.3	19.0	40.3	64.0
Average among top 10 regions (Group 1)	1.0	4.8	34.5	74.6	121.6
Average among bottom 10 regions (Group 2)	0.2	1.0	10.5	22.4	35.6
Group 1 / Group 2, times	**5.0**	**4.8**	**3.3**	**3.3**	**3.4**
4. Consolidated budget revenues per capita, thousand rubles					
	1992*	**2000**	**2010**	**2021**	**2024**
National average	16.8	7.3	45.8	120.3	168.5
Average among top 10 regions (Group 1)	42.7	31.8	151.0	449.4	497.1
Average among bottom 10 regions (Group 2)	8.8	2.4	26.0	68.5	84.2
Group 1 / Group 2, times	**4.8**	**13.1**	**5.8**	**6.6**	**5.9**

* For the calculation, the period was chosen for which open and complete statistical data are available for all the country's regions
** Value indicators are presented in current prices.
Source: own calculations.

[35] Bakhtizin A.R. (2024). Urbanization and issues of spatial development. In: Scientific Works of the Free Economic Society of Russia. Pp. 69–88.

All of this is a consequence of the policy of market-based organization of space pursued over recent decades, which has focused on supporting a limited number of "locomotive regions" and the largest agglomerations, thereby compressing Russia's developed socio-economic space. Against this backdrop, the country's vast territory has often come to be seen as a "burden" on economic growth and sustainable development.

The scale of differentiation is especially acute at the intraregional level. In particular, peripheralization here manifests itself not only in depopulation but also in the erosion of the socio-economic base of territories remote from large cities, leading to increasing heterogeneity of a region's socio-economic space. Thus, whereas 68% of the population of the Vologda Region lived in urban agglomerations in 2000, by 2024 this share had risen to 74%. Similar processes of concentration are characteristic of agricultural production (an increase from 55.6 to 58.5%) and fixed capital investment (from 77.6 to 88.4%, *Tab. 5*).

Against this background, socio-economic activity on the periphery is fading, differentiation along the "urban–rural" divide is growing, and the standard and quality of life of the population is declining. For example, the gap between urban and rural areas in terms of life expectancy at birth widened from 1.5 to 1.8 years between 2000 and 2024; in terms of per capita household disposable resources, it increased from 9.5 to 13.4 thousand rubles per household member.

Table 5. Share of urban agglomerations and other territories in key indicators of socio-economic development of the Vologda Region, 2000 and 2024, %

Indicator	Territory	2000	2024	2024 to 2000, p.p.
1. Permanent resident population	Urban agglomerations, including	67.5**	74.2	+6.7
	*Vologda agglomeration**	*35.6*	*39.9*	*+4.3*
	*Cherepovets agglomeration**	*31.9*	*34.3*	*+2.4*
	Other municipalities of the region	32.5	25.8	-6.7
2. Industrial output	Urban agglomerations, including	94.6	94.7	+0.1
	*Vologda agglomeration**	*10.5*	*17.8*	*+7.3*
	*Cherepovets agglomeration**	*84.1*	*76.9*	*-7.2*
	Other municipalities of the region	5.4	5.3	-0.1
3. Agricultural output	Urban agglomerations, including	55.6	58.5	+12.9
	*Vologda agglomeration**	*33.9*	*48.9*	*+15*
	*Cherepovets agglomeration**	*21.7*	*19.6*	*-2.1*
	Other municipalities of the region	44.4	31.5	-12.9
4. Fixed capital investment	Urban agglomerations, including	77.6	88.4	+10.8
	*Vologda agglomeration**	*26.9*	*29.5*	*+2.6*
	*Cherepovets agglomeration**	*50.7*	*58.9*	*+8.2*
	Other municipalities of the region	22.4	11.6	-10.8
5. Housing completions	Urban agglomerations, including	72.7	80.6	+7.9
	*Vologda agglomeration**	*45.9*	*50.9*	*+5.0*
	*Cherepovets agglomeration**	*26.8*	*29.7*	*+2.9*
	Other municipalities of the region	27.3	19.4	-7.9

* The Vologda agglomeration includes 4 municipalities adjacent to the core city: the City of Vologda and Vologodsky, Gryazovetsky, and Sokolsky municipal okrugs; the Cherepovets agglomeration includes 4 municipalities: the City of Cherepovets and Kaduysky, Cherepovetsky, and Sheksninsky municipal okrugs. The remaining territories comprise 20 municipal okrugs of the region.

** The figures presented in the table show the contribution made by each group of territories to the overall indicator for the region as a whole.

Compiled from: Uskova T.V., Voroshilov N.V. (Eds). (2025). Socio-Economic Development of Municipal Formations of Vologda Region, 2000–2024: Information-Analytical Bulletin, Issue 12. Vologda: VoIRC RAS. 96 p.

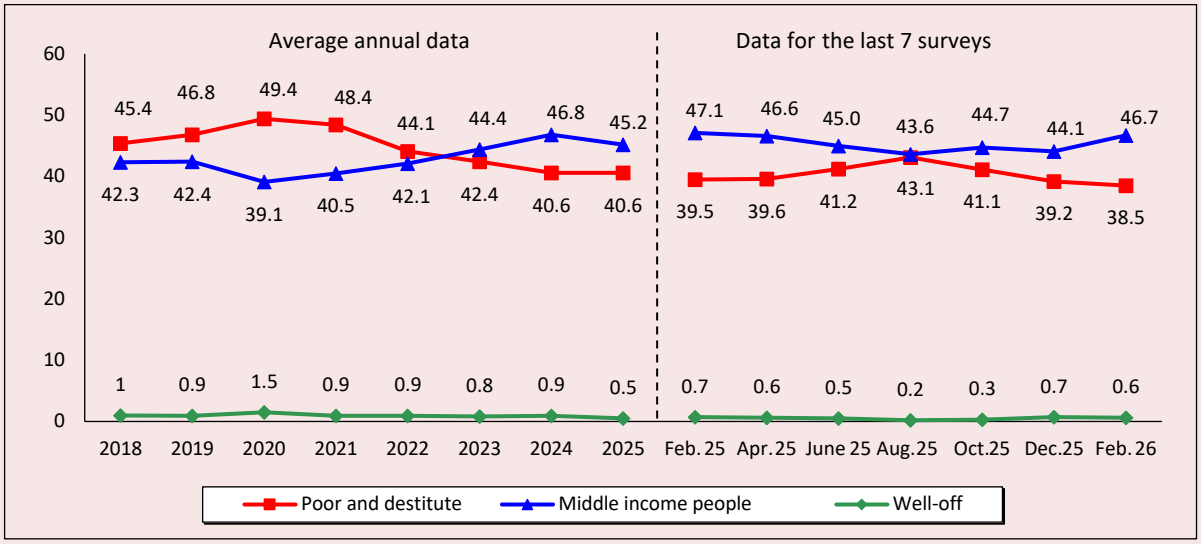
At the same time, after four years of the special military operation, Russian society has accumulated a certain "fatigue from geopolitics and a colossal demand for the normalization of everyday life"[36]. The importance of addressing key social and economic problems is being raised once again with renewed urgency. As noted in studies by VCIOM and VolRC RAS, the public is once again beginning to be troubled by the everyday concerns of the "lifeworld"[37]: living standards, work, place of residence, family, and prices in shops.

In particular, despite some decline in negative assessments since 2018, around 41% of Vologda Region residents still identify themselves as "poor" or "destitute" which makes it more urgent to enhance the effectiveness of public administration in terms of improving the well-being of all socio-demographic groups in the country and the region (*Fig. 2*).

Another key problem for the majority of residents is uncertainty about tomorrow: in 2025, 54.1% of respondents held this view, which is 4.1 percentage points higher than in 2018 (*Tab. 6*). This problem is most acute for vulnerable population groups: the least materially secure categories (57.2%), residents of rural areas (55.7%), and people with secondary education (57.3%). All of this reflects a deep-seated uncertainty, a deficit of trust in institutions, and a lack of long-term predictability, which is not compensated for by socio-economic improvements in the place of residence (for 9 out of 10 indicators, an increase in positive assessments has been observed since 2018).

Despite some improvement in the situation, the most acute problems for residents remain the housing problem (in 2025, 23.2% of respondents indicated this, 9.4 p.p. lower than in 2018) and the lack of funds for paid medical treatment (21.3%,

Figure 2. Dynamics of the social self-identification of the population*, % of respondents



* Distribution of answers to the question: "Which category do you belong to, in your opinion?"

Source: VolRC RAS public opinion monitoring data.

[36] Obukhov S.P., Mikhalchuk A.M., Bogachev A.M., Strelkov D.A., Khamadieva T.V., Chervontsev A.V. Results of 2025 from V.V. Putin. Express analysis of the message to Russian society and foreign opponents. Center for Research on Political Culture of Russia. December 19, 2025. Official website of the CPRF. Available at: https://kprf.ru/politindx/239901.html?ysclid=mlhmrkgapk916136109

[37] VCIOM Director General named the topics that most worry Russians. Available at: https://news.ru/society/gendirektor-vciom-nazval-temy-kotorye-bolshe-vsego-volnuyut-rossiyan

Table 6. Which of the following problems have you personally encountered in the past year?, % of respondents

Response option	Year								Change (+/-), 2025 vs	
	2018	2019	2020	2021	2022	2023	2024	2025*	2018	2022
Lack of confidence in tomorrow	50.0	45.9	56.7	53.9	55.8	53.8	51.1	54.1	+4.1	-2
Inability to improve housing conditions due to high cost of housing	32.6	31.1	29.0	27.6	25.9	23.9	22.4	23.2	-9.4	-3
Lack of funds for paid medical treatment	29.1	32.5	32.7	29.7	27.5	25.3	22.5	21.3	-7.8	-6
Reduction in leisure time due to the need to work extra hours	23.5	24.5	21.5	18.9	17.5	16.9	16.1	16.9	-6.6	-1
Inability to purchase a package tour due to high cost	21.2	25.6	19.1	17.0	16.9	14.3	13.3	15.9	-5.3	-1
Need to seek additional work due to low income	24.7	23.9	22.4	19.3	17.7	15.7	15.1	13.9	-10.8	-4

*Ranked according to 2025 data.
Source: VoIRC RAS public opinion monitoring data.

a decline of 7.8 p.p.), the combined assessment of which shapes the population's holistic perception of living conditions and migration attitudes.

The quality of life in a territory depends to a large extent on the effectiveness of the state policy being pursued and on the successful on-the-ground implementation of strategic projects at the federal and regional levels.

At the same time, the findings of a study conducted by the Vologda Research Center of the Russian Academy of Sciences in May–June 2025[38] on the provision of infrastructure facilities to the region's residents and the quality of services delivered indicate that *national projects in the spheres of healthcare, education, demography, and roads* receive the *lowest assessments across all territories of the region* (the cities of Vologda and Cherepovets and the municipal okrugs) – i.e., precisely in those areas where residents see the most acute problems that are reducing their quality of life[39] (*Tab. 7*).

In July 2020, a Presidential Decree by Vladimir Putin set out Russia's national development goals through to 2030, envisaging the creation of conditions for the all-round development of the individual. To achieve these goals, 14 national projects were developed and implemented between 2020 and 2024, aimed at developing the country's human capital, ensuring economic growth, and creating a comfortable living environment.

[38] The findings of a survey of Vologda Region residents conducted in 2025 are presented, broken down by large cities (Vologda, Cherepovets) and a number of municipal okrugs (Babaevsky, Velikoustyugsky, Vozhegodsky, Gryazovetsky, Kirillovsky, Nikolsky, Tarnogsky, Sheksninsky). The sample is quota-based by gender, age, and territory and includes 1,500 people aged 18 and over. The sampling error for the survey does not exceed 3% with a confidence interval of 4–5%.

[39] In our view, the higher ratings given to the national projects on exports and labor productivity may stem from residents' limited awareness of their actual outcomes, since these projects affect the population only indirectly.

Table 7. How do you assess the results of the implementation of the following national projects in 2020–2024? (mean score on a five-point scale: 1 – lowest, 5 – highest)

National project	Vologda	Cherepovets	Municipal okrugs*	Region overall
Digital Economy of the Russian Federation	3.3	3.5	**4.1**	3.7
International Cooperation and Exports	3.3	4.0	**4.1**	3.9
Comprehensive Plan for Modernizing and Expanding Trunk Infrastructure	3.3	4.0	**4.1**	3.9
Labor Productivity	3.2	3.7	**4.0**	3.7
Science and Universities	3.2	3.7	**4.0**	3.7
Small and Medium-Sized Enterprises and Support for Individual Entrepreneurial Initiative	3.3	3.3	**4.0**	3.6
Culture	3.1	3.5	**3.7**	3.5
Ecology	3.1	3.0	**3.7**	3.3
Tourism and the Hospitality Industry	3.1	3.5	**3.7**	3.5
Safe and High-Quality Roads	3.0	3.1	**3.6**	3.3
Demography	3.1	3.2	**3.5**	3.3
Education	3.0	3.4	**3.6**	3.4
Healthcare	3.2	3.1	**3.4**	3.3

* Sorted in descending order of assessments by residents of municipal okrugs.
Source: VoIRC RAS public opinion monitoring data.

Another negative trend that was revealed in the latest article by the editor-in-chief[40] is the ***rather persistent gap between residents' assessments of the general situation in the country (predominantly pessimistic) and of their personal lives*** (cautiously optimistic). Thus, 26.2% of respondents expect 2026 to be a successful year for the country, whereas the figure for themselves and their families is already 39.6% (13.3 p.p. higher, *Tab. 8*). In other words, there is a certain polarization – a gap between "the country" and "oneself".

Table 8. In your opinion, what will the coming year be like?*, % of respondents

Response option	2018	2019	2020	2021	2022	2023	2024	2025	2026	Change (+/-), 2026 vs	
										2025	2023
For Russia											
Very successful, generally good	35.9	35.7	36.6	31.4	29.0	24.9	25.7	27.6	**26.2**	-1	+1
Rather difficult, poor, very hard	38.8	36.8	37.4	42.5	44.2	49.2	47.7	46.2	46.2	0	-3
For the region											
Very successful, generally good	32.6	33.6	35.4	28.0	28.9	25.7	28.2	27.5	28.6	+1	+3
Rather difficult, poor, very hard	40.1	39.3	39.1	45.7	46.1	49.0	46.3	46.6	43.8	-3	-5
For you (your family)											
Very successful, generally good	39.4	38.1	39.7	34.0	34.7	31.8	35.2	38.0	**39.6**	+2	+8
Rather difficult, poor, very hard	35.1	35.5	35.8	41.2	40.2	41.6	39.1	37.1	34.5	-3	-7

* The questions were asked in February 2026.
Source: VoIRC RAS public opinion monitoring data.

[40] Ilyin V.A., Morev M.V. (2026). Efficiency of strategic public administration: The state of Russian society following four years of the special military operation. Economic and Social Changes: Facts, Trends, Forecast, 19(1), 19–56. DOI: 10.15838/esc.2026.1.103.6

In such a situation, attention should be drawn to the fact that the adaptation phase of Russian society has, to a certain degree, been completed: it has moved from the shock of 2022–2023 to a "new normality" with a recovery in personal expectations, and future dynamics will depend on the authorities' ability to convert the stability of personal expectations into positive assessments at the regional and federal levels. The key risk is the deepening of the gap between "life here and now" and "the country's prospects".

An unfavorable environment and dissatisfaction with objective living conditions in a territory constitute one of the factors that determine the population's migration attitudes. According to a VCIOM survey conducted in early 2026, nearly 19% of Russian residents plan to leave their locality[41].

The findings of our own surveys yield similar results. Thus, 14% of the region's residents plan to move permanently to another locality within the next 3–5 years; at the same time, the share of those who found it difficult to answer is high (across the region as a whole, around 23% of respondents were unsure, *Tab. 9*), which also testifies to the instability of their migration attitudes and their sensitivity to changes in the economy, social policy, and quality of life.

More entrenched migration attitudes are characteristic of residents of large cities, whose population plans to move outside the region, whereas residents of municipal okrugs plan to move to another (larger) locality within the region.

Official statistics also testify to the predominance of this vector of migration. Furthermore, whereas in 2010 the region's cities registered a net migration gain (the coefficient was 3.7 per mille), this subsequently turned into a net loss (-0.5 per mille in 2023); in rural areas, the rate of net migration loss over the same period fell from 9.5 to 1.3 per mille owing to a change in the population structure toward older age cohorts characterized by low migration activity[42].

This ***attests to the reproduction of centripetal population migration trends, which in the long term represents a risk for the reproduction not only of the rural periphery but also of the region's major cities.***

The greatest migration potential is observed among young people under 30 (20.1% of those surveyed plan to leave, and 28.1% were undecided, i.e., altogether nearly half), residents with higher education (17.9% plan departure and 24.2% were undecided, i.e., do not rule out the possibility of moving), and high-income population groups

Table 9. Distribution of answers to the question "Do you plan to move permanently to another locality within the next 3–5 years?", % of respondents

Response	Vologda	Cherepovets	Municipal okrugs*	Region overall
No	51.7	63.4	70.6	63.4
Yes, including:	**17.4**	**13.8**	**12.1**	**14.1**
to another urban locality in the Vologda Region	3.3	1.5	4.8	3.5
outside the Vologda Region	8.6	5.8	3.2	5.4
to another rural locality in the Vologda Region	1.9	3.5	3.1	2.9
outside the country	3.6	3.0	1.0	2.3
Difficult to answer	30.9	22.8	17.3	22.5

* Sorted in descending order of assessments by residents of municipal okrugs.
Source: VoIRC RAS public opinion monitoring data.

[41] Will there be a garden city here?! VCIOM. February 18, 2026. Available at: https://wciom.ru/analytical-reviews/analiticheskii-obzor/zdes-budet-gorod-sad

[42] Urban and Municipal Okrugs (Districts) of the Vologda Region. Socio-Economic Indicators. 2024: Statistical Collection. Vologdastat. Vologda, 2025. 275 p.

(16.3% and 24.7%, respectively), which leads to a decline in the region's human potential (Tab. 10).

The foregoing makes it imperative to fundamentally revise the priorities of state policy and to seek internal sources of development for local territories, including by enhancing the financial and economic autonomy of the institution of local self-government.

It is necessary to begin by searching for an idea that could unite Russian society – the population, the authorities, and business. Notably, according to VolRC RAS research, the value consensus in Russian society is forming around "statist" and patriotic ideas rather than around liberal-individualist or pro-Western orientations. Thus, the view that the key idea capable of uniting Russian society today is "the unity of the peoples of Russia with the aim of its rebirth as a great power" was expressed by nearly half of all respondents (48.2%), which is 26 p.p. higher than in 2002. Moreover, intergenerational continuity can be observed: growth in support for this idea is recorded in all age groups, including young people under 30.

However, to put this into practice, what is required is the "nationalization" of the ruling elites, whose guiding principle should be the implementation of a sovereign state policy within the framework of a new social contract in the context of economic, military, and socio-cultural confrontation with the countries of the collective West. As Russia's historical experience demonstrates, this would make it possible to ensure the internal consolidation of the authorities and society in the face of emerging challenges.

Table 10. Socio-demographic profile of respondents who answered the question "Do you plan to move permanently to another locality within the next 3–5 years?", %

Indicator	Yes, outside the Vologda Region	Yes, to another urban locality in the Vologda Region	Yes, to another rural locality in the Vologda Region	Yes, outside the country	No	Difficult to answer
Gender						
Male	6.8	3.3	3.6	2.4	61.0	23.0
Female	4.3	3.7	2.3	2.2	65.3	22.2
Age						
Under 30	**9.5**	**4.8**	**1.0**	**4.8**	51.9	**28.1**
30–55	5.5	4.5	3.3	2.6	56.1	28.0
Over 55	3.8	1.9	3.1	1.0	76.3	14.0
Education						
Secondary and incomplete secondary	5.1	4.1	3.5	1.0	67.1	19.1
Secondary vocational	3.1	3.6	2.7	1.6	64.7	24.2
Higher and incomplete higher	**8.5**	**2.6**	**2.4**	**4.4**	58.0	**24.2**
Income groups						
Bottom 20%	5.5	4.4	4.1	1.8	53.1	31.0
Middle 60%	3.9	3.8	3.3	1.8	69.9	17.2
Top 20%	**8.5**	**3.0**	**1.8**	**3.0**	59.0	**24.7**
Source: VolRC RAS public opinion monitoring data.						

At the same time, the liberal reforms of the 1990s and the "capitalism for the few" that was built as a result, together with high levels of corruption at all echelons of power, currently constitute the key constraint on transforming the governance system and effectively implementing a sovereign state policy.

"In terms of its scale and the depth of its impact on the life of Russian society, the **opportunistic behavior of the Russian bureaucracy exerts a particularly strong influence. Certain of its representatives ignore the tasks of reform or carry them out with an orientation toward their own group interests. This manifests itself in the plundering of the state budget and corruption**"[43].

"**The elite today lacks patriotic feeling toward Russia; it is material values that come to the fore.** Therefore, it is still too early to speak of the 'nationalization of the elite'"[44].

The scale of the problem is vividly illustrated by the following facts. In 2025, over 43,000 corruption-related crimes were registered (more than one-third of them were committed on a large or especially large scale and as part of organized groups); the number of such cases involving officials in law enforcement agencies, the military-industrial complex, and the judicial system is growing. According to the Prosecutor General's Office, in 2025 a total of 1.6 trillion rubles worth of real estate and other assets were returned to the state treasury[45] (for reference: this is almost 0.8% of the country's GDP and 28% of the total federal budget deficit for 2025).

Furthermore, as noted in the latest report by Minchenko Consulting[46], it is precisely the *inertial scenario* in domestic politics that the hostile surroundings and the risks of a military confrontation with NATO currently render the most readily understandable for the elite, while the stability of the bureaucratic system comes to the fore as the key parameter. All of this could freeze the transformations taking place within the elites and represents a risk to the implementation of a nationally oriented policy.

"The negative external environment remains a serious constraint on domestic political dynamics in Russia. The hostile surroundings and the risks of a military clash with NATO make an inertial scenario in domestic politics the most readily understandable one for the elite, with system stability coming to the fore as the key parameter".

"The key changes in the elite structure are linked to a partial rotation within the legal and security bloc, which is not yet complete, as well as to large-scale purges of the regional and federal bureaucracy..."[47]

Addressing this task presupposes the need to instill in the elites a patriotic identity, to give priority to national interests over personal or transnational ones, and to transform them into genuine bearers of the national idea.

[43] Vlasov F. (2019). The costs of opportunistic behavior of social groups. Society and Economy, 6, 42.

[44] Vlasova O. (2020). Why is there no genuine national elite in Russia? Available at: https://portal-kultura.ru/articles/opinions/329841-pochemu-v-rossii-net-nastoyashchey-natsionalnoy-elity/

[45] Report of the Prosecutor General of the Russian Federation A. Gutsan in the Federation Council (April 15, 2026). Available at: https://epp.genproc.gov.ru/ru/gprf/mass-media/news/main/e8463315/

[46] Politburo 2.0. A Besieged Fortress. Minchenko Consulting, November 2025. 29 p.

[47] Ibidem.

An important role in this process belongs to patriotic socialization and to giving priority in public-service promotion (the "social elevator") to individuals who demonstrate a commitment to national interests[48].

> "...the problem of the nationalization of the elites cannot be solved through organizational and legal instruments of coercion. A systemic, strategically well-calibrated solution to the problem is required – i.e., a solution that would shape conditions that would guarantee protection for society, the state, the authorities, and the elites from political and value diffusion"[49].

It is worth noting that on March 1, 2024, on the initiative of the President of the Russian Federation Vladimir Putin, the federal personnel program "Time of Heroes" was launched; in our view, this program has an important role to play in this process. The program is aimed at training highly qualified managers from among participants in the special military operation for work in state and municipal government bodies and state-owned companies[50]. Over two intakes, 168 people have undergone training[51], and more than 80 participants have received appointments[52]. In December 2024, Vladimir Putin issued instructions to expand the "Time of Heroes" program to the regions[53].

It seems appropriate to scale up this project to other spheres of public life – i.e., to systematically "cultivate" a new elite that is prepared, not only in word but also in deed, to implement the sovereign development path of the country in the context of contemporary geopolitical transformations.

Alongside this, a fundamental *shift in the country's economic development model* is required. Among the key strategic priorities of the new development model should be the growth of labor productivity, the development of the domestic market, and the production of goods with high added value. It was precisely the need to address these strategic tasks and to ensure sustainable economic growth that Vladimir Putin drew attention to at a meeting on economic issues with the Government and the Central Bank of the Russian Federation held on April 15, 2026.

> "I believe that we must constantly direct our efforts toward preparing concrete measures to stimulate growth and toward elaborating adequate decisions to overcome the generally expected tendencies that have manifested themselves in recent times.
>
> And, of course, as has already been said, I expect proposals for additional measures aimed at restarting the growth of the domestic economy, at supporting business initiatives, and at improving the structure of employment in favor of sectors with more effective jobs and high value added"[54].

[48] Rastorguev S.V. (2019). "Nationalization of the Russian elite" as a political project. Humanities and Social Sciences. Bulletin of the Financial University, 4, 6–12. DOI: 10.26794/2226-7867-2019-9-4-6-12

[49] Okhotsky E.V., Grigoryan D.K. (2020). The nationalization of elites: Objective necessity, political-legal substantiation, prospects. Communicology, 8(3), 109–124.

[50] Time of Heroes. Available at: https://xn--b1aachba0csne6n.xn--p1ai/

[51] Time of Heroes: Results of the year. Available at: https://www.ranepa.ru/news/vremya-geroev-itogi-goda/?utm_source=chat.qwen.ai&utm_medium=referral&utm_campaign=chat.qwen.ai&utm_referrer=chat.qwen.ai

[52] A true elite: Results of two years of implementing the "Time of Heroes" program. Available at: https://www.gazeta.ru/social/2026/03/01/22570351.shtml

[53] The reserve of the people's supreme command. Available at: https://www.kommersant.ru/doc/7563609

[54] Speech by V. Putin at the meeting on economic issues on April 15, 2026. Available at: http://www.kremlin.ru/events/president/news/79558

A similar position was expressed by the country's leading experts (S. Glazyev, R. Nigmatullin, O. Dmitrieva, K. Babkin, O. Sukharev) in their speeches at the Tenth Moscow Economic Forum (MEF-2026), held in early April 2026. Without concealing the scale of the existing problems in the country's economy, they put forward proposals for revising monetary and fiscal policy, since the high key interest rate has undermined economic growth, while tax increases (including VAT) and the pressure on small businesses have stoked inflation. In their view, it is necessary to shift the fiscal burden from production to consumption. Furthermore, the country needs a new industrialization, support for productive business, and sensible protectionism. To this end, it seems advisable to develop an institution of targeted investment lending at 2–4%, as is now actively applied in China and the West, in order to enable the economy's transition to a new technological paradigm[55]. This, in turn, makes it more urgent to ensure balanced spatial development across the country.

To summarize certain outcomes, it should be noted that for countries with large territorial expanses, the problem of spatial development is a determining factor in the context of ensuring national security. At the same time, the liberal approach to regulating these processes, which has been actively applied in Russia over recent decades, has led to an exacerbation of negative trends – above all, the degradation of the potential of peripheral territories and the locational compression of the country's developed socio-economic space.

Konstantin Babkin, President of the Rosspetsmash Association:

"We are gathering in an unusual situation. We need to develop cities, villages, build roads, work, and invest. Yet at the same time we are seeing a cooling of the economy. Factories are switching to a three-day working week, farmers are refusing to sow – there is apathy in many sectors of the economy and spheres of human activity"[56].

Sergey Glazyev, State Secretary of the Union State of Russia and Belarus:

"...those sectors of the economy that are engaged with state or external demand continue to grow actively... Sectors that are dependent on credit, on the other hand, are forced to cut production because interest rates do not allow loans to be recouped"[57].

Robert Nigmatullin, Academician of the Russian Academy of Sciences:

"Taxes should be taken not from production but from super-incomes. The country is heading toward a double-digit economic decline. We are late, colleagues, and the world is not waiting"[58].

It is worth noting, however, that a certain positive turn in state policy, in our view, has now taken place. In particular, in implementing the Strategy for the Spatial Development of Russia to 2030 (with a forecast horizon to 2036), the state program on the "Integrated Development of Rural Areas", and a number of other regulatory instruments, significant efforts and budgetary resources are expected to be directed – alongside the development of

[55] Materials of the Tenth Moscow Economic Forum (MEF-2026). Available at: https://me-forum.ru/media/smi/

[56] At MEF-2026, they called for urgently starting to repair the Russian economy. Available at: https://www.kp.ru/daily/27773/5235443/

[57] The economy can no longer be cooled. At MEF-2026, they called for a definitive break with liberal dogmas in favor of development. Available at: https://tsargrad.tv/news/ohlazhdat-jekonomiku-bolshe-nelzja-na-mjef-2026-prizvali-okonchatelno-porvat-s-liberalnymi-dogmami-v-polzu-razvitija_1639284?spm=a2ty_o01.29997173.0.0.14db55fb8O9kyX

[58] At MEF-2026, they called for urgently starting to repair the Russian economy. Available at: https://www.kp.ru/daily/27773/5235443/

urban agglomerations – toward modernizing the economy and infrastructure of small and medium-sized towns and rural settlements. It is precisely this that will make it possible to create a solid economic foundation for the modernization of their local economies and a comfortable living environment for the population of these territories.

In this context, in our view, the implementation of the following set of measures could also become a promising instrument of state policy, one that would unlock the potential of deep-lying territories and create conditions for the development of the country's domestic market:

a) the formation of a hierarchically polycentric organization of the socio-economic space of Russia's regions, based on ensuring the co-development of urban agglomerations of various scales and of other key settlements;

b) the modernization of traditional industries and the creation of new-economy sectors in small and medium-sized towns as key settlements; what appears strategically important here is, on the one hand, to establish their close production cooperation with agglomerations in implementing major national-economic projects, and, on the other, to promote their development as organizational-economic, production, and cultural-educational centers for rural areas;

c) the revival – including on an innovative basis – of socio-economic ties along the "urban–rural" axis[59].

The principal condition for their effective practical implementation, however, is the loyalty of the national elites to the country's sovereign development path, since after 2022 Russia has entered a new phase that requires the consolidation of all forces and the enhancement of the effectiveness of public administration – above all, in terms of ensuring national security against the backdrop of the threats facing the country. These circumstances make it imperative to organize a system for monitoring the ongoing spatial transformations and the development of territorial communities at all hierarchical levels (federal, regional, and municipal).

Putting these priorities into practice will contribute to increasing the effectiveness of strategic state governance, which will enable the President to continue implementing the course of national development, guided by "the country's interests for centuries to come..."[60].

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[60] Speech by V. Putin at the Plenary Session of the Sixth International Arctic Forum "The Arctic – Territory of Dialogue" on March 27, 2025. Available at: http://www.kremlin.ru/events/president/transcripts/copy/76554

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The Global Knowledge Market: Features, Evolution

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Abstract. The early twenty-first century witnessed the emergence of new phenomena, among them an unprecedented intensification of formalization and regulation within scientific activity. To explain this development, the article introduces several useful concepts: knowledge as an ordered set of original ideas, models, and theories, their justifications and proofs, along with statistical and historical illustrations; and the knowledge market as the process of coupling the segments of knowledge supply (production) and demand (needs), as well as the acts of their purchase and sale at a given price. To deepen understanding of the global knowledge market's evolution, a three-sector model is proposed, comprising a knowledge core (fundamental, scientific knowledge), a periphery (auxiliary or secondary knowledge), and pseudo- or anti-knowledge (outdated, rejected, and erroneous knowledge). This structural model of the knowledge market enables a more focused examination of three global trends and their resulting phenomena: the first (the Great Castling) consists of the accelerated accumulation of knowledge to the point of transitioning from scarcity to surplus in the market; the second (the Great Inversion) entails the rising cost of knowledge production concurrent with a decline in its returns, such that the marginal cost of producing knowledge exceeds its marginal utility; and the third (the Great Erosion) signifies an increasing share of anti- and pseudo-knowledge within the total stock of knowledge. This corresponds to the development of crisis phenomena such as glut, unprofitability, and widespread defective output. It is precisely this crisis-ridden state of the market that has driven the evolutionary shift from the "knight of science" model (service model), in which past researchers were ready to make great sacrifices in the name of science, to the "bureaucrat and imitator" model (business model), in which today's researchers largely adapt to the

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bureaucratic demands of their organizations and skillfully simulate scientific activity. Overcoming the current crisis may be possible through "unloading" the market by "writing off" outdated and irrelevant cognitive products, which entails a transition from an additive paradigm of knowledge acquisition to a subtractive one.

Key words: knowledge, knowledge market, scientific activity, evolution, service model, business model, global crisis.

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Introduction: the rise of template science

The early 21st century has witnessed the emergence of new phenomena whose influence is becoming increasingly palpable. Moreover, the key megatrends of recent decades possess an internal logic and close interconnections that are not always obvious to the outside observer. In particular, the scientific sphere has undergone a widespread transformation toward greater formalization and regulation against a backdrop of declining substantive productivity. We are effectively witnessing the rise of formatted science, where all scientific products are calibrated in form and content according to a specific template, deviation from which is either impermissible or undesirable. In parallel, there has been a catastrophic drop in demand for research, innovation, and fundamental discoveries due to their low applied returns, while the adequate assessment of researchers' competencies has become more complex and increasingly gravitates toward formal metrics. This situation is provoking a protracted organizational crisis at all levels of the scientific system: universities, laboratories, and institutes. Despite awareness of the need for a global reform of the scientific and educational complex, efforts undertaken thus far remain fruitless. This is largely due to the absence of a systemic understanding of the ongoing changes from a unified methodological standpoint. The aim of the work is to propose a systemic perspective and establish a unified analytical foundation for understanding the nature of the crisis that has emerged in the knowledge market in general and within the scientific sphere in particular.

At the core of this new perspective lies the concept of the knowledge market, for its structure and evolution over the past half-century illuminate the essence of the problems confronting humanity. Simultaneously, understanding the specific features of the contemporary knowledge market makes it possible to outline the reforms necessary to overcome current difficulties – hence the rationale for the proposed approach. The novelty of the author's approach lies in analytically linking elements of the knowledge market with established megatrends in science, economics, and politics.

The knowledge market: concept and structure

To grasp the challenges now facing the university and research sectors, it helps to look at the knowledge market, its structure, and its dynamics. Let us first define the concept of the knowledge market.

Broadly defined, the knowledge market encompasses the segments of knowledge extraction, creation, dissemination, and use, all operating as an integrated whole; at every stage and in every segment, knowledge is paid for (Antonets, 2018). Typically, the knowledge market also includes all relationships among its participants concerning the creation, exchange, and use of knowledge (Salikhov, Salikhova, 2015). In a simpler and more convenient

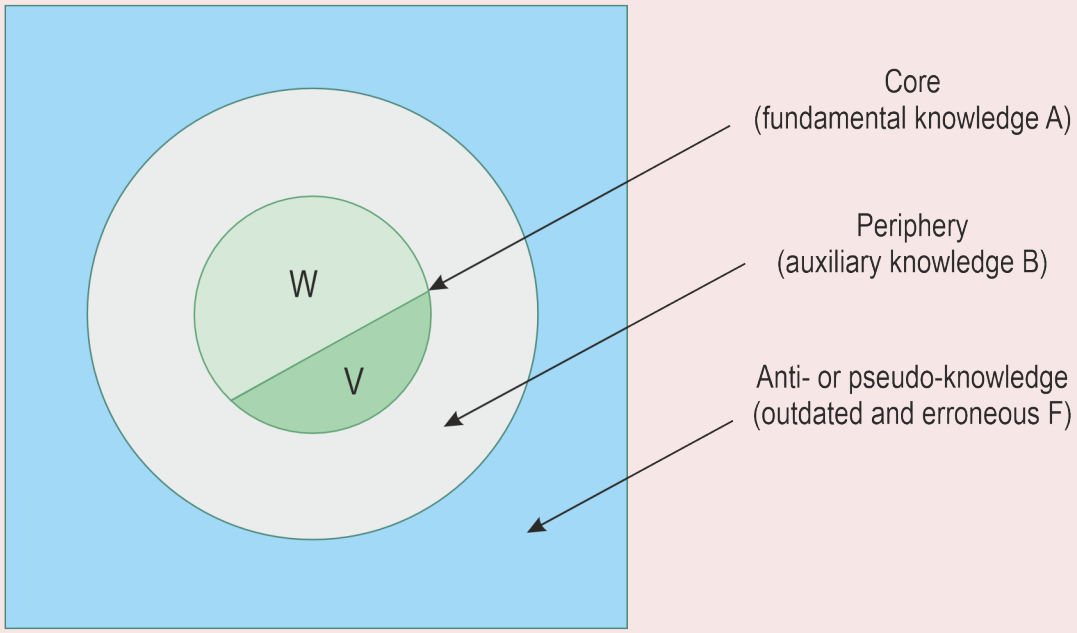
formulation, one can speak of the segments of knowledge supply (production) and demand (needs), along with the acts of buying and selling knowledge at a given price.

If we wish to refine the concept, several points should be kept in mind. First, the knowledge market is by no means equivalent to the information market. Thus, here and further in the text, knowledge is understood as an ordered set of original ideas, models, and theories, together with their justifications, proofs, and the statistical data and historical examples that illustrate them. This applies to all types of knowledge – natural, technical, social, and humanistic. Knowledge is thus not abstract bits of information but concrete cognitive constructs resting on a solid logical and empirical foundation. For example, news items as such do not belong to the knowledge market, but media publications that explain (order and connect) various phenomena are full-fledged elements of it. Second, the supply of knowledge on this market consists of all cognitive products that meet the above criterion. Correspondingly, the demand for knowledge represents the totality of explicit requests from various economic agents for specialized and general knowledge.

Note that the discussion here concerns the global knowledge market – a planetary phenomenon. This does not, however, preclude the analysis of its individual regional or sectoral segments.

The knowledge market is clearly heterogeneous. For our purposes, however, a three-sector model will suffice (*Fig. 1*). This model consists of a knowledge core (fundamental knowledge – A), made up of scientific facts and products (articles, reports, patents, monographs, etc.); a periphery (auxiliary or secondary knowledge – B), which takes the form of journalism, popular publications, some fiction, and media articles; and pseudo- or anti-knowledge (F), presented in the same forms as the previous segments. Pseudo- or anti-knowledge refers to

Figure 1. Structure of the knowledge market



Source: own compilation.

outdated or erroneous knowledge that is formally indistinguishable from genuine knowledge. These are, as a rule, alternative interpretations of events and phenomena whose justifications and proofs are either incorrect or falsified. Anti-knowledge can appear in many guises – from tendentious media articles to fabricated expert opinions, statistical data, and official government statements and documents (Kirdina-Chandler, 2017). It may arise from deliberate deception or unintentional error; the source of distortion varies, but the result is the same.

Anti-knowledge is often built on fakes, and the market for fakes has become a distinct phenomenon over the past decade. Today one can legitimately speak of a fake industry as a real sector of the economy (Stepanova, Manokhina, 2019). At the same time, anti-knowledge should not be confused with mismatches among elements of the knowledge market that stem from supply–demand divergences caused by cognitive distortions in participants' expectations (Antonets, 2018). For instance, it has been shown that in the Novosibirsk Region, students' preferences regarding fields of study remain stable, leading to a mismatch between enterprises' workforce needs and the structure of labor supply (Anofrikov et al., 2018). This illustrates a straightforward imbalance in how the knowledge dissemination and use segments function. Such discrepancies can themselves feed the anti-knowledge segment while simultaneously being generated by it.

A reasonable question arises: is it legitimate to treat the segment of pseudo- and anti-knowledge as a full-fledged element of the knowledge market?

In our view, the answer should be yes, since anti- and pseudo-knowledge (negative knowledge) are direct extensions of the knowledge core and periphery (positive knowledge). In effect, knowledge and anti-knowledge fuse into a single cognitive mass in which neither exists without the other, which is why they must be considered together. Moreover, at certain moments, elements of the core can migrate into the category of anti-knowledge, and vice versa. This structure of the knowledge market will serve as one of its defining features and will help explain certain cognitive and economic megatrends.

Despite its apparent simplicity, the concept of the knowledge market calls for a few clarifications. For instance, knowledge is not equivalent to "absorbed" information, because knowledge may be unclaimed and ignored yet remain knowledge – indicating simply a lack of demand for it. Nor is knowledge confined to scientific knowledge; there is today an enormous body of everyday knowledge (e.g., video tutorials on how to make repairs, build things, exercise, etc.; such clips usually explain why something should be done a certain way and not otherwise). An isolated fact (even a scientific one) that is not integrated into existing worldviews does not constitute knowledge; such cases are rare in science. Likewise, a scientific result consisting of an established fact together with an explanation of its significance for the phenomena under study is knowledge. It is especially important to note that the scientific sector and the broader scientific sphere rest on the market for scientific knowledge but are not reducible to it, as they involve institutional, material, and human resource provisions that lie beyond the scope of the knowledge market concept.

Notwithstanding the apparent triviality of the three-sector model of the knowledge market, it provides a highly convenient starting point for examining long-term global trends in science and the economy.

Additional features of the knowledge market

The three-sector model of the knowledge market can be further refined by dividing the knowledge core into two elements: active (applied) knowledge (V) and passive (fundamental) knowledge (W). *Active knowledge* constitutes a tiny fraction of all scientific knowledge that is actually used in the economy, whereas *passive knowledge* comprises all remaining knowledge required for the reproduction

of scientific knowledge. The chief property of passive knowledge is its continual accumulation – indeed, far more rapidly than its active counterpart. This is only natural, since active knowledge is drawn from passive knowledge, and the passive portion never disappears but only grows. For example, if a particular mathematical model from economic theory is adopted in state regulation practice, the model itself remains preserved in the "archive" of the knowledge market.

The latter property captures the fact that passive knowledge expands faster than active knowledge, yet accumulation characterizes all knowledge. If A denotes the volume of core (scientific) knowledge, V the volume of active (practically used) knowledge, and W the volume of passive (self-sustaining) knowledge, then over time (t) the share of passive knowledge ($k = V / W$) should increase against the backdrop of an expanding total core volume: $dk / dt > 0$; $dA / dt > 0$; $A = V + W$. An analogy is helpful here: W and V play the roles of *fixed* and *variable* production costs, respectively. Consequently, even if the increment of active (applied) knowledge nullifies at certain stages, passive knowledge must not only continue to exist but also grow. For instance, if astrophysics yields no applied results for some period, research in its domain must nonetheless continue (otherwise the entire scientific field would begin to degrade). The outcome is a gradual increase in the share k, which is tantamount to a diminution of the efficacy of knowledge as such.

Another property of knowledge stems from the fact that, by its nature, it belongs to the category of informational cumulative processes, and the indicators that express it pertain to variables of stock rather than flow (Taranukha, 2023). In this sense, knowledge resembles capital, which tends toward unlimited accumulation. Indeed, knowledge in written form – characteristic of modern civilization – is rarely completely destroyed; as a result, it is preserved in one way or another and adds to humanity's total fund of knowledge. For example, the philosophical treatises of Plato and Aristotle, the scientific works of I. Newton and G. Leibniz, and the novels of L.N. Tolstoy and F.M. Dostoevsky remain assets in the accumulated intellectual baggage of contemporary people. Unlike knowledge, ordinary goods, resources, and services are effectively "liquidated" in the process of consumption; even durable goods (buildings, structures, etc.) have a life cycle after which they are demolished or completely renewed (rebuilt). The processes of devaluation and obsolescence of knowledge do not negate the overarching trend toward its accumulation. The consequence is an excessive expansion of the knowledge market, accompanied by a diminished capacity of society to actively assimilate acquired cognitive achievements. A clear manifestation of this property is the growing importance of the knowledge market for the modern economy and the formation of the so-called knowledge society (Coughlan et al., 2010).

A third feature of the knowledge market is that, for a significant portion of it, the producer and the consumer coincide. For instance, scientific articles and monographs are not final products in the usual sense; rather, they act as a kind of semi-finished good that is subsequently studied and "processed" by researchers themselves. For scientific knowledge to be consumed by agents of the market economy, it must undergo additional – and typically substantial – refinement. This characteristic hinders the knowledge market from receiving clear signals from participants in the real economy, which in turn leads to the "production" of a large mass of dubious knowledge that cannot be demanded by the market and turns into a "thing in itself" – an unclaimed intrinsic value. Scientific phantoms thus emerge, awaiting a verdict of time on their ultimate status: alive or dead.

Thus, the very nature of knowledge provokes the endless expansion of its volume, with an accelerated accumulation of its passive component.

The first megatrend and the Great Castling in the knowledge market

The first megatrend characteristic of the knowledge market is the accelerated accumulation of knowledge, culminating in a qualitative castling of market conditions – from scarcity to surplus. Let us unpack this thesis in greater detail.

At any given moment, any market can be characterized by the relative state of demand (D) and supply (S). When demand exceeds supply (D > S), scarcity prevails; in the opposite case (S > D), a surplus is observed; occasionally, market equilibrium (S = D) is reached. This dichotomy in market states carries enormous functional significance. To illustrate, recall that the economy of the USSR and other socialist countries was built on the principle of scarcity: on most goods and services markets, demand outstripped supply because prices were kept below their equilibrium levels to ensure affordability. In Western countries, by contrast, markets were typically glutted as supply exceeded demand, since prices were set above equilibrium. Thus, the difference between socialism and capitalism lay not only – and not so much – in different forms of ownership of the means of production, as Marx's theory maintained, but in the differing states of their markets. It was precisely this divergence in market conditions that underpinned J. Kornai's concept of the "economics of shortage" (Kornai, 1990), which became a methodological foundation for studying phenomena specific to different economic systems (Koryakovtsev, 2023). A pinnacle of such research is M. Weitzman's theoretical model of the shortage syndrome, which examined manifestations such as queues and inventories (Weitzman, 1990).

The foregoing underscores just how different economic systems can be when their markets operate under different conditions. As for the knowledge market, its condition changed radically over the course of the 20th century, and this change predetermines one of the essential features of contemporary society. The cause of this castling was the long-term trend of knowledge accumulation, known in the literature as the exponential model or D. Price's law: empirically, the number of researchers and the number of scientific publications doubles approximately every 10–15 years (Price, 1963). Price himself believed that at a certain stage this growth would stabilize and transition from exponential to logistic (Price, 1963). Later studies revealed considerable diversity in models of scientific growth and the absence of a single uniform pattern (Fernández-Cano et al., 2004). Yet verification of Price's law continues. For example, the most recent econometric calculations based on article counts from four databases – Dimensions (1670–2018), Microsoft Academic (1805–2018), Web of Science (1905–2018), and Scopus (1866–2018) – show that the average annual growth rate of scientific output is 4.02%, with a doubling time of 16.8 years (Bornmann et al., 2021). Thus, the exponential growth of scientific knowledge persists.

Continuing this line of inquiry, let us consider another specific but telling example: the market for Russian economics journals. On April 11, 2019, the Russian Science Citation Index (RSCI) on the eLIBRARY.RU platform listed 1,281 such journals (Balatsky, Ekimova, 2019, p. 127), whereas by December 16, 2025, the number had risen to 1,859. Over roughly 6.5 years, the number of these journals grew by nearly half. Simple calculations show that the average annual growth rate in the number of Russian economics journals is 5.98%, and a doubling relative to 2019 will occur in about 12 years – i.e., by 2031. This offers yet another confirmation of the continued operation of Derek Price's exponential rule. Naturally, some segments of the knowledge market grow faster than this "normative" rate, others slightly slower, but the essence of the problem remains unchanged.

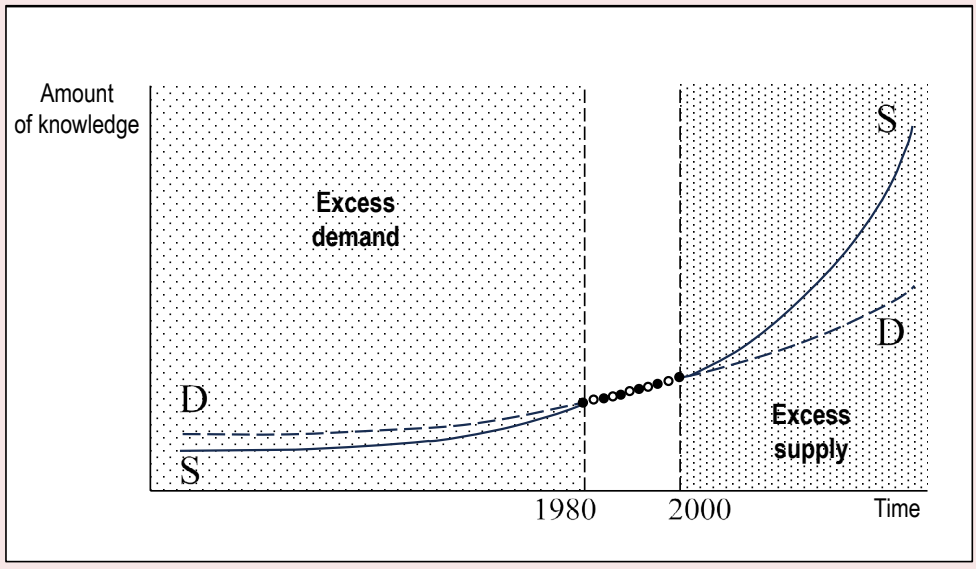
It is precisely the operation of Price's law, immanent to the information sphere, that has led to the overaccumulation of products in the

knowledge market. A survey of Russian experts conducted by the author in 2025[1] revealed an almost complete consensus – not only regarding the very fact that a knowledge surplus has emerged, but also concerning the time period when this market reversal took place: the 1980–2000 interval. The experts believe that over the last two decades of the 20th century, the previously prevailing scarcity of knowledge was definitively replaced by a surplus (*Fig. 2*). In subsequent years, and especially in the 21st century, the surplus has grown rapidly. Here and below, we shall refer to the phenomenon of the transition from knowledge scarcity to surplus as the *Great Castling*. This term underscores the civilizational significance of the event, for it launched a qualitatively new phase of economic growth and development for the global system.

It should be noted that the idea of periodically emerging *theoretical bubbles*, where the demand for scientific knowledge falls short of its supply, has been voiced before (Balatsky, 2009). In earlier centuries, however, such phenomena were local and temporary, whereas today the Great Castling has become global and persistent. Its foundation lies in information technologies, which have rendered knowledge accessible to a degree unimaginable in previous eras.

Beyond the scientific core, the knowledge market includes peripheral knowledge, which has also expanded enormously in recent decades. According to available estimates, the modern individual receives and processes as much information in a month as a person in the 17th century did in an entire lifetime; the total volume

Figure 2. The Great Castling in the knowledge market



Source: own compilation.

[1] The survey covered a non-representative random sample of 40 individuals from several professional groups of researchers holding Candidate or Doctor of Science degrees in the following fields: physics (4 persons), mathematics (4), engineering sciences (10), economics (15), sociology (4), political science (3). Regional distribution of respondents: Moscow (28 persons), Saint Petersburg (6), Yekaterinburg (3), Rostov-on-Don (3). The experts' ages ranged widely, from 46 to 93 years. The survey was conducted in 2025 in Moscow.

of data on the planet doubles every two years – five to eight times faster than scientific knowledge. Moreover, according to estimates by the International Data Corporation (IDC), useful information accounts for only 35% of the total mass[2]. Thus, the segment of anti- and pseudo-knowledge is also expanding at an accelerated pace.

These figures speak for themselves: today, no single individual can possibly encompass the accumulated knowledge even within a narrow field. For example, the 1,859 Russian economics journals currently in existence lie beyond any human's physical capacity – not only is it impossible to track their content, but the sheer number exceeds all reasonable bounds. To this mass must be added foreign periodicals and monographs, whose volume is even more staggering. No search engine can solve the substantive problems, for constructive knowledge is unevenly distributed across the vast body of scholarly literature, and locating it has become exceedingly difficult.

The fundamental impossibility of covering contemporary knowledge is most vividly illustrated by the relatively new literary genre of the scientific bestseller – books that address major scientific problems from a systemic perspective, grounded in original authorial ideas and supported by robust empirical evidence and historical illustrations. In Russia, the most notable foreign scientific bestsellers are systematically translated and published. Yet experience shows that this effort does not lead to broad acquaintance with the knowledge on offer; the overwhelming majority of domestic researchers simply bypass these books. The most striking example is Thomas Piketty's sensational Capital in the Twenty-First Century (Piketty, 2016), which generated an enormous resonance worldwide. Suffice it to recall that a year after the book's French publication, the journal Real-World Economics Review devoted a special issue to discussing its theses. One of the world's most authoritative economics journals, the Journal of Political Economy, also joined the ensuing debate. The discussion took on a truly international character, engaging representatives from nearly every country. Against this backdrop, however, Russia experienced near-total intellectual silence: a few straightforward translations, the simplest reviews of foreign commentary, and a couple of extended critiques exhaust the treatment of Piketty's themes (Balatsky, 2017; Lapin et al., 2020). A survey of Russian economists and political scientists conducted by the author regarding their familiarity with Piketty's famous bestseller revealed that the vast majority of respondents were aware of the book, but not one of them had read it in full[3]. By way of justification, all respondents cited the colossal volume of the work and its overload with numerical material. Thus, even the most significant scientific events in the contemporary world often pass by the broader scholarly community unnoticed.

Anticipating the argument that such "deafness" on the part of the scientific community is not critical for science itself, let us offer another example: the three scientific bestsellers by Daron Acemoglu, James Robinson, and Simon Johnson (Acemoglu, Robinson, 2015; Acemoglu, Robinson, 2021; Acemoglu, Johnson, 2024). The situation with these books in Russia is only marginally better than with Piketty's monograph: the number of specialists who have carefully studied all three works can be counted on the fingers of one hand. This state of affairs is hard to justify, given that these three authors received the Nobel Prize in Economics in 2024 for their body of work. Moreover, their

[2] See: Postolatii V. Expert: The volume of information in the world will double every two years. Rossiiskaya gazeta, May 13, 2013. Available at: https://rg.ru/2013/05/14/infa-site.html

[3] Over the period 2021–2025, the author surveyed 100 Russian economists (80) and political scientists (20) regarding their familiarity with Piketty's famous bestseller. Regional distribution of respondents: Moscow (91 persons), Saint Petersburg (3), Yekaterinburg (3), Rostov-on-Don (3). Experts' ages ranged from 32 to 87 years. The survey was conducted in Moscow.

three monographs have been subjected to careful analysis to identify the methods they used to achieve popularity within both the scientific community and the broader public (Maltsev, Shastitko, 2025). Nonetheless, the limitations of time and energy erect an insurmountable barrier to absorbing new knowledge. The number of even the most significant scientific bestsellers in the world is such that a contemporary researcher can get acquainted with them only selectively, thereby narrowing his or her overall worldview.

The Great Castling we have examined set in motion a range of new phenomena, among which we shall briefly note just three.

First, fundamental difficulties in the consumption of knowledge have arisen: it is impossible to cover all necessary knowledge due to the physical shortage of time and energy on the part of individuals; obtaining even the most essential and important information requires an inordinate amount of time. In other words, the new realities have imposed heightened demands on the cognitive abilities and skills of modern people – demands that cannot be met because of the biological and physiological limits of the human organism. On a planetary scale, the population is simply physically incapable of effectively "consuming" the accumulated knowledge.

Second, fundamental difficulties in the transfer of knowledge to other markets have emerged: it is hard to know what to do with the available knowledge; a large volume of general and highly specialized knowledge cannot be demanded by the market at all. One might say that the economy has not produced a sector whose capacity would be sufficient to absorb the full diversity of contemporary knowledge.

Third, new requirements have arisen for traditional activities (research, teaching, etc.) that negate old and well-established institutions (lectures, dissertations, articles, universities, institutes, libraries, etc.). The new digital realities have devalued the old organizational forms of working with knowledge, as well as the professions and activities associated with them.

Thus, the phenomenon of the Great Castling has generated new and highly significant challenges to which society has yet to find answers.

The second megatrend and the Great Inversion in the knowledge market

The second megatrend characteristic of the knowledge market is the gradual rise in the cost of producing knowledge, coupled with a simultaneous decline in its marginal utility. This trend eventually triggers a qualitative shift in the cost–benefit balance: the marginal cost of producing knowledge comes to exceed its marginal utility. Let us examine this thesis more closely.

According to elementary economic logic, producing knowledge is justified only as long as $dC / dA < dU / dA$, where A is the volume of scientific knowledge, C is the cost of producing it, and U is its utility. Put simply, the marginal utility of the knowledge produced must outweigh the marginal cost of producing it. Over at least the last hundred years, however, rising prosperity has driven up both the cost of researchers' labor and the cost of research itself, while the returns to scientific work have steadily diminished. Consequently, another landmark transition has quietly occurred in the knowledge market: from the condition of full cost recovery ($dC / dA < dU / dA$) to the violation of this condition ($dC / dA > dU / dA$). For convenience, we shall call this shift the *Great Inversion* – a transition that has produced a profound cost–value imbalance in the sphere of knowledge production.

The Great Inversion rests on several "internal" evolutionary trends that have converged into the phenomenon described.

1. The increasing scale and cost of scientific laboratories. Until the 20th century, science remained largely the domain of creative individuals – independent researchers. In the 17th and 18th centuries, the era of Isaac Newton, cutting-

edge research on the refraction of light could be conducted using a home laboratory. Newton freely purchased the necessary components from local shops and assembled his equipment himself; he also personally constructed the innovative reflecting telescope of his day (Vavilov, 1989). Even by the mid-18th century, prominent scientists' laboratories still resembled Faust's study. In 1859, Hermann Helmholtz's laboratory consisted of a small room for the professor with no separate space for his assistant and employed only four people; Ivan Sechenov's personal laboratory at Saint Petersburg University occupied just two rooms on the lower floor of a courtyard wing (Antonets, 2018). As late as the early 20th century, the American experimental physicist Robert Wood could build advanced spectroscopes and diffraction gratings at his dacha and assemble a mercury telescope in a cowshed (Seabrook, 1985). From the mid-20th century onward, however, science became an exceedingly expensive enterprise, requiring enormous funding. From that point on, the marginal costs of producing scientific knowledge climbed steeply, culminating in the Great Inversion.

2. Rising welfare and the cost of scientific personnel. While the previous factor concerns the material infrastructure of science – premises and equipment – this aspect pertains to the cost of the labor force that produces scientific knowledge. This process is civilizational in nature and directly linked to two interrelated developments. First, all the planet's resources have been appropriated by society and become part of it. Second, society's continual consumption of these resources drives their depletion, scarcity, and rising cost. Both points warrant clarification.

Society, by its nature, is an anti-entropic system capable of surviving under the most challenging conditions thanks to its ability to constantly seek out new resources to address emerging problems (Dzhemal, 2022, p. 55). In the contemporary globalized world, society has become absolutely omnipresent: even phenomena such as the sea, beaches, uninhabited islands, mountains, deserts, and oil have been transformed into social entities and acquired monetary valuations (Dzhemal, 2022, p. 58). There are no longer any ownerless, free, or cheap resources; all have been accounted for and priced. Yet the rising cost of natural resources goes hand in hand with the rising cost of human life. In the complex societies we all now inhabit, household expenses are very high, covering housing, cars, utilities, taxes, healthcare, education, and more. A direct result is the "rising cost" of children, who must be raised, entertained, kept healthy, and educated – typically for more than two decades, during which they bring the family no economic benefit. In simple societies, the cost of maintaining a household was low: food, basic shelter, rudimentary clothing, and a few other simple goods sufficed. Children participated in the family economy from an early age, which in 18th-century North America equated to an additional net household income of £100 (Galbraith, 2024). The rising cost of planetary resources, a process that effectively concluded in the 1970s with spikes in energy and food prices, interest rates, and tuition fees, removed children from the economic cycle, rendered them "unprofitable", and precipitated a widespread demographic decline (Galbraith, 2024). A corollary is that the researcher has likewise become an extremely costly resource – one that, moreover, requires substantial investment in training and ongoing maintenance. Recouping such expenditures is becoming profoundly problematic amid a parallel decline in the returns to scientific labor.

A straightforward explanation for the low cost of research up to and including the 19th century lies in who performed it. Most scientific discoveries were made by amateur researchers drawn from the ranks of physicians and clergy – individuals sufficiently educated to engage in complex analytical work and sufficiently well-off not to fret constantly about survival. Their discoveries were,

in a literal sense, free to society, as they were made in time free from primary occupations. By the 20th century, the conditions that had sustained this model were exhausted.

3. Declining returns to scientific research. The logic of comprehending the world involves distinct stages. I.R. Shafarevich, for example, identified two phases in the development of the Western world: an early phase associated with the creation of science through the discovery of nature's laws (spiritual comprehension), and a later phase characterized by the creation of technology through the application of already-known laws (practical applications of spiritual achievements) (Shafarevich, 2003, p. 421). The second phase entails generating two types of innovation: breakthrough innovations, which create new markets with high profitability, and sustaining innovations, which ensure the functioning and expansion of existing markets (Poskochinova, Petrov, 2024). It is reasonable to speak of successive streams of discoveries and of breakthrough and sustaining innovations. The general pattern here is that more global scientific results become rarer, while more modest ones become more frequent. There are grounds to believe that the era of major discoveries concluded by the mid-20th century; at the very least, the flow of significant breakthroughs and their scale has clearly diminished since then. Something similar is now observable with respect to breakthrough innovations. Thermonuclear weapons, nuclear power plants, the space industry, computer technologies, genetics, and cybernetics – all of which emerged in the second half of the 20th century – have no 21st-century analogues in terms of significance and scale. Thus, the market returns to research and development exhibit a clear tendency to shrink.

A concrete, if partial, illustration of the Great Inversion now underway can be found in Daron Acemoglu's[4] textbook on the theory of economic growth, published in Russian in two hefty volumes (Acemoglu, 2018a; 2018b). The first volume runs to 928 pages, the second to 736 – both in an enlarged, almost gigantic format. All 1,664 pages are crammed with endless formulas and graphs and demand a truly Herculean effort to master. Yet one can confidently assert that a person who studies this proposed theory of economic growth will not gain genuinely relevant knowledge about the process. Most likely, they will be unable to apply what they have learned either to understanding the world around them or, even less, to earning money. Let us unpack this.

By way of comparison: a century ago, far less material needed to be mastered to claim a place among the intellectual elite and exert noticeable influence on "high politics". Consider J.M. Keynes. He did not overindulge in mathematical formulations. Yet on the basis of his fairly compact theory, he shaped an ideological vector for state regulation and became one of the wealthiest individuals of his era. Acemoglu's textbook, in contrast, is internally contradictory. First, the theories it presents were generated primarily by representatives of the white race – a group that until recently demonstrated miracles of economic and technological development. Yet now, despite the existence of such a diverse analytical arsenal in this field, the white race is gradually vanishing from the planet due to demographic depopulation. Second, a similar logic applies to Western dominance: the West created modern technological civilization, but before our eyes it is ceding ground to Asia. Third, China's economic rise over the past 40 years cannot be explained by the body of theories presented in Acemoglu's book. All of this points to a fundamental flaw in these theories of economic growth and their dubious relevance. At a qualitative level, one can conclude that the marginal utility of such knowledge clearly fails to cover the marginal costs of acquiring it.

[4] The Russian transcription of the author's surname can be either Adzhemoglu or Asemoglu.

On one side of the scale, then, we have the available theories of economic growth, whose marginal utility is negligible if not zero. On the other side sits a wholly disproportionate sum of marginal costs. This situation is not unique within contemporary science; rather, it has become typical. The accumulation of even very extensive and sophisticated knowledge offers a person no guarantee of stable employment or decent earnings, nor does it provide a foundation for rendering meaningful public benefit.

The third megatrend and the Great Erosion in the knowledge market

The third megatrend characteristic of the knowledge market is a gradual increase in the share of anti- and pseudo-knowledge within the total stock of knowledge. As before, let us unpack this thesis in greater detail, drawing on concrete examples.

According to the concepts introduced earlier, a portion of the volume of scientific knowledge (A) migrates over time into the category of anti- or pseudo-knowledge (F), so that the share $z = F / A \rightarrow 1$ (or $dz / dA > 0$, or $dz / dt > 0$). Paradoxical though it may seem, various sciences offer numerous illustrations of precisely this course of events.

The first example concerns the history of Ancient Rome and the death of Publius Cornelius Scipio Aemilianus (Scipio the Younger). Initially, unsubstantiated suspicions of murder were voiced; later, the version of a sudden and inexplicable death gained the upper hand. In our own time, T.A. Bobrovnikova conducted a historical investigation of this event. She not only proved the fact of Scipio's murder but also identified its participants and perpetrators: he was strangled by Gaius Papirius Carbo, while his wife Sempronia – sister of the famous Gracchi brothers – administered a sleeping draught to Scipio and opened the door to the killer. Bobrovnikova also uncovered the reasons for the concealment of the truth: the victim's friends and relatives were unwilling to publicize the married life of a great man of noble lineage (Bobrovnikova, 2001). Thus, after two millennia, the thesis of Scipio the Younger's sudden and inexplicable death was refuted and moved from the category of knowledge into that of anti-knowledge. Tellingly, the Russian-language Wikipedia still presents alternative, largely absurd, and already disproven versions of Scipio Aemilianus's death[5], while the English-language encyclopedia conveys the outdated view that modern historians are inclined to believe he died of natural causes[6].

As a counterargument to the example above, one might point out that the new knowledge is refining rather than fundamental: the commander's death is a fact, while the manner of death – violent or natural – merely supplements that fact. Yet ancient history also offers fundamental refutations of old tenets. Consider the death of Mithridates VI Eupator of Pontus. Historians long held to an official version: following his defeat in a long war against Rome, Mithridates was surrounded in his palace and attempted to poison himself. The attempt failed owing to his acquired immunity to poisons, and he then asked his bodyguard Bituitus to kill him. Adrienne Mayor, however, has carried out a modern reconstruction of the event, according to which Mithridates staged a grandiose feigned death and himself fled to Scythia. Every element of the new version finds corroboration in the sources that have come down to us (Mayor, 2015). In this case, the very fact of Mithridates' death is refuted: he lived out a long life in the Scythian steppes. Nevertheless, both the Russian- and English-language versions of Wikipedia continue to present the old account[7].

[5] See:https://ru.wikipedia.org/wiki/Публий_Корнелий_Сципион_Эмилиан_Африканский

[6] See: https://en.wikipedia.org/wiki/Scipio_Aemilianus?ysclid=mjvx56utsg980685367

[7] See: https://ru.wikipedia.org/wiki/Митридат_VI; https://en.wikipedia.org/wiki/Mithridates_VI_Eupator

Thus, knowledge and anti-knowledge coexist within the contemporary information space and generate divergent narratives. Characteristically, the old version of Mithridates' death – with the preliminary poisoning of his daughters – has become firmly entrenched in numerous works of art: paintings, medieval miniatures and engravings, plays, dramas, novellas and novels, operas and librettos (Mayor, 2015). "Purging" the old notions and annulling the myth of the Pontic king's murder accordingly proves highly problematic.

Economics, too, experiences a peculiar nullification of old knowledge. A vivid example is turnpike theory, which in its time became one of the mainstream directions of economic thought. This theory not only yielded the famous von Neumann ray (the turnpike) and numerous turnpike theorems (in strong, weak, semi-strong, and semi-weak forms, the theorem of the bent turnpike, and so forth) but also served as a framework for synthesizing diverse problems – for instance, by embedding Leontief's input-output scheme into the model's constraints. This approach made it possible to transform abstract mathematics into more substantive economic tasks, which in turn fueled expectations regarding the direction's potential. Today, however, turnpike theory has been definitively rejected on the grounds that it never produced constructive results (Balatsky, 2025). The impression now is that turnpike theory never really existed, and that all its findings have joined the archive of pseudo-knowledge – cognitive products characterized by utter barrenness for real economic life.

Something similar is occurring across all sciences, including physics. Modern cosmology, for example, rests on the Big Bang theory, according to which the Universe came into being roughly 14 billion years ago as a result of the explosion of a singularity – an infinitely dense point of compressed matter. Yet astronomical observations convincingly demonstrate that cosmic superclusters do not fit this theory: data from the James Webb Space Telescope record mature galaxies at an epoch when they should not yet have formed. Roger Penrose of Oxford University, who won the Nobel Prize in Physics in 2020, puts forward an alternative cosmological theory in which the Big Bang was not the beginning but merely one link in a series of cyclical Big Bangs (Trosper, 2014). Moreover, Penrose provides a rigorously scientific version of this alternative theory[8]. The astrophysics community today finds itself at an impasse, neither acknowledging nor denying that the old cosmology, which took more than a century to build, is no longer a relevant cognitive construct.

Thus, at the root of the gradual obsolescence of knowledge and its migration from the active stock into the passive archive lies the very dynamism of the cognitive process itself. Over time, the share of the passive archive becomes unacceptably large, impeding the normal functioning of the knowledge market.

The crisis in the knowledge market: Characteristics and consequences

The three megatrends examined above have produced a fundamental realignment of forces within the knowledge market. The resulting situation meets all the criteria of a market crisis. Let us examine these manifestations more closely.

The first characteristic of the knowledge market ($S > D$) can, from an economic standpoint, be classified as chronic *glut*. Glut in markets for goods and services is, admittedly, typical of capitalist systems. In this case, however, the phenomenon has extended to knowledge itself, the production of which has outstripped society's needs. This situation arises when the actual price in the knowledge market (P) proves higher than the product's marginal utility; it is equivalent to $P > dU / dA$ (*Tab. 1*).

[8] See: Gurzadyan V.G., Penrose R. Concentric circles in WMAP data may provide evidence of violent pre-Big-Bang activity. Available at: https://arxiv.org/pdf/1011.3706

Table 1. Features of the megatrends of the knowledge market

Megatrend			
No.	Name	Essence	Market conditions
1.	The Great Castling	Accelerated accumulation of knowledge and a shift in market conditions from scarcity to surplus	$S < D \rightarrow S > D$; $P < dU / dA \rightarrow P > dU / dA$
2.	The Great Inversion	Rising costs of knowledge production to the point where marginal cost exceeds marginal utility	$dC / dA < dU / dA \rightarrow dC / dA > dU / dA$
3.	The Great Erosion	Increase in the share of anti- and pseudo-knowledge within the total stock of knowledge	$dz / dA > 0$
Source: own compilation.			

The second characteristic of the knowledge market ($dC / dA > dU / dA$) can be interpreted economically as the *unprofitability* of knowledge production. Bankruptcies of firms and even entire industries are, again, typical of capitalism, but unprofitability in the production of knowledge is a relatively new phenomenon. An important point to stress is that in both cases the key variable is the product's marginal utility. Consequently, market glut arises not from inflated actual prices but from a catastrophic decline in the marginal utility of knowledge. Similarly, the unprofitability of the knowledge market stems not from prohibitive marginal costs of production but, once again, from the extremely low marginal utility of knowledge. Both circumstances owe less to subjective factors than to the very specificity of the good itself – knowledge – and to its current stage of evolution.

The third characteristic of the knowledge market ($dz / dA > 0$) can be interpreted economically as the massive presence of *defective goods* on the market. The specificity of the knowledge market is that, over time, the share of defective output increases with no stable tendency toward reversal. As in the previous cases, the rise in defects is driven not by errors in the production of knowledge but by the very fact of its growing complexity and obsolescence – a fact that emerges at mature stages of market evolution.

The simultaneous presence of these three crisis manifestations enables us to diagnose a *global crisis* in the knowledge market – a crisis along all key dimensions.

The first two manifestations of the crisis are fairly fully captured by the following inequality.

$$P > dC/dA > dU/dA. \quad (1)$$

The hierarchy of variables in inequality (1) is highly significant. It reveals a paradoxical situation in which potential unprofitability is masked by actual prices, and the bankruptcy of knowledge production is postponed indefinitely. This paradox has a perfectly natural explanation.

The point is that knowledge appears in two forms: as a private good and as a public good. As a private good, it can be directly transferred to a consumer who pays a corresponding price. As a public good, it is consumed by many people without specific payments by any given individual. A complete analogy with traditional private and public goods holds here. Getting a tooth treated is a private good; strolling in a park is a public good. The patient pays for the tooth; the municipality maintains the park. The same logic applies to knowledge, albeit in a modified form. Most knowledge, being a public good, is produced, paid for, and partly consumed by an institutional economic agent – the state (through universities, institutes, state foundations, etc.). In effect, the production of knowledge is financed from the state budget. This makes it possible to "deceive" the market by indirectly balancing the prices, costs, and outcomes of cognitive activity. Were it otherwise, the market for scientific knowledge would have gone bankrupt long ago.

This specificity of the knowledge market means that the crisis phenomena emerging within it can

long remain unnoticed – or simply ignored. And that is precisely the situation we face today. This by no means implies that the authorities are making no attempt to address the problem. Yet their efforts follow the line of incremental adaptation of existing state and private institutions to changing conditions. This approach is entirely logical when the very production and consumption of knowledge takes place predominantly among institutional market participants. Such a regulatory paradigm has been most vividly embodied in the concept of successive generations of the university. The concept treats the university as a cognitive social institution that ensures the reproduction and development of thinking. Four generations of universities are now commonly distinguished: University 1.0 (*scholastic*, characteristic of the pre-industrial era); University 2.0 (*research*, corresponding to the industrial stage); University 3.0 (*entrepreneurial*, appropriate for the post-industrial era); and University 4.0 (*cognitive*, meeting the needs of the future) (Efimov, Lapteva, 2017; Efimov, Lapteva, 2024). Various theoretical constructs are employed to explore the specific features of these university generations: the pyramidal model of regional competitiveness, the diamond model of universities, the triple helix model, and so forth (Zuti, Lukovics, 2015).

Yet all of these categories largely obscure the real problems of the knowledge market. If we strip away the particulars, the thrust of the university generations concept is to place ever more obligations on universities for their own survival under mounting market challenges. In parallel, many types of professional activity are being regulated by creating institutional incentives for people to acquire appropriate education, thereby sustaining demand for the services of higher education institutions. By now, however, the artificiality of such approaches has become apparent. An aberration of the original conceptions of university study is taking place. In the universities of the past, students were not so much taught as they somehow taught themselves – each to the best of his or her ability and diligence (Vavilov, 1989). Universities even then served essentially as venues where talents of different ages could meet; all later ideas about special teaching methods are largely fabrications. A typical refutation of the "lofty" mission of universities is the fact that Isaac Newton, who taught at Cambridge University, was not highly rated by his students. His lectures struck them as boring and incomprehensible (Vavilov, 1989). Let us recall that the master often arrived to deliver a lecture to an empty hall. Newton would wait fifteen minutes and then go home (Vavilov, 1989). This is by no means an anecdote but a reality of the 17th and 18th centuries at Cambridge University, with I. Newton in the leading role. The example shows that already at that time the functions of research and teaching combined poorly. This very fact led Gottfried Leibniz (Newton's contemporary) to advance the idea of an academy of sciences as a counterweight to universities. Today, Russia has adopted a university model in which staff must combine the competencies of researcher, teacher, publicist, and administrator – an impossibility in practice – while the crisis in the knowledge market persists in latent form.

Attempts to "compel" universities and institutes to engage actively with a market that de facto does not exist are leading to the bureaucratization of every element of the science and education system. One "innovation" of the new era is the concept of lifelong learning, according to which people must study throughout their entire lives. This stands in stark contrast to the situation just a century ago, when formalism in science was virtually absent. Consider some facts from the biography of N.V. Timofeev-Resovsky, one of the USSR's foremost biologists and geneticists. He lost his secondary school certificate, did not sit the state examinations at university, and never received a diploma. Tellingly, many students at the time did the same. Having acquired the necessary knowledge and skills, they

felt no need for a formal educational document (Granin, 2023). Despite lacking educational certificates, Timofeev-Resovsky worked successfully at leading universities and research institutes of the country and, from 1925, headed the Department of Genetics and Biophysics at the Institute for Brain Research in Germany. Remarkably, Germany accepted him unconditionally, even without any certificates of education or qualification. A letter of recommendation from his supervisor N.K. Koltsov, already considered a classic of modern biology, proved sufficient (Granin, 2023). Today, without a full set of educational certificates, even the most accomplished researcher cannot obtain employment.

The complexity of modern knowledge and its lack of demand have generated yet another requirement for researchers: publication activity. However, the mechanistic nature of this requirement, divorced from substantive considerations, has led to the proliferation of scientometric methods and indicators, the emergence of "predatory" practices in the scientific journal market, and the spread of "junk" publications. Sample studies have shown that since 2015 Russian economists have annually published at least 1,000 papers in "toxic" outlets. On average over the period 2010–2019, nearly every third economics publication with a Russian affiliation appeared in a "predatory" journal. In absolute number of "junk" papers published over that period, Russia was second only to India (Balatsky, Yurevich, 2021). Today, the writing of pseudo-scholarly articles with the aid of artificial intelligence is underway, definitively destroying the principles of scientific inquiry. These are all typical examples of how academic knowledge is transforming into anti- and pseudo-knowledge, while the knowledge market becomes glutted with "defective goods".

All of this stands in opposition to the old model of the "knight of science", when scientific research entailed genuine feats on the part of scholars. Suffice it to recall how Johannes Kepler discovered his three laws of planetary motion: after an exhausting day filled with teaching and casting horoscopes, he would steal precious hours of sleep at night for endless calculations (Lishevsky, 1986). Similarly, Ilya Mechnikov tested the effects of certain infectious diseases on himself. In 1881 he injected himself with the blood of a typhus patient, fell gravely ill, and barely recovered. In 1911 he organized and led an expedition to the Carpathian steppes – a hotbed of plague and tuberculosis – where he made a number of important discoveries[9]. These examples testify to the degeneration of the institutions for producing and transmitting knowledge. Before our very eyes, an evolutionary transition is taking place from the model of the "knight of science" – in which past researchers were prepared for great sacrifices in the name of science – to the model of the "bureaucrat and imitator", in which contemporary researchers predominantly adapt to the bureaucratic demands of their organizations and skillfully simulate scientific activity. Previously, the "knight of science" model was termed the model of service, distinguished by the presence of so-called academic rent. The "bureaucrat and imitator" model, in turn, was treated as a business model, with its inherent exploitation of scale effects (Balatsky, 2014).

The crisis in the knowledge market: possibilities for overcoming it

All of the above allows us to diagnose a large-scale and, at the same time, deep crisis in the knowledge market. Yet the measures being taken by the authorities cannot resolve the problem that has arisen. They only slightly smooth over the accumulated contradictions and make it possible to defer their resolution into the future. There are grounds to believe that a genuine solution must rest on an entirely different methodological paradigm. In this connection, it is legitimate to ask not only how one might and should act in such a situation, but also how events might unfold more generally.

[9] See: https://ria.ru/20250515/mechnikov-2016631032.html?ysclid=ml5jsda4s5845873908

To better understand the situation, let us consider how a national economy copes with an ordinary crisis, with its characteristic problem of sales. Two fundamentally different lines of development are possible here. The first presupposes the emergence either of certain innovations in the markets, which give a new impulse to production, or of entirely new markets, the launch of which also jump-starts new production. Old commodity markets may persist or may disappear, but in any case the new markets must be more global, and their emergence must more than compensate for the disappearance of old product groups. The second line of development entails exiting a protracted dead end by means of wars and armed conflicts, in which old material values are destroyed, followed by a relaunch of production. In this case, old markets are "unloaded" through their physical destruction, and the production cycle is repeated from a lower base level. One way or another, we should expect something similar in the knowledge market as well, but with due account for its specific features.

Understanding the revolution that is brewing in the knowledge market will make it possible to relieve its overburdened archive and to effect a transition from an additive paradigm to a subtractive one. According to Nassim Taleb, *additive* knowledge is formed on the principle of adding the new to the existing old, whereas *subtractive* (differential) knowledge is created by subtracting from the existing stock that which is no longer relevant, while retaining what is essential (Taleb, 2012). "It is believed that intelligence is the ability to notice the significant (to detect regularities), but in a complexly organized world, intelligence lies in ignoring the insignificant (rejecting false regularities)" (Taleb, 2012, p. 207). It appears that until the 21st century, science successfully developed along the lines of additive knowledge, but a transition to a subtractive paradigm is now on the horizon. Accordingly, the future reformatting of the knowledge market will be bound up with a dialectical negation of many tenets of modern science, accompanied by a rewriting of existing achievements from the standpoint of new principles and propositions.

The anticipated qualitative transition in the development of science corresponds to the doctrine of complexity cycles. Its thrust is as follows. Over an extended period, the level of complexity of science rises together with an increase in its effectiveness (productivity) – manifested in the growth of both its explanatory (theoretical) and its recommendatory (applied) potential. Upon reaching a critical level of complexity, however, science loses its effectiveness, and a destructive accumulation of scientific baggage begins. At this stage of development, science finds itself in a state of systemic crisis, from which it sooner or later emerges by revising its methodology or paradigm. At that moment, the rewriting of science begins anew – in fresh terms and with the application of new methods and approaches. As a rule, the new model of science proves simpler than the previous version, while yielding results no worse, and often even better. The cycle then repeats until the next crisis of complexity, and so on (Balatsky, 2012).

One cannot fail to note the obvious analogy between the knowledge market and the capital market. In the case of the latter, a U-shaped trajectory in the dynamics of its global volume was observed over the 20th century: the process of capital accumulation experienced a marked trough over the historical interval 1914–1970, after which it again began to rise, reaching, in the second decade of the 21st century, roughly the level that had obtained at the beginning of the 20th century. Such retrospective dynamics are a direct consequence of the overaccumulation of capital by the early 20th century, which was eliminated through two world wars and policies of high taxation (Piketty, 2016). During that period, the growth of the capital stock led to a decline in its profitability, which in turn gave rise to business paralysis and the subsequent forcible redivision of the world through wars and the

emergence of the socialist movement. Today, there is every reason to suppose that overaccumulation in the knowledge market may provoke similar tendencies in the global economic system.

In all likelihood, modern civilization will have to go through an extremely painful process of "writing off" and renewing accumulated knowledge. Meanwhile, institutional changes will adapt to the main trend. Most probably, under these conditions the format of academic degrees, titles, and positions will be substantially altered; the organizational model of universities and institutes, of curricula and professional requirements, and of scientific publications and scientific results will change. These questions, however, fall beyond the scope of the present article.

Conclusion: on the eve of global reforms

In an attempt to explain many phenomena in the cognitive sphere of the contemporary world, several useful concepts have been introduced: knowledge as an ordered set of original ideas, models, and theories, their justifications and proofs, and statistical and historical illustrations; and the knowledge market as the process of coupling the segments of knowledge supply (production) and demand (needs), as well as the acts of their purchase and sale at a specific price. To deepen understanding of the knowledge market's evolution, a three-sector model has been proposed, consisting of a knowledge core (fundamental, scientific knowledge), a periphery (auxiliary or secondary knowledge), and pseudo- and anti-knowledge (outdated and erroneous knowledge).

An understanding of the evolution that the knowledge market has undergone over the past half-century is captured fairly fully by three global trends. The first megatrend – the Great Castling in the knowledge market – consists of the accelerated accumulation of knowledge to the point of a qualitative reversal of market conditions, i.e., the transition from scarcity to surplus. The second megatrend – the Great Inversion in the knowledge market – consists of the gradual rise in the cost of producing knowledge coupled with a simultaneous decline in its marginal returns, to the point of a qualitative shift in the cost–value balance, where the marginal cost of producing knowledge exceeds its marginal utility. The third megatrend – the Great Erosion in the knowledge market – consists of a gradual increase in the share of anti- and pseudo-knowledge within the total stock of knowledge. This allows us to offer three characteristics of the contemporary knowledge market: glut, unprofitability, and widespread defective output. These characteristics permit a diagnosis of a global crisis in the knowledge market, which is precisely what renders many managerial reforms in the scientific sector ineffective and unpromising. It is this crisis-ridden state of the market, in fact, that has led to a gradual evolutionary transition from the service model of the "knight of science" – in which past researchers were prepared for great sacrifices in the name of science – to the business model of the "bureaucrat and imitator", in which contemporary researchers predominantly adapt to the bureaucratic demands of their organizations and skillfully simulate scientific activity.

Empirical confirmation of the onset of the Great Castling is provided by Derek Price's exponential rule and by expert surveys conducted by the author. The Great Inversion is illustrated by numerous examples from the history of scientific development, while the Great Erosion is illuminated through stylized examples from ancient history, economics, and physics, as well as by the concept of four generations of the university.

Interpreting the phenomena described in market terms makes it possible to argue that, in the foreseeable future, the knowledge market awaits a total "unloading" via the "writing off" of outdated and irrelevant cognitive products. Underlying the anticipated unloading of the knowledge market will be a transition from an additive paradigm of cognition to a subtractive one. The scientific

research sector will slowly and painfully adapt to the new paradigm. As for the current measures for regulating the research sector, they rest on the old paradigm, which harks back to a state of scarcity in the knowledge market. These measures are, consequently, fundamentally inadequate in the face of present realities and are incapable of resolving the problems of the knowledge market.

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Evaluating the Effectiveness of National Project Implementation in Russia: Findings from an Expert Survey

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Abstract. This article addresses the issue of monitoring the implementation of national projects to assess the social impact of project implementation. The article aims to analyze the experience of monitoring the implementation of four national projects based on the results of an expert survey. The methodological basis of the study is the results of fundamental research conducted by the Center for Sociology of Management and Social Technologies of the Institute of Sociology FCTAS RAS. The article substantiates the need to use monitoring as a combination of integrated research methods – a mixed methodology of social assessment – specifically in accordance with the goals and objectives of regional governance. In line with emerging research trends in the analysis of subjective and objective data, this article presents the results of a comparative analysis of an expert survey (a collection of expert assessments from four regions) and official Rosstat statistics. The expert survey findings indicate an emerging positive trend

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in the consideration of social aspects in regional project decisions. It is noted that government bodies (federal, regional, and local) act both legally and in practice as the primary implementers of projects, while the public is currently relegated to the role of public observer. It is concluded that government assessments (statistical data) and expert opinions are similar – both assess the implementation of projects in the regions as satisfactory. However, greater transparency of government statistical data is needed. The study's results suggest the feasibility of incorporating monitoring of the social impacts of national projects into government monitoring. Based on this approach, it becomes possible to define government monitoring as socially oriented, institutionally structured, and unified.

Key words: government monitoring, social monitoring, social impact assessment, national projects, unification and diversity, social expertise

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Introduction

Since the national projects initiated by the Presidential Decree of 2018 were launched[1], state monitoring of their implementation has been carried out. This monitoring is designed to provide regular feedback on the attainment of program goals by comparing actual values with the planned targets set out in the state programs of the Russian Federation.

Yet this state monitoring falls short of being truly comprehensive, as it is geared mainly toward measuring economic indicators that readily lend themselves to quantification. National projects are intended to deliver not only economic but also social progress, encompassing such areas as improving people's health and well-being, supporting families, enabling every individual to realize their potential, and providing a comfortable and safe living environment. This is far from an exhaustive list of the social indicators enshrined in state policy, a fact that reflects the intensifying socialization of the economy (Grinberg, Rubinshtein, 2014). Social indicators are difficult to assess and analyze using solely the economic methods applied in state monitoring. This is because, first, such indicators carry a distinctly social component and require their own methods of evaluation. Second, measuring them with economic indicators is problematic, since the final social outcome may diverge from the economic effect achieved (in either a positive or a negative direction). Third, assessing social effects solely through quantitative methods is challenging, which makes it necessary to use qualitative methods as well. It is no coincidence that the 2024 Presidential Decree on the national development goals of the Russian Federation for the period up to 2030 postulates the social responsibility and social orientation of national projects and stipulates the need both to define a list of sociological indicators for measuring the attainment of national goals and to ensure their ongoing monitoring[2]. Thus, at the

[1] On the National Goals and Strategic Objectives of the Development of the Russian Federation for the Period up to 2024: Presidential Decree 204 dated May 7, 2018. Available at: http://www.kremlin.ru/acts/bank/43027 (accessed: 21.07.2025).

[2] Paragraph 10, Subparagraph b of Presidential Decree 309 "On the National Development Goals of the Russian Federation for the Period up to 2030 and the Long-Term Outlook up to 2036" dated May 7, 2024. Available at: http://www.kremlin.ru/acts/bank/50542 (accessed: 21.07.2025).

state level, a serious objective need has arisen to assess not only the economic but also the social impact of national project implementation, and to investigate the feasibility of comparing the two.

Social indicators are playing an ever more significant role in the evaluation of national projects. A social outcome, however, is less a set of quantitatively measurable results than a series of qualitative changes in the economic and social spheres. Here, the principal difficulty lies in defining the very concept of "social outcome" (social effect). No uniform set of metrics exists for it, which impedes the comparability of evaluation results for similar projects.

In our view, to ensure a comprehensive, all-round – and not merely economic – and adequate assessment of the results obtained from implementing national projects, it is necessary to incorporate into state monitoring a scientifically grounded tool for assessing the social consequences of such projects. Accordingly, the aim of the work is to analyze the experience of conducting monitoring linked to a scientifically grounded assessment of the social results of national project implementation, based on an expert survey and the analysis of statistical indicators.

Conceptual framework

A review of the literature reveals various specific features in the organization, direction, and approaches to embedding monitoring in the practice of public administration, particularly during the preparation and execution of state programs and projects (Panina et al., 2022). In this context, foreign authors clearly distinguish between the utilitarian goals of political elites and orientation goals – those that take into account the conditions and needs of different population groups and are pursued through the production and integration of knowledge (theory of change, knowledge management, results-based management) in monitoring state projects and programs. They bring to the fore the need for systemic thinking in order to conceptually link the monitoring and evaluation functions within the framework of state social policy development measures (Hu, 2006; Welfens, Bonjour, 2023; Wotela, 2017). Considerable attention is also paid to the methodological and instrumental components of monitoring, aimed at creating the most effective model for its implementation by state authorities and non-profit organizations – a model conceived as a set of interconnected and complementary elements that influence the execution of strategic projects on both a local (cities, regions) and a national (countries) scale (Janka, 2024; Gea et al., 2025; Kazanskaia, 2025a). Much focus is placed on measurable changes, the combination of logical-structural, reflexive, and constructivist approaches, and the social resources required to support monitoring research on the implementation of strategic planning and management (Mathayo, Kinyina, 2022; Antonie, 2024; Kazanskaia, 2025b).

The growing relevance of monitoring the state of governance systems also merits attention. A number of foreign researchers note that, in addition to monitoring the 242 indicators of the Sustainable Development Goals (SDGs) set for 2030 according to the UN methodology, countries would do well to launch monitoring to assess the effectiveness of their own governance systems as a mechanism for ensuring strategic planning and management, thereby increasing the likelihood of achieving the SDGs by 2030 (Sari et al., 2022).

As for the legitimation and organization of monitoring in the Russian practice of public administration, its increased relevance is associated with the following paradigm shifts in state governance (Stroev et al., 2025): 1) the transition from a directive-administrative model of governance to a program-target model, which embodies such key principles as results-oriented targeting, systemic linkage of measures and resources, measurability based on quantitative indicators, accountability for outcomes, and the monitoring and adjustment of interim results with the possibility of reallocating

resources; 2) the gradual introduction of project management and indicative planning into the program-target cycle for developing and implementing state programs and federal projects; 3) the shift from line-item budgeting – based on spending allocated funds by expenditure item – to "results-based budgeting" (RBB), i.e., financing the attainment of specific strategic goals and quantitatively measurable indicators; 4) taking into account the emerging orientation toward client-centricity in public services and the movement toward configuring an anthropocentric approach based on the principles of social feedback in public administration (Bogdanov, Pochestnev, 2024a), a demand is forming for the creation of a digital ecosystem of social monitoring that would make it possible to establish a multilevel system for assessing the achievement of indicative targets of federal and regional projects, as well as the real social (publicly significant) effects, on the basis of independent social assessment (Bogdanov, Pochestnev, 2024b). This last trend bears a resemblance to the Canadian model of implementing government programs, "Results-Based Management" (Stroev et al., 2025).

For the time being, however, the domestic governance system remains focused primarily on analyzing the monitoring data from two information systems: "Electronic Budget" – the unified state integrated information system for managing public finances of the Russian Federation, and "Upravlenie" (Management) – the state automated information system. Within the first, a special subsystem for managing national projects has been created (Stroev, Kuznetsov, 2023), and the distribution and spending of funds are monitored against planned and actual values of indicators for national, federal, and regional projects. The second system monitors the implementation of strategic planning documents at various levels – from federal to municipal – and also records possible risks of deviations from planned indicators, as well as achieved/unachieved milestones and checkpoints in the execution of national projects (programs) and the national development goals of the Russian Federation. This form of monitoring, based on the two information systems, has evolved from the formulation of principles and procedures for monitoring large-scale projects with state participation to the embedding of the monitoring system as a mandatory element of project activity within a complex, hierarchically structured system of strategic planning for achieving national goals. However, questions arise concerning the quality and transparency of the established monitoring system[3], connected to a whole range of negative factors, problems, and barriers that distort and cheapen its KPIs: 1) the persistence of criminogenic and corruption factors in the implementation of the old (Kamchatov, 2023; Grinko, 2025) and the new 20 national projects through 2030[4]; 2) a discernible lack of project management competencies at the implementer level in some regions[5]; 3) the deliberate inflation of indicator values and the commissioning of facilities that either do not function or operate at partial capacity[6]; 4) problems with the quality of indicator planning, such that indicators meant to be reached by 2030 have already been achieved; 5) problems in planning budget allocations to meet

[3] Procedure for Monitoring the Implementation of National Projects, Federal Projects, Departmental Projects, and Regional Projects of July 1, 2022 (as amended on June 2, 2025). Appendix No. 5 to the Unified Methodological Recommendations on Project Activities. Available at: https://gasu.gov.ru/documents?folderId=12689 (accessed: 10.04.2026).

[4] In 2025, the Ministry of Internal Affairs identified over 3,500 thefts of budget funds allocated to national projects. Available at: https://russian.rt.com/russia/news/1602852-mvd-hischeniya-nacproekty (accessed: 08.04.2026).

[5] Report by A. Malkov, Deputy Director of the Department of Project Activities of the Government of the Russian Federation: Transition from plan/fact analysis to data-driven management and predictive analytics, moving away from expert opinion toward verification algorithms. Available at: https://ac.gov.ru/uploads/2-Publications/Sbornik_PO_22.04.22.pdf (accessed: 09.04.2026).

[6] Results of the "Clean Water" National Project: Embezzlement, theft, padding, and 38 billion rubles down the drain. Available at: https://ancb.ru/publication/read/21079 (accessed: 08.04.2026).

indicator targets, associated primarily with the need to maintain a balanced budget[7]; 6) the absence of a workable methodology for attracting extra-budgetary funds, partly owing to the need to fine-tune development institutions; and 7) weak analytics and miscalculation of the risks of failing to achieve planned indicators (Buryanina, Loginov, 2022).

Some of the listed problems can be attributed to the unwieldy governance and monitoring system, which combines elements of both hierarchical and project-based approaches. Despite the declared transition to a cross-functional ("matrix") model, a rigid vertical hierarchy between deputy prime ministers and ministries persists in practice.

Also remaining on the periphery of attention are the methods and techniques for assessing the riskiness and effectiveness of national project implementation proposed by scholars from various scientific fields: economics, sociology, law, and political science (Anikina et al., 2022; Borisov, Somenkova, 2023; Kabanova, 2020; Kashirskaya, Zurnadzhyants, 2022; Troshin, 2020; Shabunova, Kozhevnikov, 2020). The experience of individual studies monitoring specific national projects on the ground – in regions and municipalities – may prove valuable (Mekha, 2023; Ponomarev, 2025; Fedotov et al., 2020). A tremendous contribution to assessing the effectiveness of national project implementation has been made by the Vologda Research Center of the Russian Academy of Sciences (VolRC RAS). The research team at VolRC RAS, led by V.A. Ilyin, A.A. Shabunova, and T.V. Uskova, has organized and conducted several waves of monitoring the effectiveness of national project implementation, examining the linkage between the dynamics of the state of Russian society and the formulation and achievement of specific national development objectives, in particular risk factors and potential opportunities for their realization (Effektivnost'..., 2025).

[7] Post-launch inspection. Available at: https://www.kommersant.ru/doc/7793538 (accessed: 08.04.2026).

Summarizing the literature review, we can state that no unified system for monitoring the implementation of national projects has emerged to date. The "Upravlenie" and "Electronic Budget" information systems address only the collection of information about budget distribution and certain indicators (Pershina et al., 2023). What remains is an open scientific question, one that L.B. Kogan raised long ago: the need for longitudinal studies of the relationship between local interests and national goals. "In our country, research on urban goals and interests and their interaction with national goals has been practically non-existent until now" (Kogan, 2008, p. 2).

Research design and methodology

The object of the monitoring is people, social groups, institutions, organizations, values, ideas, concepts, and normative acts that influence social change in the regions. The subject area encompasses social processes, managerial decisions, and their perception by the population. The principal aim is to assess the social consequences of the implementation of project decisions. In other words, it is important to ascertain the extent to which government bodies, as the responsible implementers, are coping – or failing to cope – with the execution of measures designed to achieve the planned national goals in the regions. Moreover, the monitoring mode makes it possible, first, to track the dynamics of the assessments obtained and, second, to determine their vector.

The general methodological basis of the research consisted, first, of the concept of the sociocultural modernization of regions developed at the Center for Modernization Studies of the Chinese Academy of Sciences under the direction of He Chuanqi (He Chuanqi, 2011) and adapted for the Russian legal context by the Center for the Study of Sociocultural Changes at the Institute of Philosophy of the Russian Academy of Sciences (Atlas..., 2016); and, second, of the results of fundamental research conducted by the Center for

Sociology of Management and Social Technologies of the Institute of Sociology FCTAS RAS, which identified a close link between the sociocultural and socio-economic levels of development across regions. The methodology we have adapted rests on a system of indicators that makes it possible to capture, in the fullest possible manner, the sensitivity of government and administrative institutions, the local population, and expert groups to the process of implementing national projects in the regions, as well as to the assessment of the results achieved.

We should note separately that the methodology developed ensures strict adherence to the methodological principles of comparability of empirical results obtained through different sociological methods (mixed methodology). Standardized metrics and indicators are used to a certain degree across various research strands (expert survey, mass survey, media content analysis, analysis of government websites, and content analysis of social media communities). The application of a set of sociological methods makes it possible to compare results and to capture assessments of problems from different vantage points. Depending on the specific features of the research and applied tasks at hand, a particular combination of data collection and analysis methods can be employed.

The monitoring instrument presented in this article is a regularly repeated study of the social effects of managerial decisions and the processes triggered by these actions. The monitoring mode enables the identification of the dynamics of an object (phenomenon, process). The use of the monitoring model is driven by the need for the regular collection of sociological data on the state of a social object or process. Its advantage lies in the ability to compile a database for studying the dynamics of specific diagnostic criteria over time.

The construction of the instrumental model for carrying out the monitoring of national project implementation rests on two principles. The first involves incorporating into the structure of the conceptual model the methodological foundations of the sociology of management, which – drawing on a structural-activity approach and rational-cognitive procedures for collecting and analyzing expert information (Dridze, 2000; Russia..., 2017; Tikhonov, 2017) – make it possible to identify and assess dysfunctional consequences of managerial and project decisions. The second ensures a transition from conceptual foundations to the construction of elements of an empirical model, namely, enabling the development of a system of indicators.

The results of three research projects were used to configure and analyze the findings of the monitoring of national project implementation. The first is the Russian Science Foundation grant "Civic Expertise on the Problem of Reforming the Power-Administrative Vertical in the Context of the Processes of Sociocultural Modernization of Regions: From Monitoring Conditions to Prognostic Design", 2016 (Rossiya..., 2017). The second is the RSF grant "Academic Project: The Governability of the Processes of Social Group Formation in Regions with Different Levels of Sociocultural Modernization and Public Support for the Development Strategy of the Russian Federation through 2024" (Tikhonov et al., 2021). The third is the research report under the state assignment "Remote Social Expertise as a Form of Public Communication in the Implementation of National Projects" (Bogdanov, Pochestnev, 2024b).

The content of the monitoring covered the implementation of four national projects – "Housing and the Urban Environment", "Safe and High-Quality Roads", "Education", and "Healthcare" – which, as our research has shown, carry the greatest significance in the eyes of the public. For each of these projects, indicators were developed to assess the quality of their execution. For "Housing and the Urban Environment", these were an assessment of the state of affairs with the construction and purchase of housing in the region,

as well as an assessment of the implementation of the city (village) development strategy. For "Roads", it was an assessment of road conditions. For "Education", indicators were identified for evaluating the work of preschool institutions, schools, and vocational training institutions. For "Healthcare", the focus was on assessing the work of medical institutions[8].

Ultimately, taking into account the designated configuration, the monitoring was based on: 1) expert assessments of the implementation of the specific national project where the survey was conducted[9]; and 2) official statistical indicators, in particular for conducting a comparative assessment of the effectiveness of national project implementation across the regions. Using statistical data was intended to address the important methodological task of ensuring the comparability of quantitative assessments with qualitative expert assessments. This task was accomplished through a comparative analysis of expert survey data (qualitative assessment) and statistical data from the Federal State Statistics Service of the Russian Federation (quantitative assessment). For this purpose, the Rosstat electronic information base for 2022 was used to analyze statistical data on the implementation of national projects in the selected regions[10].

[8] The choice of these national projects is not accidental; they primarily serve public interests and influence the improvement of the population's quality of life, a fact confirmed by the findings of a mass survey in 12 regions conducted during the 2016 and 2020 studies.

[9] The choice of the above regions is determined by their location in different federal districts of the country and at different levels of sociocultural modernization: low level of development (Smolensk Region, Central Federal District), below-average level of development (Vologda Region, Northwestern Federal District), medium level of development (Republic of Bashkortostan, Volga Federal District), and high level of development (Sverdlovsk Region, Ural Federal District) (Atlas..., 2016).

[10] Official statistical information on the indicators of socio-economic development of the Russian Federation required for monitoring the achievement of national project indicators. Rosstat. Available at: https://rosstat.gov.ru/folder/53175 (accessed: 25.07.2024).

The basis for analyzing the results obtained was provided by the opinions of regional experts from three regions (Vologda Region, Smolensk Region, Sverdlovsk Region) and one national republic (Republic of Bashkortostan). The opinions and assessments were captured through an online expert survey. A total of 600 experts were surveyed – 200 in each of the three studies conducted. The experts invited to participate included employees of state and municipal government bodies, managers and leading specialists from regional enterprises and business structures, as well as members of public organizations and representatives of the academic community. Some of the experts are directly involved in the development and implementation of national projects. Details of the expert selection process and the characteristics of the expert groups can be found in our publications based on the results of the aforementioned studies (Rossiya..., 2017; Bogdanov, Pochestnev, 2022; Bogdanov, Pochestnev, 2024b; Tikhonov et al., 2021).

Given the limited length of this article, we focus on the following monitoring aspects: first, assessing the social effects of national project implementation; second, identifying governance actors involved in implementing national projects and defining their roles; third, assessing the state of interaction between government bodies, as the responsible implementers of national projects, and the population, as their ultimate consumers; and fourth, exploring the feasibility of comparing economic (quantitative) and social (qualitative) indicators of national project implementation.

Research findings

Social effects of national project implementation

The findings of the first two studies (2016 and 2020) lead to the following conclusions. In the early stages of national project implementation (the 2016 study) and during the active implementation phase (the 2020 study), the situation in the regions with respect to the indicators under examination was, on the whole, rated as satisfactory (*Tab. 1*). Across

Table 1. Assessment of the state of affairs in the areas where national projects are being implemented, 2016 and 2020, % of respondents

National project	Indicator	2016			2020		
		Poor	Satisfactory	Good	Poor	Satisfactory	Good
Housing and the Urban Environment	Construction and purchase of housing	35.0	44.3	20.7	31.7	49.7	18.6
	Implementation of the city development strategy	25.6	50.3	24.1	22.4	46.5	31.2
Safe and High-Quality Roads	Road conditions	39.5	31.2	29.3	26.1	46.2	27.6
Education	Work of preschool institutions	11.4	54.6	34.1	6.8	33.2	60
	Work of schools (secondary education)	24.7	60	15.3	9.9	39.8	50.3
	Work of vocational training institutions	28.6	57.8	13.5	11.4	38.9	49.7
Healthcare	Healthcare system	42.2	47.1	10.8	39.8	42.3	17.9

Note: N = 200 per year.
Source: data from the expert surveys of 2016 and 2020.

virtually all of the dimensions assessed, mid-range ratings predominated, and for none of the indicators was a preponderance of either positive or negative assessments recorded. However, an analysis of the dynamics of the assessments obtained made it possible to identify the following trends: a) between 2016 and 2020, the share of negative assessments declined across absolutely all of the indicators (the decline ranged from 3 to 13 percentage points); b) over the same period, the share of positive assessments increased for most indicators (the increase ranged from 10 to 35 percentage points), with the sole exception of the indicators "construction and purchase of housing" and "road conditions", which showed a slight decline of roughly 3 percentage points; c) the most positive dynamics over the period were demonstrated by the Education project, which by 2020 had broken the general trend in the assessment of the state of affairs in the regions – a predominance of positive assessments is observed. Thus, one can conclude that the implementation of national projects in the regions across the areas examined over the period in question has generally formed a positive trend characterized not only by steady economic growth but also by a discernible strengthening of positive social effects.

At the second stage (the 2023 study), when it was already possible to take stock of interim results, the experts were asked to directly assess the implementation of national projects in the regions. And although no single dominant assessment emerged among respondents, one can state that the experts themselves are, on the whole, satisfied with the progress of national project implementation: for two projects, positive assessments prevail ("Housing and the Urban Environment", "Safe and High-Quality Roads"); for the other two ("Education", "Healthcare"), despite the predominance of mid-range ratings, positive assessments far outnumber negative ones (*Tab. 2*).

Thus, summarizing the findings of the studies, one can state that the implementation of national projects in the regions is yielding a positive social effect. And although this trend is not strictly linear (according to the experts, there are still many problems), one can nonetheless speak of the success and effectiveness of this work.

Table 2. Assessment of the results of national project implementation in four regions, 2023, % of respondents

National project	Assessment		
	Poor	Satisfactory	Good
Housing and the Urban Environment	11.4	40.9	47.7
Safe and High-Quality Roads	17.9	33.3	48.7
Education	17.4	44.1	38.5
Healthcare	24.1	42.1	33.8

Note: N = 200.
Source: data from the expert survey of 2023.

Assessment of the activities of regional development actors

In the course of conducting the social assessment to diagnose the state of national project implementation, it was also important to identify who the actors involved are and to evaluate their roles.

In order to determine the communicative space that has taken shape in the surveyed regions, an assessment was made of the composition of regional development actors who are directly involved in plans for implementing national projects – first, as the immediate implementers of various measures to carry out the national projects, and second, as participants in monitoring and evaluating the work done in implementing them.

The experts identified a list of regional development actors who are involved in the implementation of national projects in the regions. First and foremost, these are government bodies at various levels – federal, regional, and municipal. This very group of actors proved key in exerting influence not only on the execution of concrete work in carrying out the projects but also on the evaluation of the work performed and the quality of its execution. Within this group, however, there are particular nuances. The greatest responsibility for the execution of concrete work in implementing the national projects is borne primarily by the regional government bodies. Moreover, over the past three years the role of these structures has grown: whereas in 2020, 74% of experts pointed to regional authorities as the principal actor, by 2023 a full 82% assigned them the lead role in the implementation of national projects. They are also assigned the key role in assessing the quality of the work performed and in monitoring its execution (72%; *Tab. 3*).

This group of actors also includes federal government bodies. Unlike the regional authorities, they are more often assigned the role of curators who monitor the timelines and quality of the

Table 3. Actors of participation and control involved in the implementation of national projects as direct implementers, 2020 and 2023, % of respondents

Actor	Actors of participation		Actors of control	
	Total		Total	
	2020	2023	2020	2023
Federal government bodies	32.5	51.5	80.1	75.8
Regional government bodies	73.5	82.0	72.2	72.7
Municipal government bodies	72.8	73.0	39.7	48.0
Large businesses	37.7	39.5	7.9	8.6
Medium and small businesses	32.5	26.0	3.3	4.0
Academic and educational communities	22.5	25.0	9.3	12.1
Active citizens (the public)	23.8	26.5	35.1	24.2
Undecided	6.0	4.0	7.3	75.8

Note: N = 200 per year.
Source: data from the expert surveys of 2020 and 2023.

measures implemented under the projects. They are the leading actor in terms of monitoring the implementation of projects in the regions, and although by 2023 their role had slightly declined (from 80 to 76 p.p.), it remains dominant. The experts mentioned them considerably less often as the responsible implementers.

The municipal level deserves to be singled out separately. According to the experts, local government bodies, like regional ones, are the principal implementers of the national projects (73%); this figure did not change over the period under study. Of particular interest is the growing role of municipal authorities in monitoring the execution of concrete plans and measures in the course of project implementation: an increase in the indicator from 40 to 48 p.p. was recorded.

The remaining regional development actors are assigned a substantially smaller role in the implementation of national projects. Whereas the influence of large businesses and corporations in carrying out specific work was noted by 40% of experts (only 2% less than in 2020), only 8% pointed to them as a monitoring body. Small and medium-sized businesses exert an even smaller impact on the execution of national projects in the regions. Moreover, their role declined over the period under study, from 33 p.p. in 2020 to 26 p.p. in 2023, and only 4% of experts selected them as a monitoring body.

The least involved in the implementation of national projects are academic and educational communities (universities, higher education institutions, research organizations, etc.). Their substantial contribution to project implementation was rated by only 23–25% of experts, and their activity as a monitoring body is rated even lower, although it did increase slightly – from 9 p.p. in 2020 to 12 p.p. in 2023.

The influence of public organizations and active population groups on the implementation of national projects calls for a separate discussion. As might be expected, this group of regional actors is assigned the function of public oversight of the progress of national project implementation. However, over the period in question their influence has declined significantly – from 35 to 24 p.p. The majority of experts do not see public organizations as a real participant in the execution of concrete work: roughly one-quarter point to this function, and this indicator has not undergone significant change over the period – 24% in 2020 and 27% in 2023.

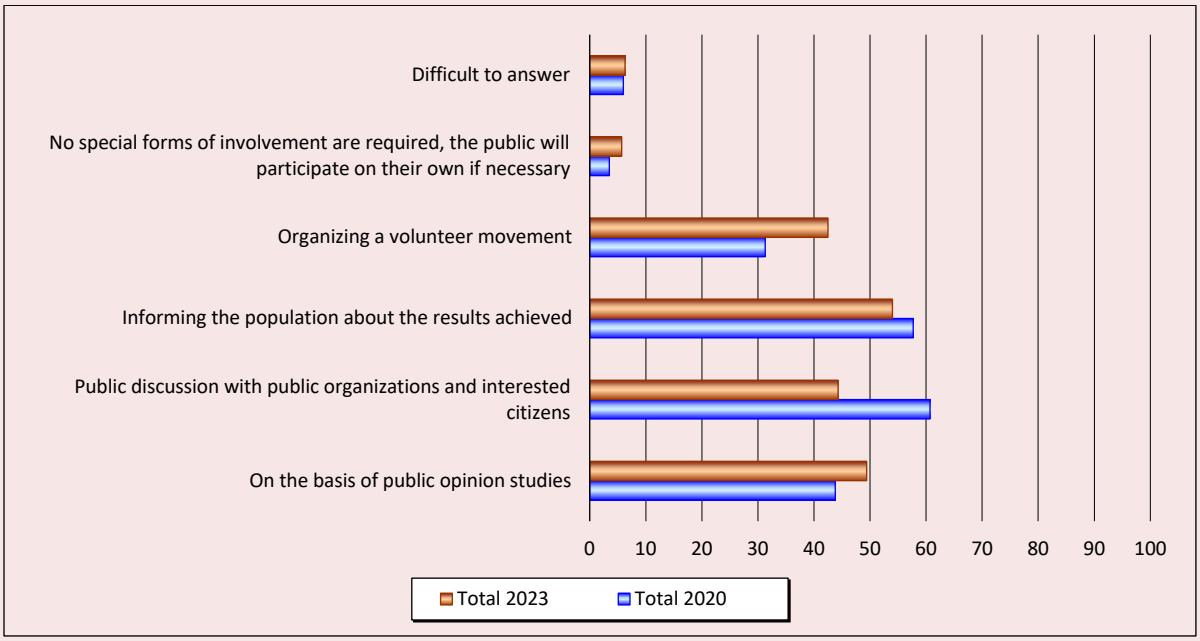
Thus, government bodies at various levels have been and remain the dominant actor in the implementation of national projects: they assume the role of the key player both in carrying out the work and in evaluating and monitoring the progress of its implementation. Public oversight, meanwhile, is beginning to lose its standing; its role is markedly declining. Some cautious optimism may be drawn from the modest but nonetheless discernible increase in the influence of academic and educational organizations on the implementation of projects in the regions.

Means of interaction between the authorities and the public in the framework of national project implementation

In order to assess the social consequences of national project implementation, it is important not only to identify the actors exerting influence on this process but also to establish the specific channels, forms, and means of their communication. Having identified the key actors, we can delineate the circle of persons involved in communicating about emerging problems. In this connection, it was important to identify and analyze the existing methods, means, and channels of interaction between the authorities, as the key player in implementing the national projects, and the region's population, as their ultimate consumers.

The experts view the authorities' efforts to organize and maintain communication with the public as both important and appropriate. Only 5.7% of experts believe that such activity is unnecessary because the public, if need be, will

Forms of involving the region's population in the implementation of national projects, 2020 and 2023, % of respondents



Note: N = 200 per year.

Source: data from the expert surveys of 2020 and 2023.

take the initiative on its own (*Figure*). The findings of the study indicate that various channels of communication between the authorities and the public exist in the regions and are being actively used. Moreover, these channels have experienced slight growth over the period under study. Most often, the experts singled out methods of informing the public about the progress of national project implementation (in the range of 54–57%).

A significant share of the experts also pointed to public discussions with civil society organizations and concerned citizens about problems associated with the implementation of national projects as an important communication channel. And although their share declined from 61 to 44 p.p. between 2020 and 2023, this form of interaction with the public remains popular. Possible explanations for the decline may include a shift toward interactive methods of communication and circumstances related to the pandemic, as the experts themselves have repeatedly noted. A highly widespread form of interaction in the regions remains the traditional one of public opinion polling. Its use (unlike that of public discussions) grew somewhat over the period under study – from 44 to 49 p.p. A similar trend emerged with respect to the organization of volunteer movements: whereas in 2020, 31% of experts noted this form of interaction, by 2023 a full 43% of experts mentioned it.

The finding that online sources (90% – official government websites, online forums, social media, etc.) represent the optimal channel for providing information about the progress of national project implementation is among other important conclusions that can be drawn from the analysis of expert assessments regarding the means of communication between the authorities and the public. Television is the second most important source of information (62%). Personal experience and observation rank third (41%).

Informal channels for obtaining information about the progress of project implementation in the regions proved to be in much lower demand. For example, such sources of information as conversations with co-workers, inquiries to the administration at one's workplace, and discussions within the family, with neighbors, or with acquaintances were indicated by only 16% of experts. This fact may indirectly suggest that the public needs more official information about the projects.

We should single out one particular means of interaction: the work of government and administrative bodies on social media. It is noteworthy that in 2020, according to 60% of experts, a lack of feedback was observed between the public and the government bodies represented by specialized online communities (Tikhonov et al., 2021). The analysis for 2023, however, showed that the regional government communities regularly conduct surveys on national projects on their social media pages. Whereas previously this had been characteristic only of the Education national project, it has now also become relevant for the Housing and Urban Environment and Healthcare projects. Alongside this, announcements are made about open public discussions on the problems of the Housing and Urban Environment and Safe and High-Quality Roads national projects. A "Q&A" section has appeared on the official pages of government bodies, where residents receive answers from the relevant authorities to their comments.

According to the experts, despite the observed expansion in the use of structural elements of communicative interaction with the public across the regions (information provision and discussion), these elements on the whole do not yet yield a sufficient result in terms of the targeted and broader involvement of the public in the implementation of national projects. The experts note that at present the public remains insufficiently informed and insufficiently engaged in the implementation of the national projects.

Comparative analysis of economic and social indicators for assessing the implementation of national projects

National projects, by design, represent a state-level approach to implementing the strategic development goals of the Russian Federation in its regions. First and foremost, they are key mechanisms for technological and socio-economic development. In this connection, it was important to compare the official results of national project implementation – as expressed in state statistical indicators – with the opinions of experts from the regions. This also made it possible to assess the instrumental and substantive capabilities of social assessment.

The assessment of national project implementation in the regions is carried out by the Government of the Russian Federation using a specially developed methodology that encompasses three assessment dimensions. The first evaluates the volume of measures that have been carried out relative to the plan. This dimension examines the tangible indicators of plan implementation. The second assesses the financial expenditures on project implementation and calculates the percentage of funds spent relative to the planned sum. The third assessment dimension involves the analysis of feedback data, which is carried out according to a methodology developed by the government. A special Analytical Center under the Government of the Russian Federation is already monitoring the implementation of national projects using this methodology. However, we were unable to find publicly available data on its portal. We encountered the problem of government bodies being closed off from public scrutiny in the matter of national project implementation. The only accessible indicator turned out to be the level of budget execution for the national projects (the second assessment dimension in the methodology). It is constructed as the percentage of financial resources spent relative to the planned figure. As of October 2023, the following level of budget execution had been achieved in the subjects under consideration (*Tab. 4*).

Table 4. Assessments of the progress of national project implementation: official and expert versions, 2023, % of respondents, points

National project	Indicator	RF	Sverdlovsk Region	Republic of Bashkortostan	Vologda Region	Smolensk Region
Healthcare	Official % of budget execution	59.60	66.42	51.56	82.96	43.38
"5" – very high, "4" – high, "3" – medium, "2" – low, "1" – very low	Subjective assessment of implementation	3	3	4	3	3
"4" – very successful, "3"– broadly successful, "2" – rather unsuccessful, "1" – unsuccessful	Subjective assessment of future implementation	2	3	3	2	2
Education	Official % of budget execution	64.09	76.91	70.31	94.57	49.90
"5" – very high, "4" – high, "3" – medium, "2" – low, "1" – very low	Subjective assessment of implementation	3	3	4	3	3
"4" – very successful, "3"– broadly successful, "2" – rather unsuccessful, "1" – unsuccessful	Subjective assessment of future implementation	2	3	3	3	2
Housing and the Urban Environment	Official % of budget execution	56.36	44.21	57.40	53.61	30.78
"5" – very high, "4" – high, "3" – medium, "2" – low, "1" – very low	Subjective assessment of implementation	3	4	4	3	4
"4" – very successful, "3"– broadly successful, "2" – rather unsuccessful, "1" – unsuccessful	Subjective assessment of future implementation	2	3	3	3	3
Safe and High-Quality Roads	Official % of budget execution	77.86	88.95	80.77	85.80	93.22
"5" – very high, "4" – high, "3" – medium, "2" – low, "1" – very low	Subjective assessment of implementation	3	4	3	3	4
"4" – very successful, "3"– broadly successful, "2" – rather unsuccessful, "1" – unsuccessful	Subjective assessment of future implementation	2	3	3	3	3

Note: N = 200. Sources: Official statistical information on the indicators of socio-economic development of the Russian Federation required for monitoring the achievement of national project indicators. Rosstat. Available at: https://rosstat.gov.ru/folder/53175 (accessed: July 25, 2024); Research report under the state assignment «Remote Social Expertise as a Form of Public Communication in the Implementation of National Projects», 2023, expert survey in four constituent entities of the Russian Federation (Vologda, Smolensk, and Sverdlovsk regions, Republic of Bashkortostan), 200 experts surveyed.

It was important to assess just how optimistic the perceptions of the effects of national project implementation are among representatives of government bodies (official statistical data and the opinions of regional experts) and whether they coincide with the assessments of the expert group recorded through the social assessment exercise.

The official percentage of budget execution as of October 2023 for all projects stood at just 68.8%[11]. In the Smolensk Region and the Republic of Bashkortostan it was the lowest – 64.0 and 65.6%, respectively (see Tab. 4). In the Sverdlovsk and Vologda regions it was somewhat higher – 69.7 and 75.3%.

[11] Budget expenditures on national projects as of October 1 amounted to 1.991 trillion rubles. Available at: https://tass.ru/ekonomika/18954283 (accessed: 21.07.2025).

The Healthcare project had been implemented across Russia as a whole to the extent of 60%. In the Vologda Region the percentage of budget execution is comparable with the indicators of the leading regions (the cities of Moscow and Saint Petersburg) and is far higher than the average percentage of execution across Russia. The experts, however, noted only a medium level of project implementation quality (me = 3). According to the experts' subjective perceptions, the ultimate effect of the project will be minimal. In the Sverdlovsk Region the percentage of implementation is above the national average but below that of the leaders – 66.4%. The experts likewise rate the quality of project implementation at a medium level (me = 3), but they are confident that the project will be implemented rather successfully (me = 3). In Bashkortostan the percentage of execution is below the national average (51.6%), but the experts note a high level of project implementation (me = 4), and they have hope that it will be completed successfully (me = 3). The implementation of the project in the Smolensk Region is the worst (43.4%); the experts rate it as middling, but they have no confidence in its successful completion (me = 2).

The Education national project has been implemented to the extent of 64% overall. In the Vologda Region it has been implemented almost to the end – 94.6%, a value higher than in the leading regions. The experts rate the level of project implementation as medium and hope that the project will be implemented successfully. In the Sverdlovsk Region and Bashkortostan the percentage of implementation is above the national average and is comparable with the indicators of the leading regions (76.9 and 70.3%). The experts rate the implementation of the national project at a medium level in the Sverdlovsk Region (me = 3) and at a high level in Bashkortostan (me = 4). The experts in both regions are confident of success. In the Smolensk Region the percentage of implementation is below the national average (49.9%). The experts' assessment of project implementation is satisfactory (me = 3), but they have no confidence in ultimate success (me = 2).

The Housing and Urban Environment national project has been implemented to the extent of 56.4%. In Bashkortostan the percentage is slightly higher – 57.4% – but it falls short of the leaders' indicators. However, the experts note a high level of project implementation (me = 4) and are confident that it will be completed successfully (me = 3). In the Vologda Region the percentage is below the national average – 53.6%. The experts are satisfied with its implementation at a medium level, but there is hope for success (me = 3). In the Sverdlovsk and Smolensk regions the percentages are low – 44.2% and 30.8% – but the experts rate the implementation of the project highly (me = 4) and are confident of success (me = 3).

The Safe and High-Quality Roads project has been implemented to the extent of 77.9%. In the regions examined, implementation is higher and is comparable with that of the leaders. In the Sverdlovsk and Smolensk regions it stands at 89.0 and 93.2%. The experts give the quality of implementation a high rating (me = 4) and are confident of success (me = 3). In the Vologda Region and Bashkortostan the implementation figures are 85.8% and 80.8%. The experts rate the project at a medium level (me = 3) but are confident it will end successfully (me = 3).

Summing up the comparison of assessments of national project implementation based on the financial criterion and on expert opinions, we can say that the implementation of the projects we have examined is in a satisfactory state. This is evident both from official data and from the expert assessments. However, a partial discrepancy was detected between the assessments based on the financial criterion and the expert opinions: higher assessments from the experts were recorded in the presence of comparatively low official ratings of budget execution. One may hypothesize that the experts place greater value on the quality of the effects obtained from project decisions on the

ground than on the quantitative values of financial and economic indicators for individual regions and for the country as a whole.

Conclusions and discussion

The key task of the monitoring of national projects that we conducted was to assess the social consequences arising from the implementation of project decisions. The system of indicators specially developed for this task made it possible, first, to evaluate specific areas (in our case, the assessment of the implementation of four national projects), and second, to capture an emerging trend over a certain period of time. As the findings indicate, a positive trend has now taken shape with respect to the strengthening of the social effect of national project implementation in the regions.

The results of the expert survey lead to the following conclusions. The actions of government bodies at various levels (from municipal to federal) are rated most highly in terms of the nature of their participation (implementation, oversight) and their contribution to the implementation of the national projects. The degree of influence of the remaining actors and the level of approval of the work they have done are rated considerably lower. The dominance of the role of governance structures is, in the experts' view, largely justified, since their leading role in the implementation of national projects provides an impetus for carrying out the tasks set out in the plans.

The role of the local population as the primary beneficiary (consumer) of the national projects remains, for the time being, confined to public observation and, to some extent, oversight. And although the situation concerning interaction between the authorities and the public and the involvement of the latter in the implementation of national projects is improving, it is still far from ideal. A system for disseminating information about the national projects has been created in the regions, but it differs in the level of development of its forms and scale of coverage and is in need of further development and greater effectiveness.

The comparative analysis of subjective (expert) and objective (financial) indicators of national project implementation has uncovered an important problem – the insufficiency of publicly available data, which generally affects the understanding of how well the social effects of project decisions are being achieved. Given that only one indicator – the level of budget execution for national projects (one of the three assessment dimensions in the Government of the Russian Federation's evaluation methodology) – is publicly available, it was possible to establish the level of project implementation as satisfactory. However, the resulting snapshot could be of greater value for assessing the consequences of the decisions being implemented, particularly if data on the volume of measures carried out relative to the plan, as well as the feedback data organized by the Government of the Russian Federation, were also available for analysis.

It has been established that an important characteristic of effective (successful) monitoring lies in overcoming the subjectivity of expert assessments, which entails adhering to a valid selection of experts based on the criterion of their involvement in the development and implementation of the national projects and their awareness of the quality with which organizational measures and project decisions are being executed. The quality and significance of monitoring also depend on the regularity with which the social consequences of project decisions are recorded, so as to enable timely and prompt responses. In order to enhance the verification and comprehensive analysis of the data obtained, the results of mass population surveys can also be employed. On the whole, though, the proposed toolkit constitutes an important source of information for the timely adjustment of managerial (project) decisions.

Assessing the social results (consequences and effects) of national project implementation in the regions is no less important than assessing its economic component. In our view, it should become an integral part of state monitoring –

more specifically, it should take the form of social assessment, which would make it possible to carry out project measures most effectively in accordance with the national goals set and the public's expectations. We should note that social assessment is a regularly repeated, comprehensive study (based on a combination of mixed methods) aimed at examining the social effects of the implementation of managerial decisions (social consequences) and the social processes triggered by these actions.

Even today, the pilot testing of social assessment as a basis for the comprehensive studies conducted by the Center for Sociology of Management and Social Technologies of the Institute of Sociology FCTAS RAS points to both the possibilities it opens up and the positive effects it can yield for state monitoring (Bogdanov, Pochestnev, 2024b; Rossiya..., 2017; Tikhonov et al., 2021). Specifically: first, it becomes possible to draw more substantiated conclusions about the state of, and changes in, the socio-economic situation arising from the implementation of national projects in the regions; and second, it provides grounds for a balanced assessment of the necessary adjustments to be made and the further actions to be planned.

On the whole, social assessment can be viewed as a standardized tool for evaluating the social effects of project and strategic decisions – a tool that has the variability of regions' socio-economic conditions and resource potential built into its very foundations. In our view, the proposed approach requires legitimation and the conferral of state (institutional) status upon social assessment, as well as the incorporation of its foundations into the state monitoring of national project implementation.

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Product Niches of the Region's Chemical Complex: Potential, Barriers, and Macroeconomic Effects

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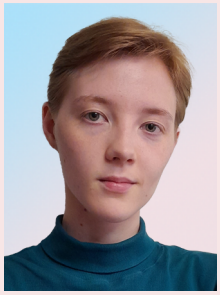

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Abstract. The global economy is undergoing a period of transformation, which is characterized by a deep recession, increased market volatility, instability of the financial system, a slowdown in the formation of new transnational production chains, and a decrease in investment flows. The technological foundation of economic activity is changing, and new sectors are emerging. For the Russian Federation, the harsh sanctions imposed by Western countries after the start of the special military operation in Ukraine are an additional deterrent to development. In conditions of external constraints and uncertainty, the issue of finding ways to develop domestic industry and organize new production facilities, taking into account national priorities, is acute. The latter include the structural transformation of the economy and an increase in its technological efficiency. It is important in this context to study the issue of identifying promising types of economic activity and areas for completing regional value chains in key areas of the national economy, one of which is the chemical industry. The purpose of the study is to identify and scientifically substantiate strategic niches for the development of the chemical complex in the region. Research objectives: to analyze the region's potential for the development of the chemical industry, identify product niches of specialization, identify barriers to their implementation and assess the effects of the development of selected areas. The Vologda Region was chosen as the object of research. The information base of the study consists of data from the Federal State Statistics Service and its territorial division in the Vologda Region, the Federal Agency for Subsoil Use, industry rating agencies, input-output tables of the Vologda Region for 2020, and information on companies' investment plans. An analysis of the potential showed that the Vologda Region has its own resources for the production of forest chemical products, and logistical capabilities allow organizing other chemical production using imported raw materials. However, the production and technological potential of the industry's enterprises is limited by capacity utilization and significant depreciation of fixed assets, and the innovative potential is not sufficiently developed. The strategic priorities of the regional chemical complex have been identified, including the production of fertilizers, composites and new materials. Potential niches of specialization are substantiated, such as the production of polymer-metal composites, polymers for additive technologies, phosphogypsum building materials and forest chemicals. The multiplicative effect of the impact on the gross regional product of the production development of the identified niches is calculated. The technological, economic, industrial and environmental barriers that hinder the implementation of the proposed priority areas are highlighted. The scientific novelty of the study lies in identifying niches of promising specialization for the Vologda Region chemical complex. The results of the study can be used by regional authorities to substantiate strategic directions of economic policy.

Key words: structural transformation, chemical complex, promising specialization, strategic niches, region.

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Introduction

The effects of the transformation of the global economy, the harsh anti-Russian sanctions imposed by Western countries after the start of a special military operation in Ukraine in 2022 were disruption of supply chains, restrictions on exports of goods to traditional markets, the departure of foreign companies, etc. These circumstances required manufacturers to take measures to adapt to the new market realities by transforming production chains, changing the structure of their products, and restructuring trade and logistics relationships. However, the problems outlined above are compounded by the export-oriented economic development model formed in the country, in which low-value-added products predominate (Porfir'ev et al., 2024). As a result, combined with tight monetary policy, which leads to a decrease in investment and business activity, the growth rate of the economy has slowed down.

The current situation is increasingly pressing the issue of finding sources of economic growth, primarily based on the development of industry, the organization of new industries, taking into account the needs of import substitution, the activation of the domestic market and the achievement of technological sovereignty. This is consistent with the strategic plans of the state, one of the key directions of which is the structural transformation of the economy, its transfer to a new technological basis. According to the Plan of Structural Changes in the Russian Economy until 2030[1], national priorities include increasing the level of technological development of the economy and achieving technological independence in key areas, among which the chemical industry occupies a special place, primarily the manufacture of new materials. At the same time, strategic documents set general development vectors, identify economic policy priorities represented by large industries, which actualizes the task of detailing promising economic activities to specific product niches.

It is important to study the issue related to the identification of promising types of economic activity and areas of completion of value chains through the formation of new industries at the regional level. The aim of the study is to identify and scientifically substantiate strategic niches for the development of the chemical complex in the region. As the object of research, we chose the Vologda Region, which has material, technological and financial potential, as well as undisclosed reserves for the modernization of chemical industries. It is important to solve the following tasks as part of the research objective:

– to conduct a comprehensive analysis of the Vologda Region's potential for the development of the chemical industry;

– to identify priority product niches of specialization;

– to identify key barriers to the implementation of the identified niches and assess the expected economic impact of the development of the selected areas.

Theoretical background of the research

In the context of the development of the national and regional economy, the issue of its structural and technological transformation has received wide discourse (Porfir'ev et al., 2024). Through the restructuring of the economy, its long-term growth is achieved, a new spatial structure is formed, and the added value produced increases (Mikheeva, 2024).

One of the key directions of the structural transformation of the economy is the development of value chains. Their contribution to the formation of economic dynamics, the relationship between involvement in the global economy and the development of the national economy is studied (Sayapova, Shirov, 2025). Experts pay special

[1] Plan of structural changes in the Russian economy until 2030 (approved by the minutes of the meeting of the Government of the Russian Federation 41, dated November 27, 2025).

attention to regional chains, their completion, and the possibilities of integrating enterprises into interregional and national chains (Lukin, 2025). In this context, the tools of input–output modeling have found wide application. It allows assessing the consequences of the implementation of structural policy, the dynamics of socio-economic development of the region (Ivanter, 2018), the involvement of the regional economy in the processes of the international division of labor. Researchers are developing statistical and dynamic models (Kurz, Salvadori, 2000), including those involving a block of investments (Sayapova, Shirov, 2019).

Researchers pay special attention to regional cross-industry models based on input–output tables. They are being developed in the USA (Boero et al., 2006), Brazil (Dietzenbacher et al., 2012), China (Jiang, 2011) and other countries. Similar studies are presented in Russia. One of the first models based on the System of National Accounts (SNA) was the Republic of Bashkortostan (Nigmatulin et al., 2006). Other examples are the Republic of Buryatia (Dondokov et al., 2014), the Kaliningrad Region, the Republic of Sakha, etc. A number of input–output tables, not only regional, but national, were proposed by specialists from the Institute of Economics and Industrial Engineering, Siberian Branch of the Russian Academy of Sciences and the Institute of Economic Forecasting of the Russian Academy of Sciences. They include inter-regional optimization, forecasting and analytical model complexes that allow coordinating macroeconomic and sectoral indicators, predicting the state of the economy in the medium and long term, etc. (Suslov, Suspitsyn, 2005; Suvorov, Balashova, 2009).

The use of input-output modeling makes it possible to determine the multiplicative effects of the development of economic sectors and the implementation of investment projects. The most significant are production and investment multipliers. The mechanism of the multiplier effect formation consists in initiating a change in the volume of final output or investment, which leads to an increase in production in related sectors and the economy as a whole, the formation of additional income and its redistribution in final demand. The calculations are based on the input–output tables (Suvorov et al., 2005), followed by the calculation of changes in value added across economic sectors. It is worth noting that the multiplier effect is influenced by transformations in the structure of the economy, which require adjustments to the cost coefficient matrix, as well as the structure of demand (Sayapova, Shirov, 2019).

Research involving input–output is also being conducted for the Vologda Region (Ilyin et al., 2021). The author's team from the Vologda Research Center of the Russian Academy of Sciences concluded that the region is deeply integrated into national and global value chains, but at the same time, the region's position in the Russian supply chains is deteriorating. The distance from the last links of the chain and from the final consumer, associated with an increase in the supply of intermediate goods, is cited as a factor constraining the development of the Vologda Region. The result is a decrease in resource efficiency, a reduction in income generation opportunities and an increase in added value.

Thus, the priority areas for the development of the regional economy should be to increase the degree of processing of domestic and imported resources, eliminate "gaps" and lengthen of value chains. The results will be an increase in the incomes of economic agents, increased domestic consumption, increased demand for innovation, expansion of capacity and qualitative transformation of the engineering, educational, transport and financial services market (Nikitenko, Goosen, 2017; Lukin, 2023). At the same time, it is worth noting that there is a need to localize high-income CSR units in the region (Pilyasov, 2018).

For the transformation of production and distribution chains and, as a result, the implementation of structural changes in the economy, it is necessary to determine the current and future economic specialization of the region (Lukin, 2023). The basic sectors for the formation of promising specialization and modernization of the Vologda Region economy are agro-industrial and timber complexes, metalworking and mechanical engineering, as well as the chemical complex. They have a certain industrial, scientific, technological and innovative reserve for the development of national value chains (Lukin, 2025).

The chemical complex is one of the leading sectors of the heavy industry. It contributes not only to the development of productive forces, but also to strengthening the state's defense capability and ensuring the vital needs of society (Malyshev, Pechenskaya-Polishchuk, 2024). Its distinctive feature is its connection with many industries, since most segments of the national economy are consumers of its products.

The chemical industry is described as a driver of economic growth in the country and the region (Shirokova, 2021), with the potential to become the flagship of the Russian industry (Malsagov, 2022). In particular, the market of mineral fertilizers is considered to be one of the most promising markets in terms of development in the near future (Malyshev, 2024). This is due to the fact that this industry ensures food security not only for the country, but also for the whole world, since Russia is one of the largest suppliers of fertilizers (Bogachev, Dorofeeva, 2022).

The issue of the specifics of the functioning of the chemical complex under the conditions of sanctions has received wide discourse in the scientific community. They led to an increase in prices for the industry's products, especially for ammonia and fertilizers, disruption of logistics supply chains, a decrease in exports and imports, a decrease in the availability of investments, etc. (Ashinova et al., 2022; Smagulova, Fetisova, 2023). Due to the sanctions blocking access to foreign equipment, technologies and components, the problem of import substitution has become more acute for some chemical industries. Researchers note that the development of the chemical complex is hindered by an insufficiently favorable business climate in the industry, lack of transparency in the distribution of government subsidies for production, as well as high bureaucratic barriers when applying for subsidies or grants (Provorova, Zhemerikin, 2020). Scientists at the Oryol State Agrarian University named after N.V. Parakhin emphasize the need to improve the material and technical base and government support measures for the industry, in particular chemical fertilizers, the production of which has been particularly affected by sanctions (Bogachev, Dorofeeva, 2022).

The publications of the Vologda Research Center of RAS examine large chemical industry corporations. Aspects such as the formation of financial results (Malyshev, 2024), production indicators and their analysis (Kopytova, 2017) are being studied. The research block is devoted to assessing the financial interaction of enterprises with the state, their role in generating revenues for the budget system (Malyshev, 2023). The trends of export-import relations (Malyshev, Pechenskaya-Polishchuk, 2024), environmental protection activities of large Russian producers of mineral fertilizers (Malyshev, 2025), and the impact on the development of regional economies (Razgulina, Barabanov, 2014; Razgulina, 2015) are studied.

A number of studies have identified promising specializations in the Vologda Region, including in the chemical complex. For example, the production of basic chemicals is named among such industries (Rumyantsev, 2023). The identification of promising specializations is based on the author's methodology, which is based on an integral score composed of assessments of the following components of

the industry's functioning: its efficiency, market potential, innovation activity and patent security. The export priorities of the Vologda Region are determined based on the calculation of the index of revealed comparative advantages (Balassa, 1965) within the framework of the concept of economic complexity (Hausmann, Klinger, 2006; Hidalgo, et al., 2007). These include nitrogen and complex chemical fertilizers (Cheplinskite, Lukin, 2024). The centers of regional specialization of the Vologda Region have also been identified. They represent potential clusters of sectoral development, the most significant of which for the region is the cluster uniting the metallurgical and chemical industries. In the latter, the main chemical production and the manufacture of rubber and plastic products are identified as promising industries (Danilova et al., 2021).

Thus, the chemical complex is characterized by a number of problems, the solution of which is possible through the search and development of new industries in the region. Different methods are used to identify them, but in the presented works, the proposed industries focus on the main chemical industries, the manufacture of rubber and plastic products, and less often fertilizers. It is necessary to form methodological tools aimed at finding and substantiating narrower niches of specialization.

Materials and methods

This study uses an approach to the selection of specialization niches developed with the participation of the authors (Glazyev et al., 2025). It determines the prospects of a niche based on compliance with a number of selected criteria.

1. Compliance with global macro-trends in the industry: economic, social, and demographic. For example, an increase in the rate of urbanization leads to an increase in the production of packaging materials from polymer products. As a result of the substitution of traditional materials with polymer ones, it becomes necessary to increase the production of the latter.

2. The presence of a fast-growing product market: the growth of a promising niche is assessed through the study of analytical reports from various industry agencies, such as mordorintelligence.com, precedenceresearch.com and others.

3. Compliance with global technological trends. They are met by products that are required to implement global trends, including cross-industry ones (for example, digitalization, robotics, etc.), or are an innovative industry product.

4. Compliance with the strategic plans of the state, determined on the basis of an analysis of the sectoral development strategy and other documents indicating which products and technologies the state plans to develop.

5. The need for import substitution.

6. Availability of the region's raw material base.

7. Availability of existing production facilities, determined based on their search for both large product groups and technologically similar products.

8. Availability of energy resources.

9. Availability of logistical opportunities for the production and sale of finished products.

10. Compliance with the plans of major players in the industry. It is based on an analysis of reports and strategic plans of companies of major players in the industry, primarily PhosAgro enterprises.

11. Availability of technological competence centers. It is conducted through the database of the TC NTI centers, and a university or an enterprise with a similar unit can also act as such a center[2].

12. Availability of training opportunities in the region, based on the assessment of educational programs of higher and secondary educational institutions of the region.

13. Lack of competitive industries in the country. The analysis according to this criterion includes an assessment of the availability of analog production

[2] NTI competence centers. National Technology Initiative Foundation. Available at: https://nti.fund/support/centers/ (accessed: 02.02.2026).

facilities in the country through a search on special sites, for example, "Sdelano u nas" (Products of our own production). Products with pronounced competitive advantages also meet this criterion.

The assessment of the macroeconomic effects of the development of promising niches in the region is based on an approach using the input–output methodology (Miller, Blair, 2009) and the theory of production multipliers (Ksenofontov et al., 2018).

It is necessary to apply an input–output approach based on input–output tables (input–output balances) to quantify these effects. The methodology is based on V.V. Leontiev's static model, which makes it possible to calculate the multipliers of output, gross value added (GVA), investment and employment.

The regionalized symmetrical input–output table of the Vologda Region (the base is 2020) was used for calculations in the context of 35 enlarged industries. The matrix of intermediate consumption, the vectors of gross output and final demand (adjusted for imports and inter-regional trade) were calculated based on the SNA data for the Vologda Region. The shares of value added, taxes, and wages in the output of industries are from the third quadrant of the input–output balance.

The calculation algorithm is as follows.

A matrix of direct cost coefficients is constructed $A = [a_{ij}]$:

$$a_{ij} = Z_{ij} / X_j,$$

where a_{ij} – the coefficient of direct material costs, which shows how much output of industry *i* is needed to produce a unit of gross output of industry *j*;

Z_{ij} – costs of industry *i* products in sector j;

X_j – gross output of the industry *j*.

The total cost matrix (Leontiev matrix) is calculated:

$$B = (E - A)^{-1},$$

where E – the identity matrix.

The element b_{ij} shows how many rubles the output of industry *i* will increase with an increase in the final demand for products of industry *j* by 1 ruble.

3. For Chemical Industry, column *B* of the matrix is used to calculate multipliers:

– the total effect of the release is equal to the sum of the elements of column *j* (chemical production);

– the indirect effect is equal to the full effect minus the direct effect;

– the induced effect is estimated separately through the re-expenditure of income (wages, taxes, profits) using the elasticity coefficients of household consumption and budget expenditures.

Within the framework of this study, a scenario modeling of the production and resource potential of the Vologda Region has been carried out, which is changing as a result of the development of the proposed specialization niches in the chemical complex. The full multiplicative effect of the Vologda Region GRP is considered. Its calculation is performed by multiplying the cost volumes of the chemical complex by production multipliers. The latter are calculated based on data from the regionalized input–output table for the Vologda Region for 2020.

The forecasting of the output of the chemical complex as a whole until 2030 and for the future until 2040 was carried out within the framework of two scenarios: inertial and target. Within the framework of the first, the retrospective trends of 2017–2023 were extrapolated, while the second was based on the target levels of industry output approved in national development plans, taking into account existing restrictions on production capacity.

Within the framework of the inertial scenario, the stagnating dynamics of the region's economy and an increase in the production of low-value-added products are being laid. The growth in the chemical complex is provided by the export

of fertilizers, but the emerging growth rates are insufficient to become a key driver of the economy. The calculations were based on the volume of products shipped at comparable prices in 20203.

The target scenario implies the dynamic development of the economy in the context of an investment breakthrough, where growth rates reach 15–20% per year, the formation of the core of a new technological structure and the achievement of national development goals. The growth rates of production of fertilizers, rubber and plastic products, as well as other chemical products correspond to those laid down in the innovative scenario for the development of the Russian chemical complex (according to the Strategy for the Development of the Chemical and Petrochemical Complex for the period up to 2030).

The model is based on the basic equation of the input–output balance, the equation was used in the modeling:

$$(E - A)^{-1} * Y = X,$$

where E – the identity matrix;

$(E - A)^{-1}$ –matrix of total cost coefficients.

Based on the obtained matrix dependence, it is possible to calculate what the volume of sales of X in all sectors of the economy should be if it is planned to change the end use of Y, i.e. the full costs are calculated.

Based on the data from the table of use of goods and services, the direct cost matrix is calculated. For this purpose, the share of direct costs F_{ij} in the volume of output X_j is determined:

$$a_{ij} = F_{ij} / X_j.$$

Next, the total cost matrix $B = (E - A)^{-1}$ is calculated. The element b_{ij} of the matrix B characterizes the need for the gross output of industry i, which is necessary to obtain a unit of the final product of industry j in the process of material production. The total cost matrix B multiplied by the planned end-use vector Y equals the gross output of all industries X:

$$x_i = f(y_1, y_2, y_3 \ldots, y_n) = \sum_{j=1}^{n} b_{ij} y_j.$$

The execution of this algorithm allows obtaining the vector X (gross output) for each industry. However, to predict the dynamics of end-use items, it will be necessary to calculate the values of the Y vector, which includes components such as household consumption, investment, exports, etc.

To calculate the rate of change of individual elements y_j of the end-use vector Y, the formula is used:

$$y_j = fc_j * w_j^{fc} + ga_j * w_j^{ga} + ge_j * w_j^{ge},$$

where fc_j – dynamics of final consumption;

ga_j – dynamics of gross accumulation;

ge_j – dynamics of net exports;

w_j^{fc}, w_j^{ga}, w_j^{ge} – share of relevant elements in the end-use structure.

This decomposition is applied due to the fact that individual elements of end-use can be predicted more accurately using indirect statistics: for example, changes in population and income levels for end-use, dynamics of investments in fixed assets for gross accumulation, demand for key goods and price changes for net exports (Rumyantsev, Lukin, 2024).

Within the framework of the study, the shares in the end-use structure were averaged based on retrospective dynamics (forecasting structural proportions is considered as the development of the model complex and the research area as a whole), while the dynamics of indicators in the industry context is an exogenous variable of the model and is calculated taking into account retrospect and expert assessments.

[3] A more detailed description of the scenarios is presented in (Glazyev et al., 2025).

The limitation of the study consists in evaluating the multiplicative effects without detailed financial modeling of each niche of specialization, as well as performing calculations based on data for 2020.

The information base of the study included data from industry rating agencies, the Federal State Statistics Service and its territorial division in the Vologda Region, the Federal Agency for Subsoil Use, the input–output tables of the Vologda Region for 2020, as well as information on investment plans of companies and strategic acts of the state.

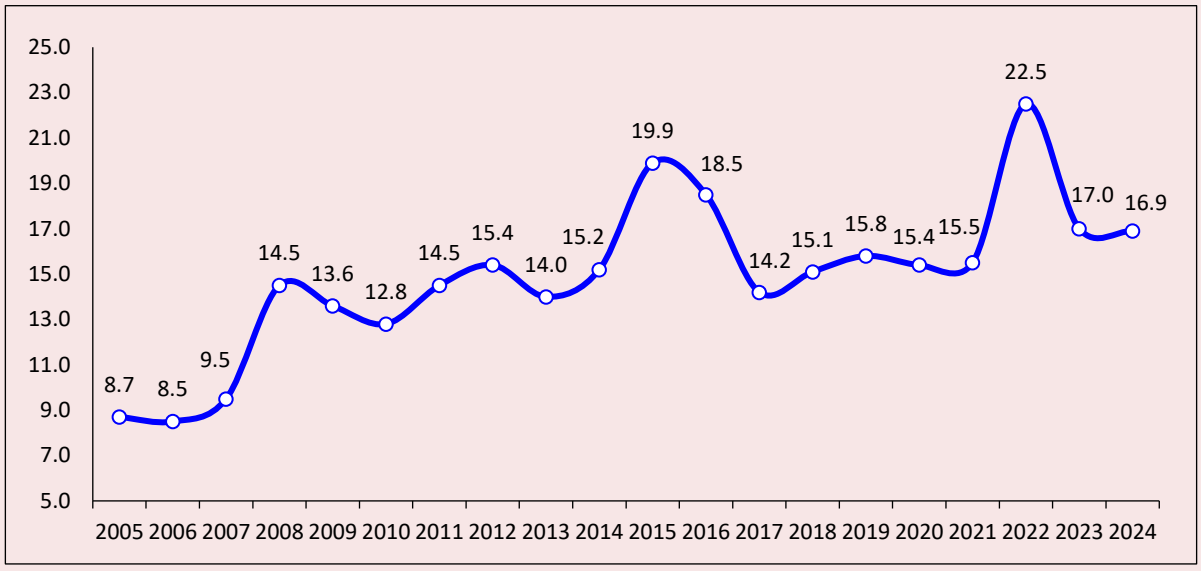
Analysis of the potential for the development of the chemical industry

The chemical industry is the most important branch of the Vologda Region economy. Its share in the total volume of shipped products in the region in 2024 was 16.9%. Compared to 2019, it increased by 1.1 percentage points, and has almost doubled over the past twenty years (*Fig. 1*). The industry's contribution to the region's tax revenues is also very high. Thus, by the end of 2023, the taxes of industry enterprises in the total tax revenues of the region amounted to almost 9%.

The main products of the chemical industry in the region are phosphorus-containing mineral fertilizers produced by PJSC PhosAgro. The raw materials for them are apatite-nepheline ores extracted from the Khibinsky deposit in the Murmansk Region. The mining and processing plant of JSC Apatit produces apatite concentrate, which is then supplied to the Vologda Region4. In other words, the phosphorus-containing raw materials are located outside the region, but the developed infrastructure and logistics links have made it possible to establish a "raw materials – processing" scheme.

The Vologda Region has reserves of minerals such as fluxed limestones, peat, building materials, expanded clay and pottery clays, etc. (*Tab. 1*). Their main consumers are construction and metallurgical

Figure 1. Share of the chemical industry in the total volume of shipped products in the Vologda Region in 2005–2024, % of the total



Source: own compilation based on Rosstat data.

[4] Kirov branch of JSC Apatit. PhosAgro. Available at: https://www.phosagro.ru/about/holding_kirovsk/ (accessed: 04.02.2026).

Table 1. Mineral reserves of the Vologda Region

Group and type of mineral	Units of measurement	Stocks	% of reserves in the federal district	% of reserves in Russia
Solid combustible fuels				
Peat	Thousand tons	3127781	39.7	16.8
Building materials				
Construction sands (man-made)	Thousand m^3	122727	6.6	
Brick and tile raw materials	Thousand m^3	52779	11	0.9
Other minerals				
Mineral paints	Thousand tons	138,7	3.6	0.4
Carbonate rocks for lime firing	Thousand tons	52125	14	1.9
Carbonate rocks for chemical soil reclamation	Thousand m^3	12768	25.7	3.6
Expanded clay materials	Thousand tons	5663	7.5	0.4
Source: data from the Federal Agency for Subsoil Use.				

industries, but a number of resources can also be used in chemical production. For example, by chemical processing of peat, components of the feed mass can be produced for the needs of agriculture.

Oil, associated gas and natural gas are definitely important sources of raw materials for the chemical industry. The Vologda Region does not have its own reserves of these critically important minerals, but a branch of the Yamal – Europe main gas pipeline runs through the region on the Ukhta – Gryazovets – Vyborg section. The design capacity of the gas pipeline is about 55 million m^3 per year[5]. Natural gas can be considered as a raw material for expanding the range of chemical products produced in the region.

The Vologda Region is rich in forest resources, which are widely used primarily in the timber chemical industry. The region has extensive timber reserves, reaching about 1.6 billion m3. This volume can provide raw materials for the industry in the long term, taking into account the renewable nature of this resource. Its other advantage is that its use can contribute to the development of the economy in local territories by creating jobs in the forestry industry and related sectors, bringing additional economic and social benefits to the region.

Thus, chemical production in the Vologda Region is carried out mainly on the basis of imported raw materials, which is facilitated by a well-developed transport network and stable logistics links with other regions. Raw materials for potential small- and low-tonnage chemical projects can be supplied from the European part of Russia via the Transsib and North – South railway transport routes.

The region is also rich in water resources. There is a dense river network, many lakes and a number of reservoirs on its territory. This factor is especially important in the location of water-intensive chemical industries, primarily polymer ones.

The region's energy resources provision is estimated as average. Since the region's energy system is in short supply in terms of electricity and capacity, its production is carried out by its own generating sources of large enterprises. These include, for example, the Nyuksen linear production management of main gas pipelines, branch of Gazprom Transgaz Ukhta LLC, and the Jubilee linear production management of main gas pipelines, branch of Gazprom Transgaz Ukhta LLC.

[5] Gryazovets – Vyborg main gas pipeline. Gazprom Invest. Available at: https://invest.gazprom.ru/about/projects/seg/ (accessed: 04.02.2026).

An analysis of the degree of utilization of the main production facilities suggests that the Vologda Region chemical complex has the potential to accelerate the growth rate of key products. In the production of a number of products, capacity utilization has almost reached 100% (*Tab. 2*). This applies to ammonia, oleum, sulfuric acid and fertilizers. This situation is due to the high demand for these products, primarily on the foreign market. Underutilization of capacities for two types of products, plastics and bricks, ranges from 35 to 43%. The reasons for this are insufficient demand for these products on the domestic market and the disruption of production chains in the Russian economy, which has resulted in manufacturers focusing on exports. Supplies come from low-grade products, while imports are high-value-added end products made from Russian raw materials.

The implementation of the production potential of the region as a whole and the chemical complex in particular, and the increase in economic growth rates depend on the state of production assets. The degree of their wear exceeds 50% for a number of products of the complex, primarily non-metallic mineral products and chemicals (*Tab. 3*). In recent years, there has been a tendency to increase the degree of wear of funds used in the manufacture of chemicals, and to a slight decrease in two other industries. The potential threat of loss of the material and technical base is created by high wear of machinery and equipment, which exceeds the average for all fixed assets. This is due to the high import dependence on investment goods and the sanctions imposed, which limit the ability to purchase new machinery and equipment, along with technologies and components for the production of chemicals (Smagulova, Fetisova, 2023).

At the same time, new production facilities are being gradually introduced. The renewal coefficients exceed the liquidation coefficients (*Tab. 4*), which indicates the gradual replacement of fixed assets with new ones. However, the renewal of funds in the industry of production of other non-metallic mineral products is proceeding at a slow pace, in the production of rubber and plastic products, the value of the indicator for 2024 decreased by almost 20% compared to the previous one. The production facilities being repaired and re-commissioned are characterized by accelerated physical wear and obsolescence.

Table 2. Level of utilization of the average annual production capacity of organizations for production of certain types of products in the Vologda Region in 2019–2024, %

Products	2019	2020	2021	2022	2023	2024
Production of chemicals						
Oleum, sulfuric acid	98.2	94.0	99.4	97.3	99.0	96.2
Ammonia	98.5	99.2	98.9	98.3	97.9	99.5
Phosphorous fertilizers	96.2	93.5	92.4	93.4	98.2	94.0
Plastics in primary forms	56.2	54.1	63.6	58.7	61.3	64.9
Production of other non-metallic mineral products						
Glass bottles	97.6	99.0	92.4	94.6	93.7	97.8
Building brick	56.0	60.0	56.4	66.7	60.8	57.1
Products made of cement, concrete or artificial stone	38.6	41.2	42.3	54.2	35.1	33.5
Source: own compilation based on Vologda Statistical Office data.						

Table 3. Degree of depreciation of fixed assets of the Vologda Region in 2019–2024, % of the total book value

Products	2019	2020	2021	2022	2023	2024
Chemicals and chemical products	40.9	54.2	55.1	55.9	57.6	59.4
Rubber and plastic products	80.1	82.2	71.8	51.5	42.0	41.9
Other non-metallic mineral products	68.0	67.4	60.4	61.2	67.0	65.3
Source: own compilation based on Vologda Statistical Office data.						

Table 4. Renovation of fixed assets in the Vologda Region in 2019–2024, %

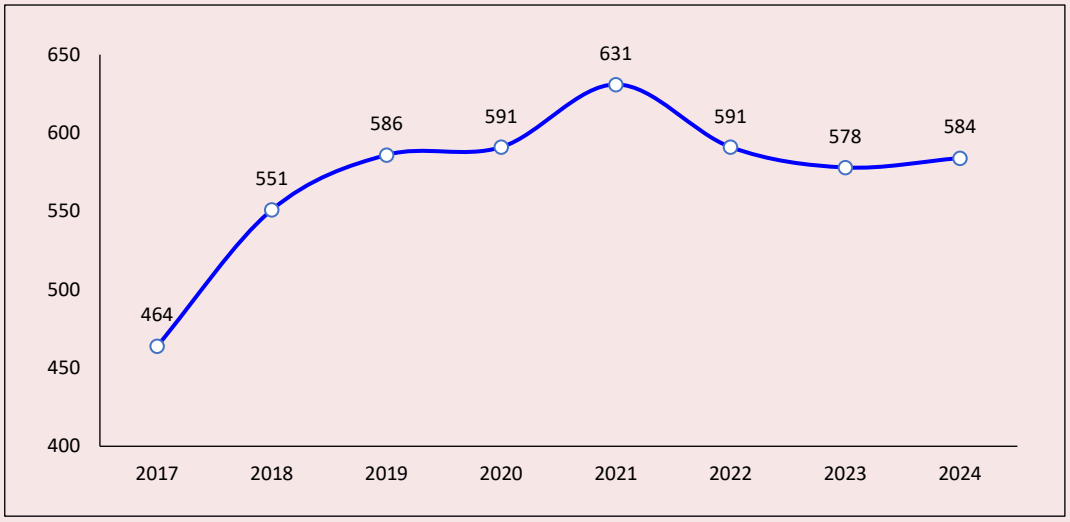
Products	2019	2020	2021	2022	2023	2024
Coefficient of renewal of fixed assets						
Chemicals and chemical products	10.2	13.7	8.1	6.4	0.1	5.0
Rubber and plastic products	5.2	3.4	18.0	26.7	33.0	14.7
Other non-metallic mineral products	9.4	1.9	16.3	4.0	2.7	2.2
Coefficient of liquidation of fixed assets						
Chemicals and chemical products	0.5	0.4	1.5	2.8	0.1	1.4
Rubber and plastic products	0.0	1.3	-	-	-	-
Other non-metallic mineral products	0.9	0.3	4.7	2.0	0.2	0.8
Source: own compilation based on Vologda Statistical Office data.						

Innovative potential. The development of the technological complex, as well as the economy as a whole, the possibilities of transition to a new technological paradigm, and the increase in added value are determined by innovation activities.

The number of personnel engaged in scientific research and development shows a downward trend starting in 2021. Only in 2024 there was a slight increase in the parameter (*Fig. 2*).

The stagnating dynamics is demonstrated by the indicators of the number of organizations engaged in research and development, the number of advanced production technologies developed practically does not change. The level of innovation activity of organizations in the chemical complex is higher than the regional average. In the region as a whole, it amounted to 9.3% in 2022, in the chemical complex – 16.7% (20% in 2023). The share of innovative goods, works, and services in the total volume of shipments in the region has decreased significantly in recent years. This indicates the displacement of innovative products by traditional products. In terms of industries, innovation activity is highly heterogeneous. It is concentrated primarily in industries producing low-grade products.

Figure 2. Number of personnel engaged in scientific research and development in the Vologda Region in 2017–2024, people



Source: own compilation based on Rosstat data.

Thus, the Vologda Region has the resources for the production of forest chemical products, the production of fertilizers is based on imported raw materials. The formation of new industries, especially low-tonnage ones, can also be based on resources supplied from other regions, which is facilitated by the region's location at the intersection of transport routes in different directions. The region has fixed assets for production, but their workload is high, and the degree of wear and tear is significant, primarily in industries producing chemicals and non-metallic mineral products. The innovation potential is insufficiently developed.

At the same time, the urgency of the issue of finding sources of economic growth requires substantiating priorities that can give an impetus to development. Promising specializations of the chemical industry in the region can be considered as such priorities, the formation of a scientifically based list of which should be carried out through an analysis of federal priorities for the development of the industry, taking into account the requirements of the country's economic security. In the context of the development of the chemical complex, the following documents are crucial:

– National Security Strategy[6];

– Economic Security Strategy for the period up to 2030[7];

– Food Security Doctrine[8];

– Strategy for Scientific and Technological Development[9];

– Concept for Technological Development[10];

– "On National Development Goals"[11];

– Decree "Fundamentals of State Policy in the Field of Strategic Planning"[12];

– Strategy for the development of the chemical and petrochemical complex[13].

A critical analysis of the above-mentioned strategic documents led to the conclusion that the following areas of the chemical complex are priorities for development from the point of view of the state:

1) production of highly effective fertilizers and other chemicals for the needs of agriculture in order to ensure food security;

2) production of high-quality fuels and composite materials that ensure the interests of the military-industrial complex;

3) biotechnology and fuel production, as well as energy technologies;

4) release of new materials.

The tasks of increasing exports of non-primary non-energy materials, reducing the share of imports, increasing the density of robotics, and ensuring technological sovereignty are becoming common to different areas of chemical production. In terms of import substitution, the production of composite materials, ingredients of the perfumery and cosmetics industry, household chemicals and other products are seen as promising[14].

[6] On the National Security Strategy of the Russian Federation: Presidential Decree 400, dated July 2, 2021.

[7] On the Strategy of Economic Security of the Russian Federation for the period up to 2030: Presidential Decree 208, dated May 13, 2017.

[8] On the Approval of the Food Security Doctrine of the Russian Federation: Presidential Decree 20, dated January 21, 2020.

[9] On the Strategy of Scientific and Technological Development of the Russian Federation: Presidential Decree 145, dated February 28, 2024.

[10] On the Approval of the Concept of Technological Development for the period up to 2030: RF Government Resolution 1315-r, dated May 20, 2023.

[11] On the National Development Goals of the Russian Federation for the period up to 2030 and for the future up to 2036: Presidential Decree 309, dated May 7, 2024.

[12] On the Approval of the Fundamentals of State Policy in the Field of Strategic Planning in the Russian Federation: Presidential Decree 633, dated November 8, 2021.

[13] On the Approval of the Strategy for the Development of the Chemical and Petrochemical Complex for the period up to 2030: Order 651/172 of the Ministry of Industry and Trade of the Russian Federation and the Ministry of Energy of the Russian Federation, dated April 4, 2014.

[14] Lists of critical industrial products of the Russian Ministry of Industry and Trade. Available at: https://frprf.ru/plany-importozameshcheniya/

Table 5. Assessment of the prospects of the niches of specialization of the Vologda Region's chemical complex

No.	Criteria	Polymer-metal composites	Polymers for additive technologies	Phosphogypsum building materials	Forest chemical products
1.	Compliance with global macro trends	2	2	2	0
2.	Availability of fast-growing product market	1	2	0	0
3.	Compliance with global technological trends	2	2	0	0
4.	Compliance with the strategic plans of the state	2	2	0	0
5.	The need for import substitution	2	2	0	0
6.	Availability of the raw material base in the region	2	0	2	2
7.	Availability of existing production facilities	0	2	2	2
8.	Availability of energy resources for production	2	0	2	2
9.	Availability of logistics facilities for production or sales	2	2	2	2
10.	Compliance with the plans of major industry players	0	2	2	2
11.	Availability of technological competence centers	2	2	2	2
12.	Availability of training opportunities in the region	2	0	2	2
13.	Lack of competitive industries in the country	2	1	1	0
	Total	**21**	**19**	**17**	**14**

Source: own compilation.

Promising specialization niches for the chemical complex

In the course of the research, a list of project initiatives was formed, to assess the feasibility of which a strategic session "Technological future of the Vologda Region economy" was held, where experts were representatives of large industry businesses, science and government authorities[15]. The experts assessed the prospects of the niches specializing in the Vologda Region's chemical complex[16] (*Tab. 5*).

According to the final score, the most promising for the Vologda Region are the production of polymer-metal composites and polymers for additive technologies. Phosphogypsum building materials received the average score, while wood chemical products received the lowest score.

Let us take a closer look at each niche of specialization.

1. Organization of production of polymer-metal composites.

The development of this niche is due to an increase in domestic consumption of metals, as well as the need to develop high-tech materials production in general. According to JEC Group research, the global market of composite materials and products made from them is estimated at 100 billion U.S. dollars. By industry, their main consumers are construction (27%), transport (23%), electronic industry (17%) and energy (13%), which may be used in the manufacture of biomedical equipment in the future. The largest volume of products in this category is used in Asia and North America. In the future, the composite market is expected to grow at a rate of up to 6.5% per year until 2030.

[15] Zhestyannikov: the Vologda Region deputies discussed the region's development strategy. RIA Novosti. Available at: https://ria.ru/20250121/zhestyannikov-1994874926.html

[16] Each of the proposed niches of specialization of the chemical complex is analyzed for compliance with the criteria specified in the methodological part. For this purpose, a scoring system has been formed. For each criterion, a score from 0 to 2 is assigned, among which 0 means complete non–compliance, 1 means partial compliance, that is, the feature is limited, and 2 means full compliance.

Currently, there are no industries in Russia that produce composite materials on an industrial scale. At the same time, there is groundwork in R&D and the creation of prototypes. The market of composite materials has received the greatest development abroad, but their import to Russia is limited, which may be due to two factors: sanctions or inconsistency with the needs of the Russian economy.

2. Organization of polymer production for additive technologies.

The active development of additive technologies and the need to establish these industries actualize the need to form their own production in the Vologda Region. It is one of the fastest growing markets, with an average annual growth rate of 22% until 2030. According to the Russian Association for the Development of Additive Technologies, the volume of their consumption in the country in 2022 amounted to 6.1 billion rubles, and it is projected to increase to 9.8 billion rubles by 2030.

A key component of additive technologies are filaments, which are plastics for printing. At the moment, they are mainly purchased abroad, while domestic demand for them is still low. The production of filaments should be accompanied by an increase in demand for 3D printing in the manufacturing industry, which will make it possible to form production facilities for the production of customized polymer products. The raw materials for the formation of this production can be supplied from the Ust-Luga Gas Chemical Plant, which is provided by the established railway logistics. In the early stages, it is also possible to use ready-made polymer raw materials from other regions.

3. Organization of production of phosphogypsum materials.

The formation of industries in this area is due to a number of factors. The first is associated with the accumulation of large volumes of phosphogypsum, which is a waste product of the production of phosphorous fertilizers. Existing technologies for their processing do not allow the full use of accumulated phosphogypsum waste. The second factor is due to the shortage of building materials in the region and the need to develop the local construction industry (Lebedeva, 2023).

These products can be used in road construction to carry out work on laying highways and strengthening the soil at their base (Lebedeva, 2024). Phosphogypsum can also be used in the production of drywall, gypsum blocks, dry building mixes, etc. The growth rate of the phosphogypsum building materials market is estimated at 5–7% annually.

4. Organization of the production of forest chemical products.

This niche includes the formation of timber chemical plants based on the pulp and paper mill and other enterprises harvesting timber. The established production facilities using waste from the forestry industry will allow the production of high-quality chemical products with high added value. Products such as tall rosin and tall oil fatty acids are a priority for the domestic and Asian markets. It is expected that in the future, until 2027, the average annual growth rate of the global rosin market will be at least 5%. It is also predicted that the consumption of tall oil fatty acids will double by 2030 due to increased consumption of paint and varnish products and the growth of national markets.

Potential sources of financing for the development of the proposed specialization niches may include special investment contracts, funds from the Industrial Development Fund, grant support from the Agency for Technological Development, as well as other funds from the federal and regional budgets, and private investors, including from related sectors of the economy.

Barriers to and effects of the implementation of the proposed niches of specialization

A number of barriers may hinder the formation of designated specialization niches in the region's enterprises. They can be arranged into several

groups. The first group is technological barriers. The most significant limitation of the technological development of chemical industries, as well as the economy as a whole, is the physical and moral deterioration of industrial equipment, which is aggravated by high import dependence. In these conditions, it is necessary to subsidize loans and conclude investment contracts for the modernization of fixed assets, as well as the formation of domestic industries within the framework of import substitution. Another barrier is the disruption of the technology transfer chain from the scientific sector directly to industrial production. To eliminate it, it is necessary to create a special technology transfer center for enterprises that acts as an intermediary between science and business, as well as a fund to support research and development on a project basis.

The second group is economic barriers. First of all, it includes limited domestic demand for products manufactured by the chemical complex, low economic attractiveness of high-grade products, limited financing of promising projects due to the difficulties in predicting future incomes, as well as the high cost of loans and the tax burden on enterprises. To overcome them, export support is needed, including simplification of customs procedures for the supply of promising products to the markets of friendly countries, increased duties on exports of low-grade products, guarantee support for new enterprises, improvement of the investment attractiveness of promising projects, provision of tax incentives, direct reimbursable and gratuitous financing through the provision of concessional loans and loans, subsidies and grants. A possible tool for expanding the domestic market is the restriction and prohibition of purchases of imported products for state and municipal needs.

The third group consists of production barriers. A number of problems are related to the staffing of enterprises. There is not only a shortage of staff in working professions, but also a discrepancy between the professional skills of employees and the requirements imposed by employers. To offset these shortcomings, it is proposed to strengthen cooperation between educational institutions and enterprises to form programs that take into account specific production requirements and offer an extension of the practical training module. It is also important to strengthen the motivation of employees to improve their skills in the workplace. Within this group of barriers, the problem of import dependence outlined above stands out. In the chemical complex as a whole, the share of imports reaches up to a third, while in high-tech products it reaches 60–100% (Abashkin et al., 2018). The production of plastics, paints and synthetic fibers is limited by dependence on imported raw materials (Kruglova, 2016). Production barriers also include high prices for fuel, electricity and transportation, energy and material consumption of chemical production combined with high consumption of process and recycled water[17]. Ways to eliminate them are to provide import substitution enterprises with benefits and subsidies, increase R&D funding, and create new laboratories and research departments at enterprises whose activities will be aimed at accelerating the development and introduction of new technologies into production. The introduction of new types of fuels, the stimulation of waste recycling, and the reduction of the tax burden of enterprises in order to increase investment activities are seen as promising. Bureaucratic barriers limit the development of branches of specialization. The support measures proposed by the government do not meet the needs of enterprises, and there are large time costs for documentation, which is due to the complexity of this process. This indicates the need to take into account the opinions of manufacturers and

[17] Ivanov S.V. Chemical complex of Russia: the state and ways of ensuring sustainable economic development. Available at: https://www.chem.msu.ru/rus/chemr.html (accessed: 19.02.2026).

the specifics of their work, as well as to expand the interaction of industry organizations and representatives of executive authorities.

The fourth group is environmental barriers. The chemical industry is one of the main sources of environmental pollution, and many harmful substances are produced during the production process, which subsequently enter the environment. Due to the increased attention to the issues of sustainable development and the "green economy", environmental requirements for production are being tightened. To minimize the negative impact, a number of legislative acts are being introduced that limit emissions, oblige the disposal of dangerous pollutants, and use technologies that cause the least harm to the environment[18]. In this regard, enterprises are modernizing production facilities and investing in wastewater treatment plants. Those companies that do not have sufficient financial resources are forced to reduce production volumes. Thus, non-compliance with environmental safety requirements can lead to the closure of enterprises, limit the formation of new ones, reduce the output of certain types of products in the absence of modernization of production facilities and reduce their competitiveness (Kulagina, Unik, 2026). Overcoming these barriers is possible through encouraging enterprises to introduce wastewater treatment plants and conduct research within the framework of greening production. Potential tools include the use of tax deductions for enterprises that finance their own research and development, and the provision of preferential loans for retrofitting. It is also possible to hold thematic events and exhibitions in the region aimed at sharing experiences on the introduction of new technologies and addressing industrial safety issues[19].

The removal of the identified barriers will contribute to the development of specialization niches in the region, integrating them into existing value chains, which, in turn, will have a positive effect not only in the chemical complex, but also in related sectors of the economy. In the course of the study, estimates of production multipliers for the branches of the chemical complex in the Vologda Region were obtained (*Tab. 6*).

Table 6. Production multipliers for branches of the Vologda Region chemical complex in 2020

Indicator	Fertilizer production	Production of other chemical products	Production of rubber and plastic products
Direct effect on gross output	1.000	1.000	1.000
Indirect effect on gross output	0.542	0.438	0.080
Induced effect on gross output	0.350	0.319	0.187
Full effect on gross output	**1.891**	**1.756**	**1.267**
Direct effect on GRP	0.337	0.337	0.206
Indirect effect on GRP	0.229	0.185	0.036
Induced effect on GRP	0.176	0.160	0.098
Full effect on GRP	**0.742**	**0.682**	**0.340**
Direct effect on gross output in the manufacturing industry	1.000	1.000	1.000
Indirect effect on gross output in the manufacturing industry	0.179	0.144	0.023
Induced effect on gross output in the manufacturing industry	0.068	0.062	0.032
Full effect on gross output in the manufacturing industry	**1.246**	**1.206**	**1.056**
Source: own compilation based on data from the input–output table of the Vologda Region for 2020.			

[18] On Environmental Protection: Federal Law 7-FZ, dated January 10, 2002 (as amended on December 28, 2025, as amended and supplemented, entered into force March 1, 2026).

[19] Ecology of the chemical industry. Exhibition "Chemistry-2026": Chemical industry and science. Available at: https://www.chemistry-expo.ru/ru/articles/ekologiya-himicheskoj-promyshlennosti/ (accessed: 23.04.2026).

Table 7. Total absolute effects on GRP from the development of specialization niches of the Vologda Region's chemical complex, billion rubles (in 2023 prices)

Scenario	2023–2030	2031–2040	2023–2040
Inertial scenario	11	23	36
Objective scenario	20	39	62
Source: own compilation.			

Based on the data presented in Table 6, the total (direct, indirect, and induced) effects on the Vologda region GRP from the development of the proposed specialization niches are estimated (*Tab. 7*).

The full multiplier effect on GRP from the development of the proposed specialization niches in the chemical complex as a whole for the period up to 2040 reaches 36 billion rubles within the inertial and 62 billion rubles within the objective scenario.

The implementation of new investment projects entails making profits for businesses, the state and the population, which leads to the stimulation of such sectors of the economy as the service sector, the production of consumer and investment products, etc.

Conclusion

The conducted research allows drawing a number of conclusions.

First, the transformational processes leading to a recession in the global economy, a decrease in investment flows, increased instability and instability, on the one hand, and the emergence of new sectors of the economy as a result of a change in technological structure, on the other, are increasingly pressing the issue of finding new sources of economic growth. For the Russian economy, this problem has become particularly acute due to the harsh sanctions imposed by Western countries. These circumstances raise the issue of substantiating the priorities of economic policy, including increasing the level of technological development of the economy and achieving technological independence in key industries.

Second, the chemical industry occupies an important place in the economy of Russia and a number of regions. One of these regions is the Vologda Region, where the industry's share in the total volume of shipped products and tax revenues is very significant. Moreover, the region has significant potential for the development of new high-tech industries and the expansion of the range of chemical products.

Third, the formation of a list of promising specializations in the chemical industry of the region should be carried out taking into account the priorities stated in the strategic documents of the state and in accordance with the requirements of the country's economic security. For the chemical complex, these can be the production of composite materials, ingredients of the perfume and cosmetics industry and household chemicals; highly effective fertilizers and other chemicals for agricultural needs; high-quality fuels and new materials that ensure the interests of the military-industrial complex, etc.

Fourth, in accordance with technological and global trends, strategic plans of the government and large business, the existing potential and economic features of the Vologda Region, the production of polymer-metal composites and polymers for additive technologies, phosphogypsum building materials and forest chemicals are the niches of the promising specialization of the chemical industry in the region.

Fifth, the removal of a number of technological, economic, industrial and environmental barriers that hinder the development of specialization niches will have a very significant positive effect on the

regional economy. According to calculations based on input–output modeling, the development of specialization niches can lead to an increase in gross domestic product by 36–62 billion rubles by 2040.

The scientific novelty of the research consists in identifying niches of promising specialization for the Vologda Region chemical complex based on an approach consisting in analyzing a number of criteria that make it possible to assess the relevance and priority of products in modern economic and geopolitical conditions. The results of the work can be used by regional authorities to substantiate the directions of economic policy.

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Forecasting and Managing the Development of Regional Manufacturing Based on Econometric Modeling and Digital Interface

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Abstract. The article focuses on modeling, forecasting, and scenario-based management of manufacturing output, using the Nizhny Novgorod Region as a case study. The relevance of the work stems from the need of government authorities and businesses for a reliable tool when making strategic decisions under conditions of economic uncertainty. The main objective is to construct econometric models that provide medium-term forecasts of industrial output shipments and to develop a digital calculator with a web interface for analyzing various scenarios of industrial sector development. The scientific novelty of the study is fourfold: (1) an extended Cobb – Douglas production function incorporating macro-level conditions is refined; (2) an approach to separately modeling the real and inflationary components of industrial output shipments is proposed and implemented; (3) a novel methodological technique for forecasting one price index (the producer price index, PPI) based on another (the consumer price index, CPI) is proposed and implemented; and (4) new approaches to scenario modeling of the regional economy that incorporate macro-forecasts are proposed and implemented. The study employs a wide range of time-series econometric methods, including ARIMAX and ARDL models, stationarity tests, residual diagnostics, and automated specification selection. The principal findings consist of two predictive ARDL models, which were integrated into the newly developed digital calculator with a user-friendly web interface. It is shown that real manufacturing output in the Nizhny Novgorod Region is influenced by the value of fixed assets in the "Manufacturing" type of economic activity, the permanent resident population, retail trade turnover, the monthly average consumer price index, and the price of Urals crude oil. Based on the constructed models, a digital calculator was developed – a flexible tool that enables users to promptly assess the consequences of changes in key macroeconomic parameters, compare alternative development scenarios, and produce analytically grounded forecasts of the region's manufacturing development. This tool appears highly useful for government authorities and other users in planning and optimizing production processes.

Key words: manufacturing, volume of industrial output shipments, Nizhny Novgorod Region, ARDL model, ARIMAX model, digital calculator.

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Introduction

Industrial production in most regions of the Russian Federation is the most important component of their economic life, determining competitiveness and prospects for further economic development. One of the basic indicators demonstrating the activity of the industrial sector of the economy is the volume of shipped products of its own production. The shipment reflects the degree of demand for manufactured products within and outside the region and allows assessing the effectiveness of its manufacturing sector. In modern conditions, this indicator is of particular importance, since Russian industrial enterprises face many challenges, both from the geopolitical situation and the availability of global markets, as well as internal conditions related to the problems of import substitution and technological development, the growing tax burden and the high cost of credit resources.

It is worth noting that forecasting the volume of shipments in the medium term is not an easy task. Modern economic processes are characterized by a high degree of uncertainty and unpredictability. Economic sanctions, the COVID-19 pandemic, technological innovations and other factors create additional difficulties in the strategic management of the region's industrial sector. Therefore, the introduction of innovative forecasting methods is becoming relevant, which will allow for more accurate consideration of external and internal circumstances affecting the activities of enterprises.

This study considers forecasting industrial production using the example of the Nizhny Novgorod Region, which is one of the top 5 Russian regions in terms of scientific and technological development[1], which suggests the potential for further industrial growth. The region has large production facilities in the field of mechanical engineering, chemical industry, instrument engineering and many other industries. The industrial complex in the Nizhny Novgorod Region produces a third of the gross regional product, makes a third of payments to the budget and creates a quarter of all jobs in the region[2]. We will limit ourselves to considering the manufacturing industry in our study since the extractive industry of the Nizhny Novgorod Region, due to limited natural resource potential of the region, does not represent a significant share of industrial production. However, an objective assessment of the current state and development prospects of the industrial sector is possible only if reliable forecasting tools are available. That is why there is a need to develop a scientifically sound methodology that makes it possible to most accurately predict the volume of shipments of manufacturing products in the region and determine its sensitivity to both internal and external factors.

The aim of the study is to build an econometric model for medium-term forecasting of the shipment of own-made products by the economic activity "Manufacturing" in the Nizhny Novgorod Region and to develop a digital calculator with a web-based user interface.

We set and solved the following tasks to achieve this aim: analysis and selection of variables (factors) that affect the shipment of manufacturing products in the Nizhny Novgorod Region; construction of econometric models for the shipment of manufacturing products in the Nizhny Novgorod Region of two types: an autoregressive moving average model with additional regressors (ARIMAX) and an autoregressive and distributed lag model (ARDL); selection of the most adequate and suitable specification among the obtained models for making forecasts; construction of forecast models for various scenarios of the development of the macro-economic situation in the Russian Federation; design and implementation in the JavaScript programming language (ECMAScript 2015 – ES6 standard) using HTML5 and CSS3 technologies of a digital forecast calculator for the shipment of manufacturing products in the Nizhny Novgorod Region.

The relevance of the research is due to the need to develop effective forecasting tools in the regions in order to design various scenarios for the region's development, taking into account the impact of certain external shocks and control influences. The need for such developments is also explained by the fact that the current mechanisms for building plans and forecasts in regional government structures often do not provide for the use of advanced data analysis and forecasting methods based on the involvement of a large pool of regional indicators, but are guided by federal forecasts. In addition, the level of use of modern digital technologies in

[1] The development strategy of the Nizhny Novgorod Region. 2023. Available at: https://strategy.nobl.ru/stati/nauka-i-innovaczii/chem-proslavilas-nizhegorodskaya-nauka-etoj-osenyu/

[2] Ministry of Industry, Trade and Entrepreneurship of the Nizhny Novgorod Region. Available at: https://minprom.nobl.ru/activity/1746/

forecasts of the socio-economic development of the region remains low, which determined the direction of research development. The results of the work can be used by executive authorities and business entities to improve the quality of forecasts and the effectiveness of decisions made in managing the regional industrial sector.

The literature review will show a lot of current Russian studies on forecasting industrial production, but they either relate to the Russian Federation economy as a whole without taking into account regional specifics, or are limited to building econometric models without conducting interactive scenario analysis. Incorporating macroeconomic environment parameters (oil prices, exchange rates, inflation, etc.) into models, along with supply and demand factors, will allow interested economic agents not only to make forecasts based on econometric models, but also to conduct scenario experiments for more correct management of industrial production in the region.

Literature review

A number of works by Russian and foreign researchers are devoted to the problems, factors and methods of managing the development of the industrial production sector at the federal and regional levels.

For example, the work of N.M. Sergeeva and E.V. Skripkina emphasizes that manufacturing, mining, wholesale and retail trade remain the leading industries in the structure of gross value added (GVA) of the Russian economy despite the crisis and sanctions pressure (Sergeeva, Skripkina, 2024).

The indicator of the volume of shipments of own-made products, completed works and services by industrial enterprises is recognized as one of the key indicators of the state and dynamics of the industrial sector (Pirogova, Maiorova, 2025; Shvaika, Khripin, 2025; Sokolova, Sidorov, 2022). Forecasting it at the regional level is important for shaping development strategies, making operational management decisions, and evaluating the effectiveness of import substitution policies. The studies highlight the heterogeneity of industrial development in Russian regions and, as a result, the need for regional specification of predictive models. For instance, it was revealed a significant differentiation in the industrial development of the regions of the Central Federal District (CFD): an increase in the share of manufacturing industry in the Moscow and Tula regions was accompanied by a decrease in this share in Moscow (Pirogova, Maiorova, 2025). This highlights the need to develop different forecast scenarios even within the same federal district. In this regard, research on forecasting industrial production indicators in certain regions of the Russian Federation is particularly relevant (for example, Gladkikh, Malugina, 2023; Sokolova, Sidorov, 2022).

An important task is to identify factors that have a significant impact on the resulting industry indicators at both the national and regional levels when building a forecast model. For example, in L.G. Rudenko's work, regression analysis revealed the following significant determinants of the growth of manufacturing production in Russia: the volume of mining, the net financial result of organizations, the number of workers and the number of organizations involved in research and development (Rudenko, 2024). Regression analysis has shown that the factors determining the GVA of the industry of the Central Federal District, excluding Moscow and the Moscow Region, are fixed assets and employment of the region's population (Krupko et al., 2018). In the work (Gubarev et al., 2020), fixed assets and labor resources of individual industries are also considered as determinants of the GVA of industry.

The research of M.Yu. Malkina for the regions of the Nizhny Novgorod Region cluster revealed a positive impact on GRP growth of both supply factors (accumulated fixed assets, current investments, number of employees) and demand factors (per capita income in the previous period), as

well as monetary (interest rate) and fiscal policy instruments (budget revenue and expenditure and their structure). The paper notes that rising oil prices are accompanied by an increase in energy exports earnings and budget revenues, and this makes it possible to increase funding of the national economy, including manufacturing and infrastructure industries, as well as various social programs that contribute to the growth of household incomes and consumer demand (Malkina, 2025).

One of the approaches to forecasting regional economic indicators is the decomposition of macro forecasts: the forecast at the regional level is based on the distribution of national indicators by type of economic activity. For example, A.O. Polynev suggests a methodology for medium-term forecasting of regional GRP growth based on the decomposition of the macro forecast for Russia, where investment dynamics is a key factor (Polynev, 2020). Other scientists consider it more correct to move not from federal forecasts to regional forecasts, but rather from regional to federal forecasts, which allows taking into account the potential and development characteristics of each region (Mikheeva, 2018).

Modern scientific literature uses a number of approaches to predict the socio-economic development of a region. The most common is econometric and regression modeling: models are built that link the resulting indicator with factor indicators. For example, the work (Kalinina, Kalinina, 2012) considers regression analysis as the basic one for forecasting industrial indicators: the predicted value of the performance indicator is obtained by substituting the expected value of the factor indicator into the regression equation.

Another effective predictive modeling tool is time series analysis and trend forecasting, which is used to identify patterns and extrapolate dynamics. For example, A.V. Shchetilov applies analytical alignment (linear and polynomial trends) for retrospective analysis and forecasting in the metalworking and mechanical engineering subsectors until 2030 (Shchetilov, 2025).

A modern, promising tool for predictive modeling is the construction of neural network models. For example, this approach is being implemented to forecast the development of the manufacturing industry in the Voronezh Region (Treshchevskii et al., 2020).

Scenario and expert approaches are effective in conditions of high instability, when formal models quickly lose relevance. For example, in a study of the manufacturing industry, quantitative analysis is complemented by an expert assessment of risk factors (Shchetilov, 2025). In general, a combination of different approaches (econometric, trend-based, neural network, and expert) should be considered the most promising to improve forecast accuracy.

Forecasting works also use other methods of predicting economic processes. For example, scenario forecasts for the industrial complex of the Southern Federal District of the Russian Federation are being developed on the basis of cognitive modeling, and its response to impulse impact are being determined (Makarenya et al., 2024).

A large pool of forecasting works in the foreign literature concerns macro-economic indicators at the national level (such as economic growth rate, inflation rate, budget revenues), which is explained by the need of regulatory authorities. Less frequently, there are works devoted to forecasting a particular industry or a complex of industries in a country or region (Baum et al, 2025; Bodo et al, 2000; Wang et al, 2025; Zervas, Thomakos, 2026). An example is the article (Serban et al., 2021), which examines the GVA of the high-tech industries of the EU countries, assesses the contribution of investments and the number of employees to it. Panel data are used for analysis, and models are evaluated using the generalized method of moments. Another study developed a scenario-based system for monthly forecasting of industrial production in the eurozone

(Georgieva, et al., 2025). Key macro-economic indicators were used for forecasting: the rates of inflation (HICP) and unemployment, as well as the business climate index. As the study result, the authors concluded that industrial production is more sensitive to adverse macro-economic shocks than to positive shocks, which underscores the importance of short-term management of inflation and business sentiment. The paper also substantiates the importance of using dynamic scenario analysis in forecasting, which provides a flexible tool for monitoring the economy in real time.

The work (Akhmadjanov, Hakimov, 2025) built a multifactorial predictive model to estimate the volume of gross output of industrial enterprises in the Andijan region in Uzbekistan from 2024 to 2030 using multiple regression, the elasticity coefficients of which indicate a constant increase in production efficiency, despite fluctuations in the efficiency of the use of fixed assets. In the article (Lu, 2024), an ARIMA model was built for modeling and forecasting the GDP of the Nanyang City District in China. Based on the Pearson correlation coefficients and the analytical hierarchy method, the relationship of the district's GDP with environmental indicators (number of enterprises, employees and industrial pollution) is analyzed, and the significant instability of the region's ecological development is demonstrated.

A completely new approach in our study is to create an add-on to econometric models in the form of digital calculator. This calculator can be considered as part of a more complex digital product – the digital twin of the region. The topic of digital twins is currently becoming increasingly popular for research and development. However, there is some uncertainty in the interpretation of this concept (Singh et al., 2021), which is why this term can refer to various digital objects in various fields of science. The authors believe that the main feature of digital twins, which distinguishes them from digital models, "shadows" and avatars, are automated bidirectional information flows. From the point of view of economics, the natural sphere where the application of this concept arises first is production. The paper (Warke et al., 2021) analyzes research on the topic of digital twins in the field of "smart" production, and (Turan et al., 2022) describes a specific example of the introduction of a digital twin into the production process in the form of a digital application and shows that this allows optimizing material costs. The article (Pobuda, 2020) notes that at the macro level of individual countries' economies, agent-based simulation becomes an effective tool for building digital twins that could be used to make strategic management decisions.

Literature analysis shows that, despite the significant scientific interest of scientists in the problem of forecasting, there is a clear shortage of modern research devoted to forecasting the industrial production indicators of the region with the inclusion of macro-economic shocks and regulatory instruments in econometric models and the formation of different scenarios for the development of the industrial sector in the region. We have not found any works where such models are equipped with a digital calculator integrated with a managed user interface. The present study aims to fill this gap.

Data and methods

The object of the study is the indicator of the shipment of own-made products by type of economic activity "Manufacturing" (excluding VAT, excise taxes and similar mandatory payments) in the Nizhny Novgorod Region (million rubles), and the subject is its medium-term forecasting. The choice of the indicator is due to the fact that it is one of the main operational indicators of industrial activity, available on a monthly basis, obtained on the basis of the primary reporting of enterprises. In addition, it characterizes not only the production, but also the sale of products, that is, it indicates their demand in the market.

The theoretical basis of the research consists of the main provisions of economic theory and system analysis, as well as the results of fundamental and applied research by foreign and Russian scientists in the field of macro-economics and economic and mathematical modeling. We used methods of mathematical statistics and econometrics to solve specific problems.

To describe the dependent variable Y, the shipment of own-made products by type of economic activity is "Manufacturing" (excluding VAT, excise taxes and similar mandatory payments) in the Nizhny Novgorod Region in millions of rubles[3] – it was formed a set of factors x_1, x_2,..., x_m, which were further tested for input into the model. The initial choice of factors is based on theoretical assumptions: it takes into account the traditional form of the Cobb – Douglas production function, supply and demand factors, and monetary conditions in the region, which is confirmed by the analysis of scientific literature (Bazhanov, Oreshko, 2019; Domnich, 2023; Malkina et al., 2025). The final selection of factors is determined by their statistical significance in the analyzed specifications. The data covered the period from 2017 to 2025. Table 1 shows the system of indicators.

We used Google Colab, a cloud service for interactive computing in the Python programming language, to conduct statistical analysis and build econometric models.

The first step in preparing the data for analysis was to bring the indicators at current prices to the constant prices of the base year. We chose 2017 as the base year, which is the initial year of the data set. For deflation, either producer price indices for the type of economic activity "Manufacturing" or consumer price indices in the Nizhny Novgorod Region were used, depending on the nature of the factor being studied.

[3] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/57722 (accessed: 07.02.2026).

The use of econometric models requires that the time series contain a sufficient number of observations, and the indicators included in the model have the same frequency. We should also consider that information related to earlier periods of time is less relevant for current analysis due to the rapidly changing institutional and macro-economic environment. Therefore, the study used data for a more modern period (corresponding to the functioning of the Russian economy under the sanctions regime), but on a monthly basis. Since monthly statistics are not available for all indicators, it has become necessary to convert annual or quarterly data to a monthly format. The spline interpolation method recommended in the scientific literature was chosen (Vlasenko, 2019; Portilla et al., 2025; Ribeiro, Castro, 2022) to accomplish this task. Similar transformations were applied to two indicators of fixed assets, population, current assets, investments and average per capita monetary income. The dynamics of these indicators does not imply too rapid and sharp fluctuations during the year (and in the case of investments during the quarter), which makes the considered methodology quite appropriate. In addition, final forecasts are generated by aggregating monthly data by year, which reduces the impact of interpolation on the forecast.

At the final stage of data preprocessing, the time series was checked for seasonality and, if necessary, the time series was cleared of the seasonal factor using statistical filtering. To bring the time series to a stationary form, they were determined by taking logarithmic differences for all indicators except for indicators of macro-economic conditions. The additive time series model was considered as the basis at this stage:

$$Y_t = T_t + S_t + E_t, \quad (1)$$

where T_t – trend,
S_t – seasonal component,
E_t – random component.

Table 1. Indicators presumably affecting industrial production in the Nizhny Novgorod Region

Variable	Naming of the indicator	Units of measurement	Duration of the time interval and frequency of measurement	Average	Minimum	Maximum	Standard deviation
In the Nizhny Novgorod Region							
Capital_res	Availability of fixed assets at the residual book value for the full range of organizations at the beginning of the period by type of economic activity "Manufacturing"[1)]	billion rubles	2017–2024; annual	383.3	319.5	464.0	55.5
Capital	Availability of fixed assets at full book value for the full range of organizations at the beginning of the period by type of economic activity "Manufacturing"[1)]	billion rubles	2017–2024; annual	872.9	658.0	1143.6	178.8
CurrentAssets	Value of current assets of large and medium-sized organizations at the beginning of the period by type of economic activity "Manufacturing"[2)]	billion rubles	I quarter 2017 – I quarter 2025; quarterly	936.4	554.5	1689.6	350.5
Investment, Investment12, Investment24	Investments in fixed assets by all forms of ownership: for the current period, with a lag of 1 and 2 years by type of economic activity "Manufacturing"[3)]	billion rubles	I quarter 2014 – IV quarter 2024; quarterly	23.1	4.6	80.6	16.6
Credit	Volume of loans to resident legal entities and individual entrepreneurs by type of economic activity "Manufacturing"[4)]	billion rubles	January 2017 – June 2025; monthly payments	23.3	6.3	70.7	14.6
Labour	Average number of employees (excluding external part-timers) in the full range of organizations by type of economic activity "Manufacturing"[5)]	thousand people	January 2017 – May 2025; monthly	253.8	246.3	270.0	4.8
Population	Permanent population at the beginning of the year [6)]	million people	2016–2024; annual	3.15	3.05	3.24	0.07
Incomes1	Average per capita monetary income of the population with a lag of 1 month [7)]	thousand rubles	I quarter of 2016 – I quarter of 2025; quarterly	40.0	28.0	73.4	11.6
*Inc*Popul*	Total monetary incomes of the population (own compilation)	billion rubles	January 2017 – January 2025; monthly	124.2	90.4	216.1	28.9
RetailTrade1	Retail trade turnover with a lag of 1 month [8)]	million rubles	December 2016 – June 2025; monthly	76,922	49,035	120,889	18,536
Inflation	Monthly average value of consumer price indices for goods and services [9)]	%	February 2016 – June 2025; monthly	6.3	-1.3	21.4	4.1

End of Table 1

Variable	Naming of the indicator	Units of measurement	Duration of the time interval and frequency of measurement	Average	Minimum	Maximum	Standard deviation
PPI	Producer price indices by type of economic activity "Manufacturing" (compared to the previous month) [10]	%	January 2017 – August 2025; monthly	100.7	94.6	106.1	1.7
In the Russian Federation							
Dollar	Average monthly official exchange rate of the U.S. dollar against the ruble [11]	rubles per U.S. dollar	January 2017 – July 2025; monthly	73.1	56.4	103.7	12.8
KeyRate, KeyRate1, …, KeyRate6	Key rate for the current month and with a lag of 1 to 6 months [12]	% per annum	January 2016 – June 2025; monthly	9.9	4.3	21.0	4.7
RealKeyRate, RealKeyRate1, …, RealKeyRate6	Real key rate for the current month and with a lag of 1 to 6 months (calculated by the authors taking into account inflation)	% per annum	February 2016 – June 2025; monthly	3.4	-6.6	13.3	4.7
Urals,	Urals oil price [13]	thousand rubles	January 2017 – February 2025; monthly	4.7	1.1	8.6	1.5
Urals$		$		64.7	15.1	98.0	14.2

[1] Territorial body of the Federal State Statistics Service for the Nizhny Novgorod Region. Available at: https://52.rosstat.gov.ru/folder/32667 (accessed: 07.02.2026).
[2] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/59586 (accessed: 07.02.2026).
[3] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/58090 (accessed: 07.02.2026).
[4] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/38366 (accessed: 07.02.2026).
[5] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/57848 (accessed: 07.02.2026).
[6] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/31557 (accessed: 07.02.2026).
[7] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/57039 (accessed: 07.02.2026).
[8] EMISS. Government statistics. Available at: https://52.rosstat.gov.ru/folder/204282 (accessed: 07.02.2026).
[9] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/31074 (accessed: 07.02.2026).
[10] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/57609 (accessed: 07.02.2026).
[11] EMISS. Government statistics. Available at: https://www.fedstat.ru/indicator/42108 (accessed: 07.02.2026).
[12] Bank of Russia. Available at: https://cbr.ru/statistics/ddkp/infl/?UniDbQuery.Posted=True (accessed: 07.02.2026).
[13] Infotables.ru. Available at: https://infotables.ru/statistika/95-tseny-tarify/1325-tsena-na-neft-tablitsa#urals (accessed: 07.02.2026).
Source: own compilation.

This method of component analysis is basic and has been studied in detail in the literature (for example, Tindova, Lesneva, 2023). We should note, however, that when constructing ARIMAX models, both purified and non-purified seasonality data were used, because the model specification allows identifying the seasonal factor. In the considered data set, the indicators of industrial product shipments were subject to seasonal influence.

The next step of the research was the construction of econometric models. The traditional form of the Cobb – Douglas production function was chosen as the theoretical basis, which is reduced to an additive form by logarithm and is further used to model the dependence of output on production factors (Kapitanova, Zinyakov, 2023).

$$\ln y_t = \beta_0 + \beta_1 \ln x_{1t} + \cdots + \beta_j \ln x_{jt} + \cdots + \\ + \beta_n \ln x_{mt} + \varepsilon_t. \quad (2)$$

where y_t is the shipment of products of own production by the type of economic activity "Manufacturing";

x_{jt} – variables included in the model;

β_j – coefficients of the models;

ε_j – random residuals of the corresponding models;

$j = \overline{1,m}; m$ –number of variables included in the model.

Since economic indicators have certain specifics due to the existence of lags and the spider web effect, the model has been expanded to include lag values of dependent and explanatory variables.

The study tested two types of time series models:

– autoregression-moving average model with additional regressors (ARIMAX)

$$y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i y_{t-i} + \sum_{j=1}^{q} \beta_j \varepsilon_{t-j} + \\ + \sum_{k=1}^{m} \gamma_k x_{t-k} + \varepsilon_t. \quad (3)$$

– autoregression and distributed lag model (ARDL)

$$y_t = a_0 + \sum_{i=1}^{p} a_i y_{t-i} + \sum_{j=0}^{q} b_j x_{t-j} + \varepsilon_t. \quad (4)$$

The autoregression and distributed lag model is a special case of the autoregression moving average model, taking into account additional regressors, and is placed in a separate category only due to different methods of technical implementation of the modeling process. These types of models are often used to describe various socio-economic processes, which is confirmed in the literature (Pilnik et al., 2018; Rizki, Didenko, 2025; Ji, 2025; Sahoo et al., 2025). The advantages of the ARDL model are that it is the most suitable way to describe short time series, allows evaluating long-term and short-term effects (cointegration), and also works with series of the order I(0) and I(1) in a mixture. The ARIMAX model demonstrates good predictive accuracy over small time intervals, as well as flexibility in accounting for seasonality and trends, which makes it possible to use it for both initial time series and deseasonalized and detrended data. It is also theoretically possible to use other time series models (for example, VAR, HVAR, DFM, neural network models). At the same time, vector autoregression models require stationarity of all series, which must necessarily be long enough. In addition, with a large number of variables, degrees of freedom are lost. Dynamic factor models are difficult to interpret and adjust with a short history. Neural network methods do not allow identifying the influence of individual variables and do not work well on small samples.

The model should include factors that correspond to the Cobb – Douglas production function, such as capital (fixed assets) and labor (number of employees or population). Other factors that describe the resource base of industrial enterprises in the Nizhny Novgorod Region (investments, volume of loans and current assets) can also

be included in the model; demand factors (retail trade turnover, per capita and total household incomes) and macro-economic conditions (key interest rate with a lag of 0 to 6 months, inflation, dollar exchange rate and oil price). A set of different combinations of these groups was formed, according to which a search of possible specifications was carried out. Further, the algorithm was slightly different for the two types of models, due to the specifics of the technical tools.

For the ARIMAX models, the order of the AR and MA components ranged from 0 to 3, and the order of the differences from 0 to 2. To account for possible under-adjusted seasonal fluctuations, the order of the seasonal components was from 0 to 2. Further, using cycles and logical checks, those models were selected, all factors in which are significant according to t-statistics, there is no autocorrelation in the balances (according to the Ljung – Box test) and heteroscedasticity (according to the Breusch – Pagan test), and the signs of the coefficients for capital and labor are positive (due to the type of production function). Among all the constructed models, those with a real key rate with a negative coefficient were selected, which is also conditioned by theoretical assumptions. A similar check was performed on data that was not seasonally adjusted. SARIMAX models were also built, allowing both to include exogenous factors and to take into account seasonality. The final selection of the models was based on the Akike (AIC), Bayes (BIC) and Hennan – Quinn (HQIC) information criteria for each set.

ARDL models were based only on desezonalized data. We used the function of automatically selecting the optimal model order based on the criteria of information efficiency when analyzing the data: Akike (AIC), Bayesian (BIC) or Hennan – Quinn (HQIC). Among all the models built, we selected those that include the necessary components – indicators describing capital, labor, and the macro-economic situation, and they are significant according to t-statistics. Only intermediate lags can be insignificant because the chosen Python toolkit does not allow them to be excluded.

Results of the research

Table 2 shows the two selected best ARIMAX models that meet all the above quality criteria.

Table 3 presents the two best ARDL models selected according to the algorithm described above.

The residuals of the ARDL models were tested for heteroscedasticity using the ARCH-LM test, which applies the Lagrange multiplier (LM) method to detect autoregressive conditional heteroscedasticity (ARCH) in the residuals for lag 1–10. This test showed that the residuals have a uniform variance (homoscedastic). Due to the fact that the ARDL model combines elements of dynamic regression with lagged dependent variables and lags of exogenous variables, the basic assumptions of conventional autocorrelation tests are violated, and their use to test autocorrelation in residuals becomes incorrect. Therefore, the study analyzed autocorrelation and partial autocorrelation functions (ACF and PACF), which indicate the absence of visible patterns in the residual, and it can be assumed that autocorrelation is absent in both models.

We should note that for the constructed models, the Jarque – Bera test results indicate a deviation from the hypothesis of a normal distribution of residuals. However, for ARIMAX class models, this requirement is unnecessary due to the fact that the parameter estimates are consistent and asymptotically normal when the stationarity conditions are met and there is no serial correlation in the residuals. In addition, standard errors consistent to heteroscedasticity and autocorrelation (HAC) were used to evaluate the significance of the model coefficients.

Based on the results of the root mean square error (RMSE) estimation, both ARDL models were selected for all the constructed models, on the basis of which a medium-term strategic forecast for the period up to 2027 was built. The average forecast for two ARDL models was used as the final result.

Table 2. ARIMAX models for the indicator of shipment of manufacturing products at constant prices

Variable	ARIMAX model for seasonally adjusted data	ARIMAX model for seasonal data
Capital	0.70 (0.07)	0.94 (0.04)
Labour	2.33 (0.02)	
Population		3.39 (0.00)
RealKeyRate4	-0.01 (0.06)	
Inflation		-0.01 (0.00)
Urals$		0.01 (0.00)
RetailTrade1		1.53 (0.00)
ar.L1	-0.78 (0.00)	
ma.L1	0.56 (0.03)	0.46 (0.00)
sigma2	0.01 (0.00)	0.02 (0.00)
AIC	-109.78	-104.37
BIC	-96.12	-87.27
HQIC	-104.34	-97.49
RMSE	10173.03	8320.63
Ljung – Box test	0.00 (0.99)	0.01 (0.91)
Breusch – Pagan test	0.84 (0.66)	1.45 (0.33)
Jarque – Bera test	39.57 (0.00)	22.35 (0.00)

Note. The p-values are shown in parentheses. The null hypothesis of the Ljung – Box test indicates the absence of autocorrelation in the residuals. The null hypothesis of the Breusch – Pagan test assumes homoscedasticity of the data. The Jarque – Bera test uses as a null hypothesis the assumption that the residuals have a normal distribution.
Source: own compilation.

Table 3. ARDL models for the indicator of shipment of manufacturing products at constant prices

Variable	Model 1	Model 2
Y.L1	0.55 (0.00)	0.56 (0.00)
Y.L2	0.27 (0.01)	
Capital.L0		0.63 (0.00)
Population.L0		370.15 (0.00)
Population.L1		-371.14 (0.00)
Inflation.L0	-0.002 (0.05)	
RetailTrade1.L0	0.89 (0.00)	
RetailTrade1.L1	-0.74 (0.00)	
Urals$.L0		0.0001 (0.9)
Urals$.L1		0.003 (0.01)
AIC	-242.65	-221.45
BIC	-228.14	-204.43
HQIC	-236.82	-214.61
RMSE	4763.85	5111.64
Jarque – Bera test	23.92 (0.00)	9.24 (0.00)

Note. The p-values are shown in parentheses. L0, L1, and L2 are used to indicate the current period, lag 1 and lag 2, respectively.
Source: own compilation.

Thus, in the final model, the shipment of manufacturing products in the Nizhny Novgorod Region is influenced by the following indicators:

– availability of fixed assets by type of economic activity "Manufacturing" at full book value for a full range of organizations at the beginning of the period (billion rubles): a positive coefficient reflects the effect of the classical production function – capital growth increases output;

– number of permanent population at the beginning of the period (million people): a positive coefficient for the current month's population and a negative coefficient for the lag value, which are close in modulus, may be the result of a high correlation of successive lags, which makes estimates of individual coefficients unstable; the long-term multiplier for the population in terms of cointegration will be close to zero (this means that in the long term, the population has little effect on shipping, which is economically plausible for the Nizhny Novgorod Region, where production is focused not only on domestic demand, but also on interregional supplies and exports);

– retail trade turnover (million rubles): a positive current effect (0.89) and a negative lag effect (-0.74) can be interpreted as the effect of saturation or transfer of demand over time, when growth in the current period is further adjusted and slows down;

– average monthly value of consumer price indices for goods and services (%): a negative coefficient for inflation shows that rising prices reduce real incomes and, consequently, demand for industrial products;

– Urals oil price (U.S. dollar): the positive effect for the Nizhny Novgorod Region, characterized by a poorly developed mining and a fairly highly developed manufacturing industry, is explained by the indirect influence of the budget channel: the growth of oil revenues in the federal budget increases transfers to regional budgets, government procurement and investments in the region.

In practice, future shipment values are of interest, both in comparable and current prices. In particular, the nominal figures are of interest to the tax and budget system. To translate the forecast values for shipments at constant prices into current prices, the forecasting of chain consumer price indices (CPI) and chain producer price indices (PPI) deflators for the Nizhny Novgorod Region was carried out. The projected values of the CPI deflator index were calculated based on the baseline forecast of the socio-economic development of the Nizhny Novgorod region in 2025 (8.8%) and forecasts for 2026 (5%) and 2027 (4.0%)[4]. Next, the dependence of the PPI deflator chain index on the CPI deflator chain index for the Nizhny Novgorod Region was modeled based on monthly data for 2017–2024, and their long-term ratio was determined. *Figure 1* shows the actual data and the constructed logarithmic regression.

The forecast values of the PPI chain deflator indices for 2025–2027 were determined based on the revealed logarithmic dependence and the forecast values of the CPI chain deflator indices for the same period. Calculations of forecast deflator indices made it possible to further bring all indicators modeled in constant prices to current prices.

We made forecasts of the following indicators (model factors) were made at constant and current prices to build a medium-term shipment forecast.

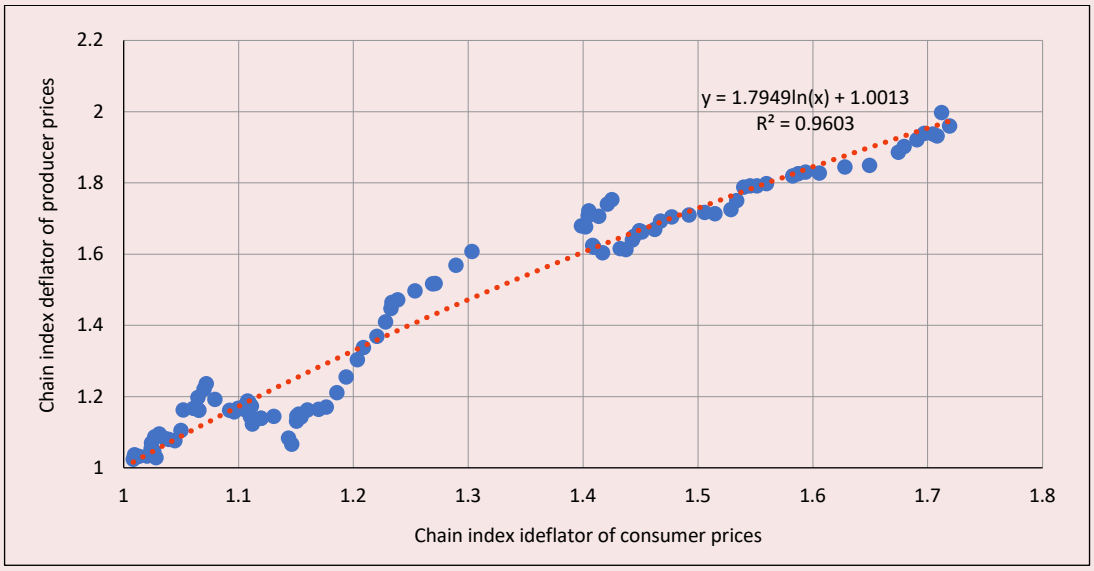
1. Availability of fixed assets by type of economic activity "Manufacturing" at full book value for the full range of organizations at the beginning of the period (billion rubles).

A stationarity check was performed for the time series. The extended Dickey – Fuller Test (ADF) and the Kwiatkowski – Phillips – Schmidt – Shin test (KPSS) showed that the series is stationary in the first differences. According to ACF and PACF, a preliminary model order was determined for the first differences, which was then adjusted to take into account the significance of variables and components.

Table 4 presents the results of the SARIMA model construction in the column "Capital".

[4] The forecast of the socio-economic development of the Nizhny Novgorod Region for the medium term (for 2026 and for the planned period of 2027 and 2028). P. 3, 6. Available at: http://publication.pravo.gov.ru/document/5200202510270003?index=1

Figure 1. Relationship between the chain producer price indices (PPI) and consumer price indices (CPI) in the Nizhny Novgorod Region



Source: own compilation.

Based on the model, we obtained a forecast of fixed assets in constant prices for the period up to 2027. With the help of the previously predicted producer price chain index, it was transformed into a forecast of the indicator at current prices. *Figure 2* shows both in dynamics.

2. Retail trade turnover (billion rubles).

The ADF and KPSS tests proved that the series is stationary in the first differences. The ACF and ACF were constructed for the first differences, and the model order was refined based on the significance of variables and

Table 4. Building SARIMA models for predicting factor indicators

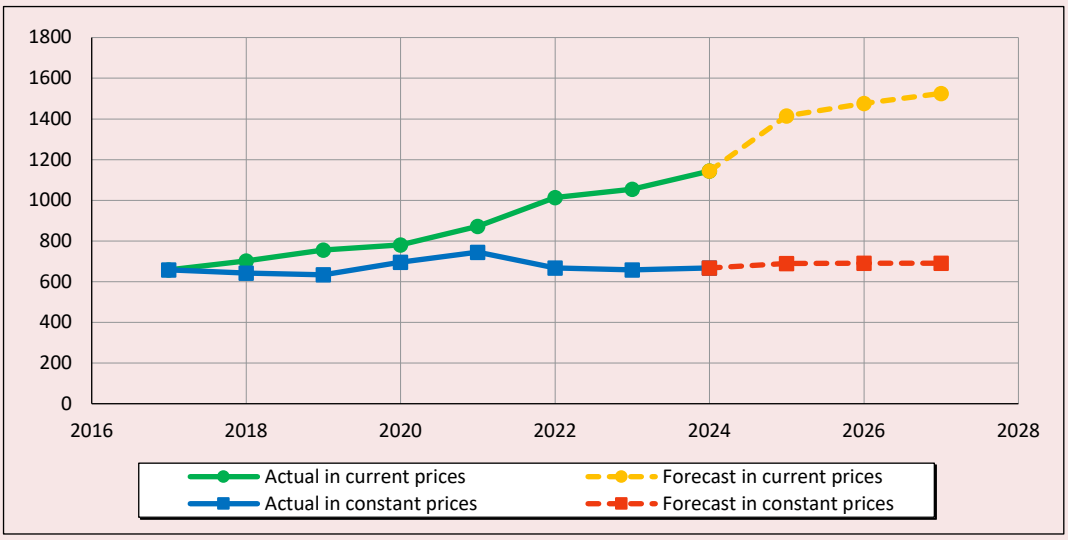
Variable	*Capital*	*RetailTrade1*	*Population*
const			3.19 (0.00)
x			-0.002 (0.00)
ar.L1	0.40 (0.00)	-0.19 (0.00)	1.04 (0.00)
ar.L2	-0.25 (0.00)	-0.09 (0.03)	0.48 (0.00)
ar.L3			-0.01 (0.00)
ar.L4			-0.19 (0.00)
ar.L5			-0.26 (0.00)
ar.L6			-0.43 (0.00)
ar.L7			0.31 (0.00)
ar.L8			0.10 (0.00)
ar.L9			0.12 (0.00)
ar.L10			-0.08 (0.00)
ar.L11			-0.42 (0.00)
ar.L12			0.35 (0.00)
ma.L1			0.08 (0.00)
ma.L2			0.05 (0.00)
ma.L3			0.03 (0.00)

End of Table 4

Variable	*Capital*	*RetailTrade1*	*Population*
ma.L4			0.02 (0.00)
ma.L5			0.01 (0.00)
ma.L6			0.01 (0.00)
ma.L7			-0.002 (0.00)
ma.L8			-0.01 (0.00)
ma.L9			-0.01 (0.00)
ma.L10			-0.001 (0.00)
ma.L11			0.01 (0.00)
ma.L12			0.02 (0.00)
ar.S.L12		0.49 (0.00)	
ma.S.L12		-0.36 (0.02)	
sigma2	102.67 (0.00)	$1.53 \cdot 10^{7}$ (0.00)	$6.64 \cdot 10^{-9}$ (0.00)
AIC	723.30	1981.30	-1467.70
BIC	730.99	1994.37	-1398.18
HQIC	726.41	1986.59	-1439.59
Ljung – Box test	0.01 (0.91)	4.26 (0.04)	32.88 (0.00)
Breusch – Pagan test	0.61 (0.16)	0.47 (0.03)	0.54 (0.08)
Jarque – Bera test	66.26 (0.00)	113.69 (0.00)	6.30 (0.04)

Note. The p-values are shown in parentheses. L1, L2, etc. are used to indicate the lags of the autoregressive component (ar) and the moving average (ma).
Source: own compilation.

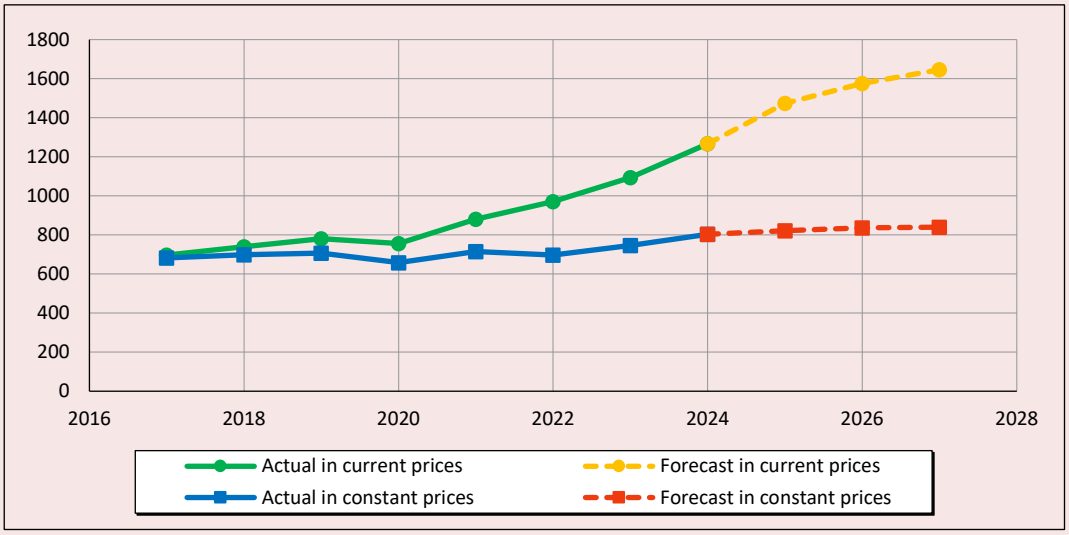
Figure 2. Forecast for the value of fixed assets, billion rubles



Source: own elaboration.

components. There is seasonality in the data, which was taken into account in the model specification. The results of the SARIMA model construction are presented in Table 4 in the column "RetailTrade1". Based on the model, a forecast of retail turnover in constant prices for the period up to 2027 was obtained. The projected values of the chain index, the consumer price deflator, were used to convert it to current prices. *Figure 3* shows the forecasts.

Figure 3. Forecast for retail trade turnover, billion rubles

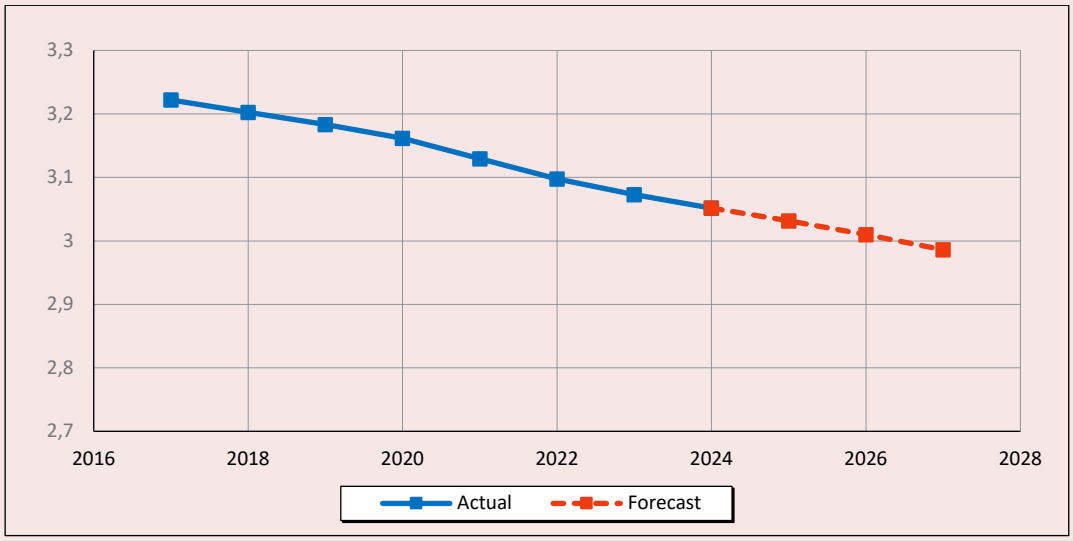


Source: own elaboration.

3. Number of permanent residents at the beginning of the year (million people).

The non-stationarity of the time series in the first differences was confirmed by ADF and KPSS tests, therefore a linear trend was included in the model specification. Due to the fact that this series was filled up by interpolation with splines, its structure is very specific, therefore, 12 lag values are included in the model, overlapping the artificial generation of values within a year. Table 4 presents the results of the ARIMA model construction in the column "Population". Based on the model, a population forecast was obtained for the period up to 2027 (*Fig. 4*).

Figure 4. Forecast for the population, million people



Source: own compilation.

The forecasts of the Government of the Nizhny Novgorod Region and the Bank of Russia, respectively, were used for the other two parameters, the average monthly value of consumer price indices for goods and services (%) and the price of Urals crude oil (U.S. dollar per barrel).

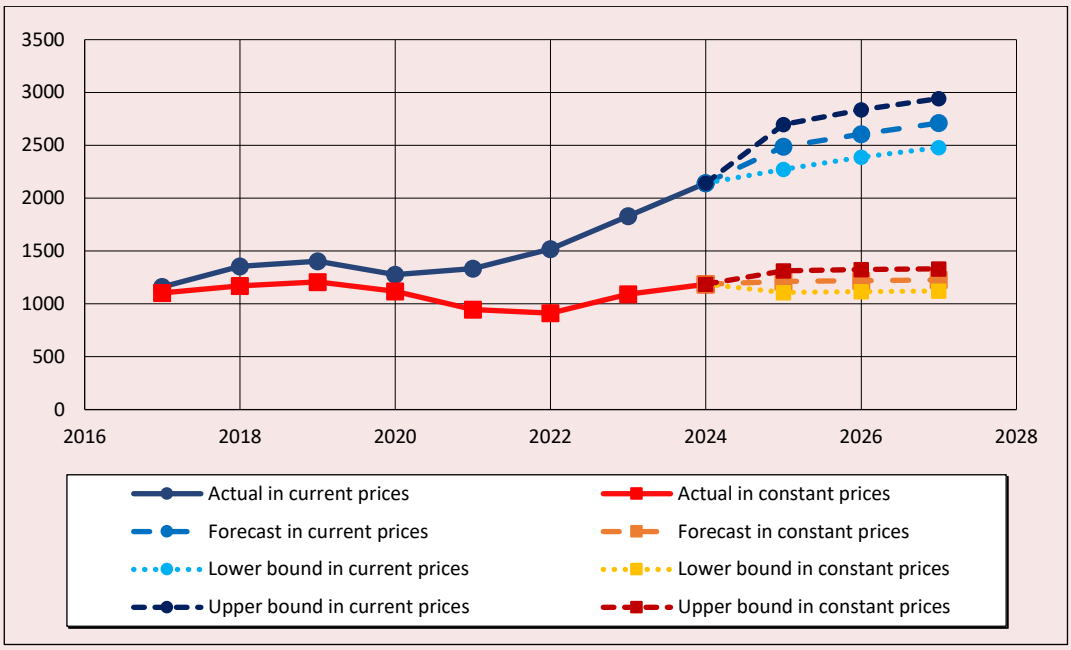
Based on the forecasts of the explanatory variables and estimates of the coefficients of the models, the predicted values of shipments of manufacturing products were calculated (*Tab. 5, Fig. 5*). The confidence interval (95%) was obtained using the bootstrap method.

Table 5. Forecasts of shipments of products of the manufacturing industry of the Nizhny Novgorod Region, billion rubles

Year	Urals oil price, U.S. dollar per barrel *	Inflation rate,%**	Shipment, Y, billion rubles***		Shipment growth, %***		95% confidence interval for shipment at current prices, billion rubles***
			at current prices	at constant prices	at current prices	at constant prices	
2025	58	8.8	2 486.897	1 212.534	16.03	2.24	2273.862 – 2696.101
2026	55	5	2 606.893	1 218.992	4.83	0.53	2388.783 – 2837.037
2027	60	4	2 711.332	1 227.423	4.01	0.69	2479.263 – 2942.760

Sources: * Forecasts of the Bank of Russia (Main directions of the unified state monetary policy for 2026 and the period 2027 and 2028. Moscow: Central Bank of the Russian Federation, 2025. P. 3. Available at: https://www.cbr.ru/about_br/publ/ondkp/on_2026_2028/; ** Forecasts of the Government of the Nizhny Novgorod Region (Forecast of the socio-economic development of the Nizhny Novgorod Region for the medium term (for 2026 and for the planned period of 2027 and 2028). P. 3, 6. Available at: http://publication.pravo.gov.ru/document/5200202510270003?index=1); *** own compilation.

Figure 5. Actual and forecast values of shipments of manufacturing products in the Nizhny Novgorod Region, billion rubles

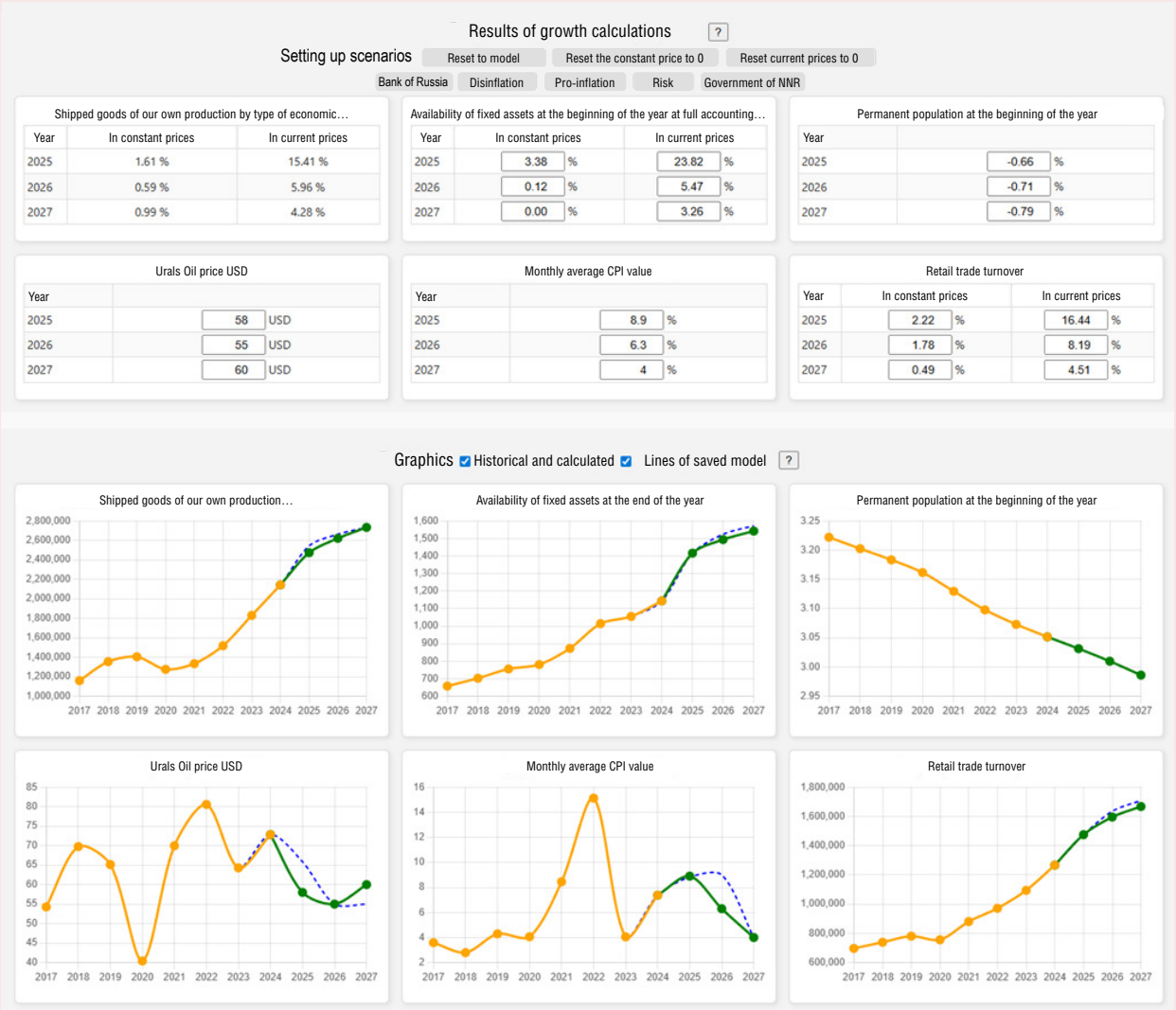


Source: own compilation.

Based on the constructed model using the JavaScript programming language (ECMAScript 2015 – ES6 standard) and HTML5 and CSS3 technologies, a software tool was developed – an interactive economic calculator implemented as a web page and allowing the user to generate and analyze alternative scenarios for the socio-economic development of the region. The calculator contains a digital twin interface for scenario modeling of key economic indicators on the 2025–2027 forecast horizon. it combines in one form a panel for entering scenario parameters, tabular output of historical and forecast values, a graph visualization module, as well as an increment calculation unit designed to quickly compare the result when the input data changes. It provides both a passive mode of use with a number of fixed presets (values that are calculated in advance), and an active mode when the user can change development scenarios using the available sliders.

Figure 6 shows a screenshot of the calculator, where the dotted blue line represents the values

Figure 6. Digital calculator with built-in web interface for forecasting the growth rates of manufacturing industries at current and constant prices



Source: own compilation.

obtained from the model, and the green solid line reflects the forecast based on user changes that are reflected in the tables.

Discussion of the research results

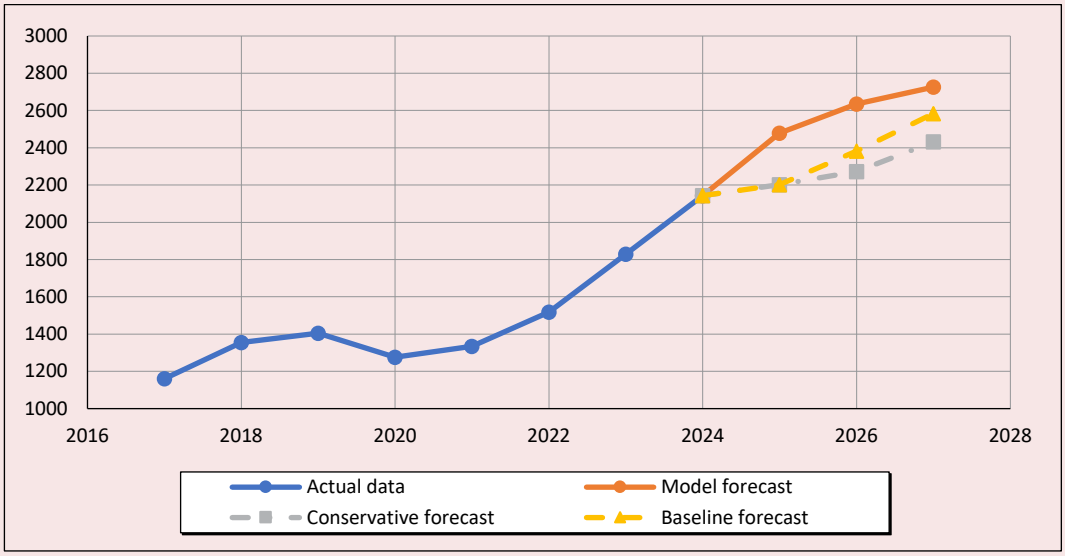
The results were compared with the Forecast of the socio-economic development of the Nizhny Novgorod Region for the medium term to verify the adequacy of the forecasts [5]. There are two scenarios in it: basic and conservative, however, the macro-economic indicators necessary for modeling are indicated only for the basic scenario. Let us calculate the forecast values based on the model constructed as part of the study, taking into account the preservation of the predicted trends for the remaining three indicators. *Table 6* and *Figure 7* present the simulation results in comparison with the forecasts of the Government of the Nizhny Novgorod Region.

Table 6. Comparison of the results of modeling the shipment of manufacturing products with forecasts of the Nizhny Novgorod Region Government

Year	Urals oil price, U.S. dollar per barrel*	Inflation rate in the Nizhny Novgorod Region, %*	Shipment of industrial products, growth, %			
			Government forecasts *		Model forecast ***	
			Basic	Conservative	at current prices	at constant prices
			at current prices			
2025	59**	8.8	2.76	2.76	15.68	1.93
2026	59	5	8.16	3.19	6.29	1.94
2027	61	4	8.47	7.01	3.43	0.13

Sources: * forecasts of the Government of the Nizhny Novgorod Region (Forecast of the socio-economic development of the Nizhny Novgorod Region for the medium term (for 2026 and for the planned period of 2027 and 2028). Available at: http://publication.pravo.gov.ru/document/5200202510270003?index=1); ** data from the Ministry of Economic Development of the Russian Federation for January – June 2025 (Ministry of Economic Development of the Russian Federation. The conjuncture of global commodity markets. Available at: https://www.economy.gov.ru/material/departments/d12/konyunktura_mirovyh_tovarnyh_rynkov/ (accessed: 14.02.2026); *** own compilation.

Figure 7. Comparison of the results of modeling shipments of manufacturing products at current prices with forecasts of the Nizhny Novgorod Region Government, billion rubles



Source: own compilation.

[5] Forecast of the socio-economic development of the Nizhny Novgorod Region for the medium term (for 2026 and for the planned period of 2027 and 2028). Available at: http://publication.pravo.gov.ru/document/5200202510270003?index=1)

The model forecasts turned out to be significantly higher than the forecasts of the Nizhny Novgorod Region Government. In addition, model forecasts show a deterioration in the situation over time, while government forecasts show an improvement in the situation. Currently, there are already first estimates of shipments of industrial products by manufacturing enterprises in the Nizhny Novgorod Region in 2025, according to which the increase in shipments at current prices this year was 5.2%[6], which is higher than the government forecast, but significantly lower than the model forecast. This deviation is mainly due to the higher value of the PPI deflator index in our 2025 forecast (1.135) compared to Rosstat estimates (1.0497)[7]. According to Rosstat estimates, in real terms, the growth rate of shipments in 2025 was 0.22%, which is lower than the model forecast, but higher than the government forecast.

The base forecast of the Nizhny Novgorod Region Government is included in the preset scenarios in the digital calculator web application for comparisons with model and user forecasts.

Thus, the presented digital calculator can be used when considering various "what-if" cases and checking various scenarios for future developments in predicting shipments of manufacturing products. For instance, based on the presented model, the impact of various scenarios of changes in macro-economic indicators developed by the Bank of Russia on the studied indicator was additionally analyzed[8]. *Table 7* shows scenario indicators of oil prices and inflation rates, as well as forecasts of shipments at current prices and their increases in current and constant prices calculated using our model. Based on these results, it can be seen how macro-economic factors affect the change in shipments of manufacturing products in the Nizhny

Table 7. Model forecasts based on various scenarios of the Bank of Russia

Year	Urals oil price, U.S. dollar per barrel *	Inflation rate, % *	Projected shipment values **		
			at current prices, billion rubles	increase in current prices, %	growth in constant prices, %
Basic					
2025	58	8.9	2473.529	15.41	1.61
2026	55	6.3	2620.920	5.96	0.59
2027	60	4	2733.085	4.28	0.99
Disinflationary					
2025	58	8.9	2473.529	15.41	1.61
2026	55	6	2617.698	5.83	0.70
2027	60	4	2728.706	4.24	0.95
Pro-inflationary					
2025	58	8.9	2473.529	15.41	1.61
2026	55	6.9	2627.294	6.22	0.36
2027	55	4.5	2711.124	3.19	-0.43
Risky					
2025	58	8.9	2473.529	15.41	1.61
2026	35	9.8	2519.934	1.88	-5.82
2027	30	12.6	2614.595	3.76	-5.33

Source: * scenarios of the Bank of Russia (Main directions of the unified state monetary policy for 2026 and the period 2027 and 2028. Moscow: Central Bank of the Russian Federation, 2025. P. 71, 77, 81, 85. Available at: https://www.cbr.ru/about_br/publ/ondkp/on_2026_2028/; ** own compilation.

[6] Rosstat. Available at: https://www.rosstat.gov.ru/enterprise_industrial (accessed: 09.02.2026).

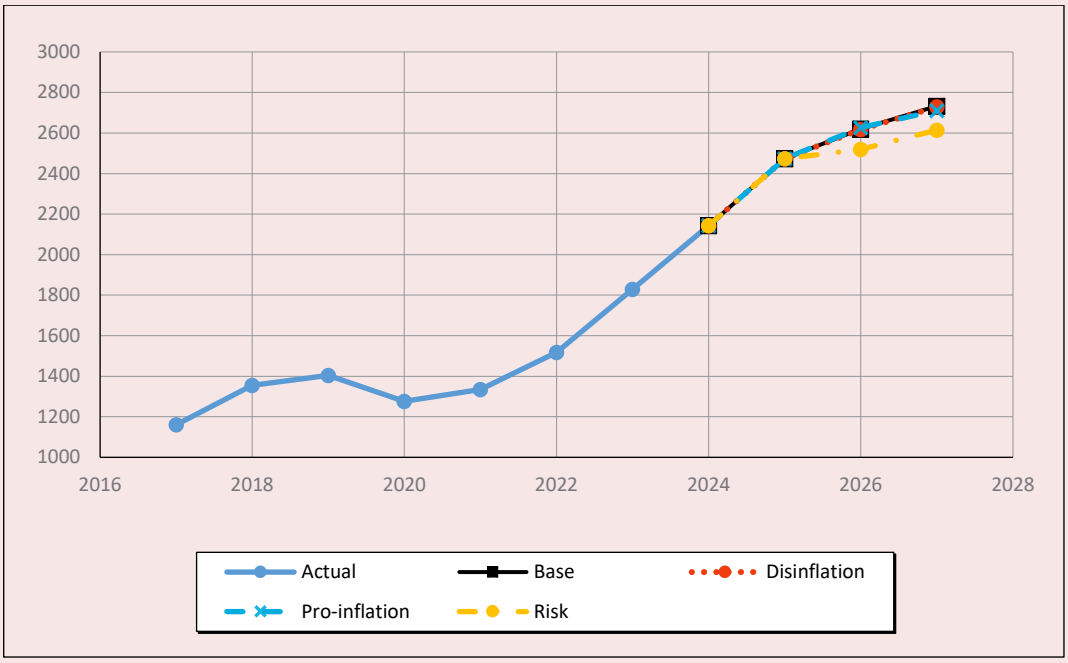
[7] Rosstat. Available at: https://www.rosstat.gov.ru/statistics/price (accessed: 09.02.2026).

[8] The main directions of the unified state monetary policy for 2026 and the period 2027 and 2028. Moscow: Central Bank of the Russian Federation, 2025. Available at: https://www.cbr.ru/about_br/publ/ondkp/on_2026_2028/

Novgorod Region (*Fig. 8*). According to the first estimates, the increase in manufacturing sector production in the Nizhny Novgorod Region in 2025 amounted to 1.1%[9], which turned out to be close to the model forecast based on the scenarios of the Bank of Russia.

It is obvious that the economic situation in the Nizhny Novgorod Region is not described by a single indicator, so the modeling is part of the work to create a larger set of forecast indicators that form an interconnected system and serve as the basis for the digital twin of the Nizhny Novgorod Region. Such a complex will make it possible to understand which current events and possible future changes (including shocks) will lead to certain consequences for the region. Assessing their impact on the regional market will allow authorities to make informed decisions regarding enterprise support, tax incentives, and investment projects. The results of the work were presented to the Ministry of Economic Development and Investments of the Nizhny Novgorod Region. A digital calculator can also be useful for other authorities when conducting a scenario analysis of the consequences of their decisions. For example, the paper (Malkina et al., 2025) presents a simulation of the gross value added of the Nizhny Novgorod Region industry as another key economic indicator of the Nizhny Novgorod Region. The next stage will be the construction of predictive models for other industries and the creation of a generalizing web application that repeats the structure of the interconnections of the Nizhny Novgorod economy and is the digital twin of the region.

Figure 8. Model forecasts based on various scenarios of the Bank of Russia for shipments of manufacturing products of the Nizhny Novgorod Region, billion rubles



Source: own compilation.

[9] The industry of the Nizhny Novgorod region continued to grow in 2025. Kommersant. Volga region. 08.02.2026. Available at: https://www.kommersant.ru/doc/8419004 (accessed: 11.02.2026).

Conclusion

The study showed that the use of econometric autoregressive models with distributed lags makes it possible to effectively predict the level of shipment of manufacturing products in the Nizhny Novgorod Region. We revealed that the main impact on shipment is exerted by such factors as the availability of fixed assets by type of economic activity "Manufacturing", the number of permanent residents at the beginning of the year, retail trade turnover, the average monthly value of consumer price indices for goods and services, as well as the price of Urals brand oil. The constructed models were used as a base for creating a digital calculator, which is a flexible scenario analysis tool combining tabular and graphical representation of data, econometric calculations and a system of user settings. The digital calculator for shipping is part of a more complex product, the digital twin of the region. Its use makes it possible to quickly assess the effects of changes in key macro-economic parameters, compare alternative development scenarios and form analytically sound conclusions about the dynamics of socio-economic indicators of the region. In this regard, this tool is very useful for authorities and other users in planning and optimizing production processes.

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The Boundaries of Population Welfare in the Arctic Regions and Municipalities of the European Part of the Russian Arctic

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Abstract. The territories of the Russian Arctic exhibit pronounced differentiation in their socio-economic development. Disparities are substantial both in living standards and household incomes, as well as in the material costs associated with daily life. Investigating the human capital of Arctic territories requires an integrated analysis of these dimensions. The aim of this study is to delineate the welfare boundaries of the population across the regions and municipalities of the Russian Arctic. An additional objective is to conduct an exploratory spatial analysis of dependencies in the distribution of household income levels, calculated in relation to welfare groups. The object of the study comprises five regions and thirty-two municipalities within the European part of the Russian Arctic. The data sources include findings from sociological surveys of the population conducted in these territories in 2023–2024 (n = 4,871), as well as a series of expert interviews with representatives of business, government, and non-profit organizations. The methodological framework draws upon the principles of regional and spatial economics, the theory of economic behavior, and the economics of living standards. The methodological toolkit combines sociological and econometric techniques for data processing, with spatial analysis performed using Stata and GeoDa software. The study reveals significant territorial differentiation both in the structure of population welfare groups and in the average income levels corresponding to each welfare tier. Based on principles of municipal contiguity and geographic proximity, local Moran's I index statistics were calculated for all welfare groups, and spatial dependencies in the associated income levels were identified. The most

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pronounced dependencies are observed within the middle-welfare group. A low income threshold for achieving this welfare level is characteristic of the White Sea coastal territories of the Republic of Karelia, whereas a high threshold is found in the Murmansk Urban Okrug and the municipal okrugs of Kolsky, Monchegorsk, and Olenegorsk. A juxtaposition of low and high income levels is recorded in Zapolyarny District of the Nenets Autonomous Area and the Urban Okrug of Naryan-Mar, as well as in the Inta Municipal Okrug and its surrounding areas.

Key words: Russian Arctic, Arctic municipalities, household income, population welfare, income groups, territorial differentiation, Moran's I index, spatial dependencies.

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Introduction

Issues of population welfare and its spatial differentiation are extremely relevant in the context of current trends and challenges to Russia's development. The need to ensure the manageability of the economy amid geopolitical and macroeconomic turbulence requires a systematic approach to regulating inter-territorial relationships of population welfare levels. These relationships are among the key macroeconomic signals determining population and labor migration and, in a broader sense, the decision-making of economic agents (Minakir, Dem'yanenko, 2010). These aspects are doubly relevant for the geostrategic territory – the Arctic Zone of the Russian Federation (AZRF), since it experiences a shortage of labor resources and a significant migration outflow (Fauzer, Smirnov, 2020), which hinders implementation of the provisions of the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security up to 2035[1]. The specifics of transport accessibility of Arctic territories (Chen et al., 2025), increased costs of doing business, as well as local consumption and demand (Skufina, Baranov, 2020) cause territorial differentiation of prices for goods and services. In turn, local economic features determine the income level of the population living there. These factors form objective prerequisites for the territorial differentiation of population welfare of the Russian Arctic and its boundaries: the level of income sufficient to ensure expanded reproduction of human capital in one territory may be insufficient to implement a similar reproduction model in other territorial conditions (Volkov, 2025). The research on aspects of population welfare in the context of household characteristics – the number of family members and total income – is of particular interest. In this approximation, the relevance of the subject field of the study is determined by its compliance with the priority directions of national policy implemented within the framework of the national project "Family"[2] and the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security up to 2035. The aim of the presented study is to determine

[1] On the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period up to 2035: Presidential Decree 645, dated October 26, 2020. Available at: http://publication.pravo.gov.ru/Document/View/0001202010260033 (accessed: 20.12.2025).

[2] National project "Family". Ministry of Labour and Social Protection of the Russian Federation. Available at: https://mintrud.gov.ru/ministry/programms/nacproekt_semya (accessed: 20.12.2025).

the boundaries of population welfare of the regions and municipalities of the Russian Arctic (AZRF). In this work, we use data on respondents' subjective assessment of household incomes and welfare, expressed in the ability to meet the family's needs for goods and services. The object of the study is the regions of the European part of the AZRF, as well as their municipal okrugs and districts.

The scientific novelty of the work lies in the detailed analysis of aspects of population welfare at the municipal level, which has not been implemented to date on the scale of the macroregion – the European part of the Russian Arctic. The study is significant as it identifies not only the boundaries of population welfare of the regions and municipalities of the AZRF, but also the spatial dependencies in the distribution of these boundaries at the municipal level. The practical significance of the results is determined by the need to assess both the initial conditions and the trends in the implementation of the national project "Family" and the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security up to 2035.

Literature review

In contemporary scientific discourse, there are several approaches to studying and formalizing the phenomenon of population welfare. Most researchers agree that this category combines many structural components corresponding to the spheres and ways of realizing human needs. M.V. Shlyapina and E.A. Tretyakova identify four elements of regional population welfare: economic, social, environmental, and institutional (Shlyapina, Tretyakova, 2024). A.A. Shabunova and co-authors link the concept of material welfare of the population with the concept of standard of living, within which it acts as a key component and is understood as the provision of the population with material, social, and cultural goods necessary for life. The researchers identify four approaches to studying population welfare: the production approach, the consumption approach, the approach based on population incomes, and the cost-of-living approach (Shabunova et al., 2014). At the same time, as noted by S.V. Dokholyan and M.A. Vershinina, "the key factor influencing people's welfare is their incomes, which determine the growth of citizens' welfare, have a direct impact on its level, and determine the process of consumption of goods" (Aleksandrova et al., 2024, p. 310). Monetary income per capita is often taken as a generalizing characteristic of welfare (Belyaevskii, 2016).

Most authors, when studying population welfare and its spatial differentiation, rely on a system of economic-sociological indicators represented by a combination of statistical and author's sociological data, which allows combining objective and subjective assessments of welfare and incomes (Domnina, 2011; Karachurina et al., 2020; Tretyakova et al., 2025). Subjective assessments of welfare make it possible to link the cost of goods in a certain territory with the income level of the population and are used alongside statistical indicators of the price level, replacing the latter in case of limited statistical data. As noted by P.V. Belopashentseva and co-authors, "subjective poverty is a concept growing out of the issues of subjective social well-being" (Belopashentseva et al., 2024, p. 37). The authors note a divergence in the dynamics and scale of subjective and objective poverty according to data from sample surveys and statistical data (Belopashentseva et al., 2024). Issues of the relationship between objective and subjective welfare are also addressed in a number of foreign studies (e.g., Posel, Rogan, 2016).

However, in a number of studies, the issue of relating income level to local price level and cost of living when studying territorial differentiation of welfare and inequality relies on purely statistical data (Bobkov, Stepanov, 2014; Bobkov et al., 2024; Hussain et al., 2020; Argyris et al., 2025). For example, A.E. Surinov and A.B. Luppov

proposed a methodology for recalculating nominal income levels of the population using territorial purchasing power parities of the ruble. They found that territorial differentiation of the cost of living largely offsets the difference in nominal incomes of the population of Russian regions, and per capita household income values adjusted for territorial purchasing power parities demonstrate a more uniform distribution within macroregions than nominal ones (Surinov, Luppov, 2021). Foreign researchers come to similar conclusions: price differences within spatially differentiated socio-economic systems lead to overestimated assessments of existing territorial inequality in population incomes (Janky, Šedivý, 2018).

Works considering spatial aspects of incomes and welfare of the population include (Naiden, Bravok, 2023; Tan et al., 2021; Acosta, Håkonsson, 2025). We also note the study that reveals how the spatial structure of morphological polycentricity influences the subjective well-being (Li et al., 2025). It should be underscored that most studies are implemented at the national or regional level, while analysis at the municipal level is presented in a relatively small number of works (Surinov, Luppov, 2022; Majchrowska, Strawiński, 2021; Mastronardi, Cavallo, 2020).

For the Arctic regions of Russia, studying aspects of population welfare, as well as its territorial differentiation, is critically important in the context of the existing mono-profile nature of local economies and increased risks for the stable functioning of enterprises under sanctions, as well as the growing need for analytical support of regulatory novations. Existing studies make a significant contribution to the development of the considered subject field (Samarina et al., 2024; Chapargina, 2020). At the same time, there are limitations. As a rule, existing works either cover individual regions of the Russian Arctic, or the nature of the data used in the analysis does not allow making detailed research and final conclusions at the municipal level. This is largely driven by the peculiarities of statistical accounting. Data on household incomes, expenditures, and consumption collected by Rosstat within the framework of a sample survey of household budgets are presented at the regional level and are not available in detail at the municipal level. They also do not allow linking the level of income in monetary terms and the subjective welfare of individual population groups by territory. Data on population incomes are also presented at the regional level and are extremely fragmented at the municipal level, which hinders full and highly detailed consideration of territorial differentiation. Nevertheless, the Russian Arctic with its pronounced spatial differences requires precisely this approach. In this context, the presented study fills the existing gap in the study of population welfare of the Arctic regions of Russia, its income boundaries, and their differentiation at the municipal level.

Methods and data

The data source for the presented study was the results of a population survey in the Arctic territories of the European part of Russia, administratively belonging to the Republic of Karelia, Murmansk Region, Arkhangelsk Region, Nenets Autonomous Area, and Komi Republic. The field stage took place from August 2023 to October 2024. Data were analyzed for 32 municipal formations in the European part of the AZRF – municipal okrugs (MO), municipal districts (MD), and urban okrugs (UO) (excluding the closed administrative-territorial formations: Aleksandrovsk, Vidyaevo, Zaozersk, Ostrovnoy, Severomorsk). A quota sampling method was applied. Across the regions, the sample is distributed as follows: Arctic territories of the Arkhangelsk Region, n = 1,145 people; Murmansk Region, n = 1,258 people; Arctic territories of the Republic of Karelia, n = 1,042 people; Arctic territories of Komi Republic, n = 825 people; the Nenets Autonomous Area (AA), n = 601 people.

At the municipal level, the study design assumes a quota sampling method. Quota groups were formed based on municipal statistics data on the age-sex structure of the population. The average deviation of the sample structure from the general population by age-sex groups overall was: in the Murmansk Region – 2.15%, in the Arkhangelsk Region – 0.9%, in the Republic of Karelia – 1.5%, in the Komi Republic – 0.4%, in the Nenets Autonomous Area – 0.7%; at the level of individual municipalities, not exceeding 3.32, 2.9, 2.4, 1.5, and 1.1% respectively.

Table 1 shows the main characteristics of the sample by gender, education, and occupation of respondents.

Respondents were selected randomly through the door-to-door poll. We used direct interviewing to do the survey; in some cases, however, the questionnaire was self-completed by the respondent (with accompanying instruction and completion control). The sociological survey was carried out by the research team itself, but in a number of territories we cooperated with specialists from the Luzin Institute for Economic Studies of the Kola Science Centre of RAS, Murmansk Arctic University, Northern Arctic Federal University, and the sociological service "Public Opinion of the Komi Republic".

Within the applied sociological tools, the following questions were used in the analysis.

1. To assess the level of population welfare, the question "Please assess the living standard of your family" was used. The response scale is represented by options distributed from the lowest welfare level to the highest:

"Not enough money even for food";

"Enough money for food, but buying clothes and paying for housing is difficult";

Table 1. Main sample characteristics

Sample characteristics		Number of people	Share of total respondents, %
Total sample size		4871	100
Gender	Female	2530	51.94
	Male	2341	48.06
Education	High school or lower	534	10.96
	Primary technical school	190	3.90
	Secondary technical school	1865	38.29
	University not completed	240	4.93
	Higher (Bachelor's Degree, Master's Degree)	1963	40.30
	Graduate student	35	0.72
	Candidate or Doctor of Sciences	44	0.90
Occupation	Public sector worker	1505	30.90
	Civil servant	594	12.19
	Military serviceman	70	1.44
	Private employee	1124	23.08
	Individual entrepreneur, self-employed	198	4.06
	Civic leader	13	0.27
	Do odd jobs	59	1.21
	Temporarily unemployed, actively seeking a job	88	1.81
	Student	364	7.47
	Pensioner	718	14.74
	On maternity/childcare leave	40	0.82
	Homemaker	43	0.88
	No answer	55	1.13

Source: own calculation based on the field study data.

"Enough money only for current needs (food, clothes, housing payments), but not for durable goods";

"Enough money for current needs, household appliances, but not for expensive purchases (apartment, car, dacha)";

"Enough money for both current needs and expensive purchases".

According to the respondents' answers, five welfare groups were identified (group 1 – group 5).

2. To assess the level of household income, we used the open-ended question "What is the approximate total income of your family per month? (Please consider all sources of income – business income, rent, wages, pensions, benefits – of all family members you live with), thousand rubles".

3. To calculate the average per capita income, the open-ended question "Number of family members living together with you (including you)" was used.

The indicator of average income per household member (in this study, the concepts of "family member" and "household member" are used interchangeably) was calculated for each welfare group. This allows estimating the boundaries of welfare expressed in income size, as well as correctly presenting territorial differences in its distribution.

The analysis of spatial dependencies was based on the theoretical provisions of spatial analysis, according to which the intensity of interaction and connections between closely located objects is more pronounced than between more distant objects (Tobler, 1970). However, considering the critical importance of the infrastructure factor within the sparse economic space in the Arctic, it seems incomplete to assess the influence of spatial proximity without accounting for the transport connectivity of territorial objects. In this regard, two approaches were implemented within the analysis of spatial dependencies:

– based on the neighborhood of territories, determined by the presence of common borders between territorial objects (implemented through an n×n matrix of territories, where n = 1 for objects with a common border, and n = 0 for objects without a common border); within this approach, a corresponding matrix was constructed for the considered 32 municipalities of the European part of the AZRF;

– based on the geographic connectivity of municipalities we compiled a matrix of inverse distances between geographic centers, calculated from the centroid of the polygon representing the municipality's territory. The information base was the cartographic data. The value of inverse distances was calculated using formula (1):

$$D_{inv} = 1/dist, \quad (1)$$

where *dist* – distance between the centroids of territories *i* and *j* along the geographic distance, km.

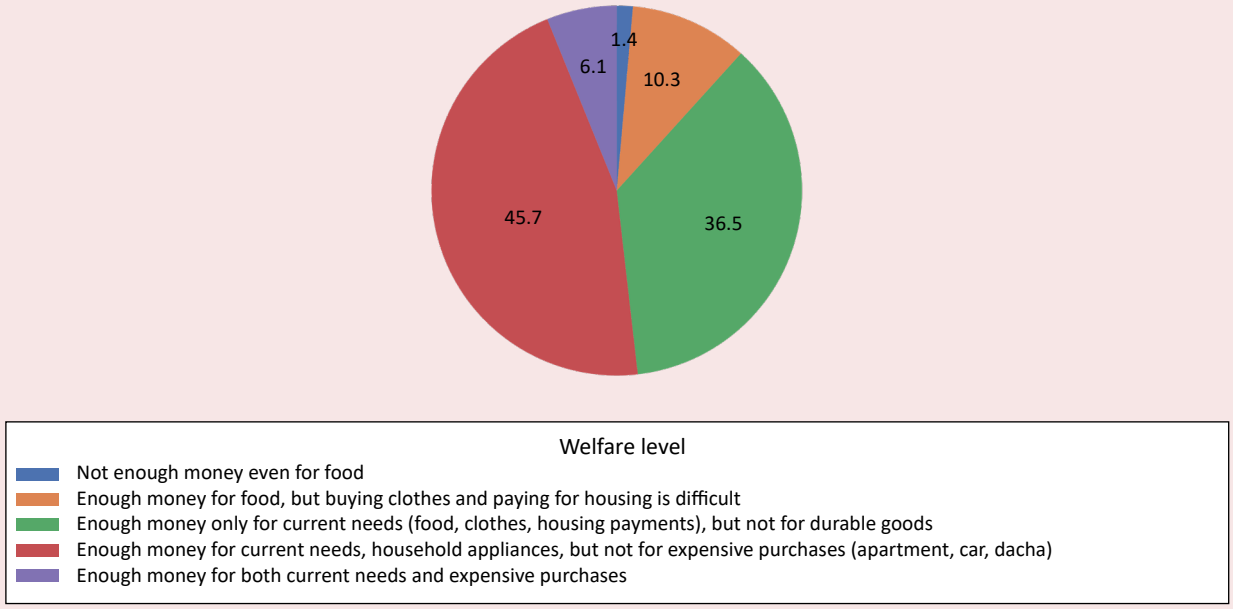
The search for spatial dependencies in the distribution of average household income per family member across welfare groups was carried out using local Moran's indices, reflecting partial (for individual municipalities) dependencies. The significance level of the relationships and their type were identified. Technical calculations and visualization of their results were performed using Stata and GeoDa software packages.

Results

Territorial differentiation of boundaries of population welfare in the European part of the Russian Arctic at the regional level

Consideration of the territorial differentiation of welfare boundaries in the Arctic municipalities of the European part of the AZRF should be preceded by an analysis of the overall picture at the macroregional level. As follows from *Figure 1*, the largest share among the five considered regions has the group characterized by having enough money for current needs, household appliances, but not for expensive purchases (apartment, car, dacha) – group 4 (45.7%). The second most common is group 3, characterized by a welfare level that

Figure 1. Distribution of households in the studied regions by welfare level (total for five regions), %



Source: own compilation.

allows meeting only current needs (36.5%). The population groups representing the pole of poverty (group 1 and group 2) in terms of share among the population (11.7% in total) almost double the share of the pole of wealth (6.1%).

A similar distribution is observed at the regional level. Group 1, characterized by a lack of money even for food and corresponding to a level of destitution, is most prevalent among the Arctic territories of the Republic of Karelia and the Arkhangelsk Region (1.7% and 1.9% respectively). It has the smallest share among the Arctic territories of the Komi Republic (Komi Republic AZ; 0.6%). The share of the population with high affluence varies from 5.1% in the Komi Republic AZ to 7.4% in the Nenets AA. Noteworthy is the relatively low share of the Nenets AA population classified as group 4 (*Fig. 2*).

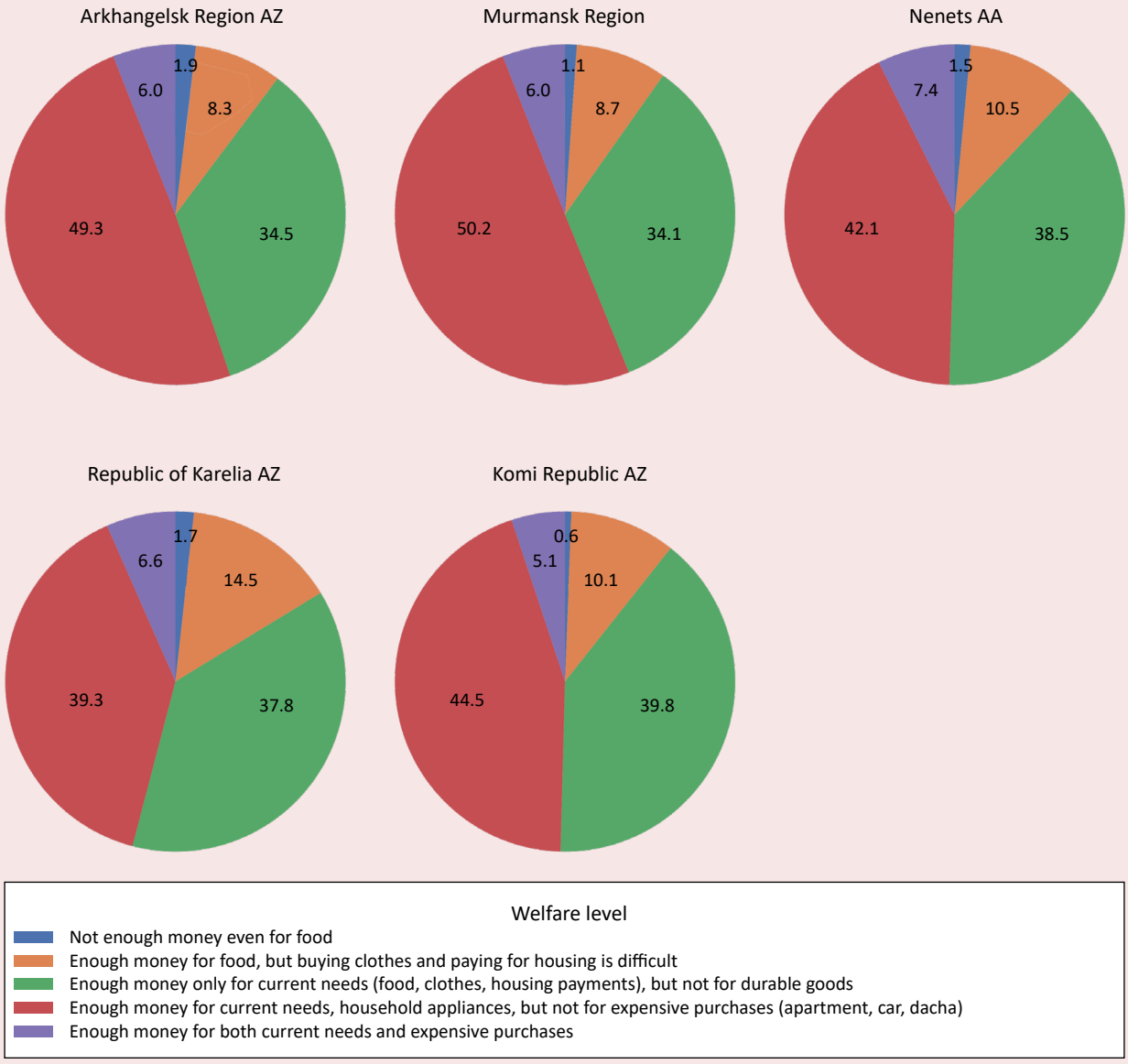
Comparison with the data from Rosstat's sample survey of household budgets (*Tab. 2*) revealed similarity in the general ratios, however, the sociological survey showed a significantly larger

Table 2. Distribution of households in the studied regions by welfare level according to Rosstat data (across five regions), %

Region	Group 1	Group 2	Group 3	Group 4	Group 5
Murmansk Region	0	2.5	34.2	54	9.3
Nenets Autonomous Area	0	1.4	37.3	40.4	20.9
Republic of Karelia	0.3	7.7	45.9	38.9	7.2
Arkhangelsk Region without Nenets Autonomous Area	0.1	12.9	37	46.6	3.4
Komi Republic	0.1	9.6	35.7	44.3	10.3

Note. Group 1 – not enough money even for food; group 2 – enough money for food, but buying clothes and paying for housing is difficult; group 3 – enough money for food and clothes, but durable goods are not affordable; group 4 – enough money for food, clothes, and durable goods, but not enough for a car, apartment, or dacha; group 5 – enough money to buy everything considered necessary.
Source: own compilation based on Rosstat data.

Figure 2. Distribution of households in the studied regions by welfare level according to sociological survey data (across five regions), %

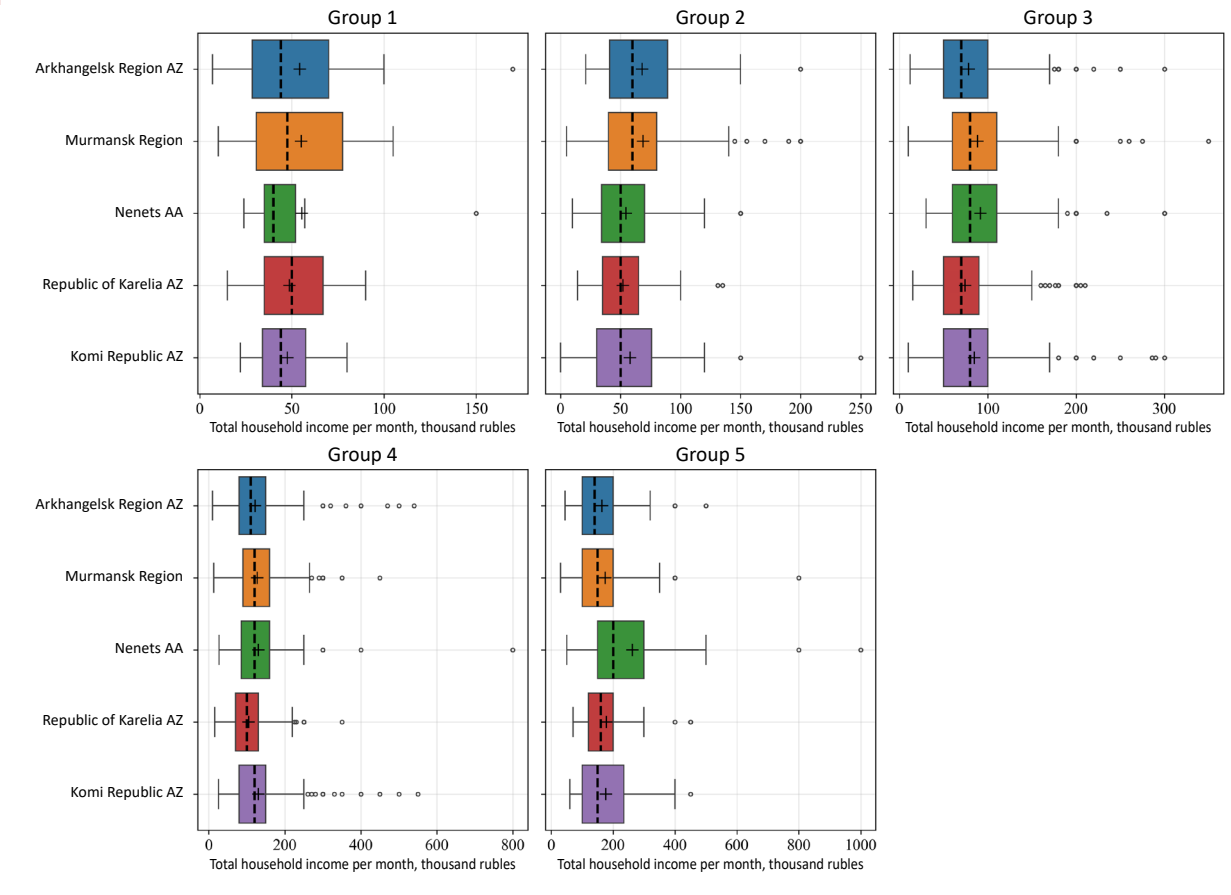


Source: own compilation.

representation of households classified as group 2, which is characterized in both data sources by having money for food but difficulties in paying for other goods and services.

Examination of the correspondence between the average household income level and the welfare level according to the sociological survey across regions indicates that the smallest territorial differentiation within this indicator is characteristic of group 1 (from 47.5 thousand rubles in the Komi Republic AZ to 55.4 thousand rubles in the Nenets AA), and the largest – of group 5 (from 163.6 thousand rubles in the Arkhangelsk Region AZ to 261.9 thousand rubles in the Nenets AA). However, the range in group 5 is wide due to the Nenets AA, an outlier, while the average household income values in the

Figure 3. Aspects of the relationship between welfare level and total household income across regions



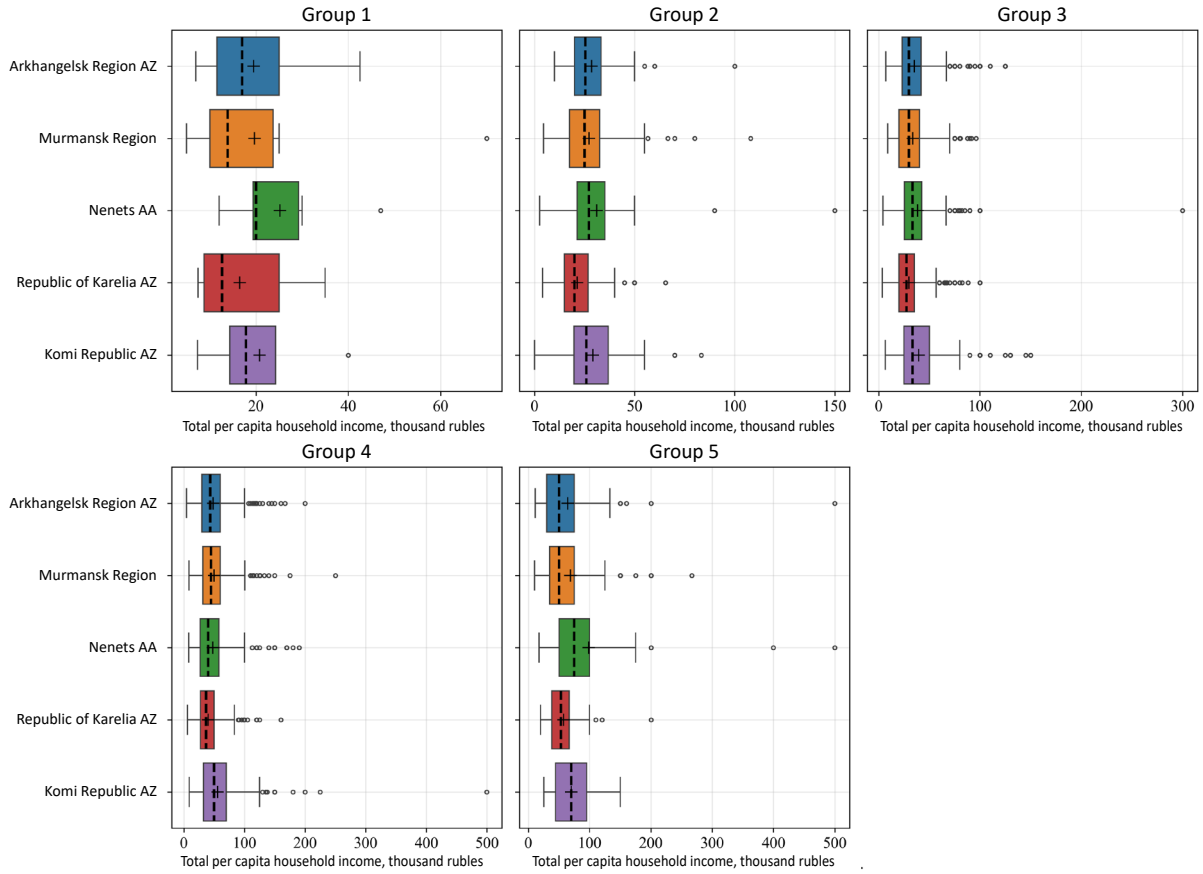
Source: own compilation.

other four regions are in the range of 163.6–178.1 thousand rubles. The Republic of Karelia AZ has the lowest average household income for the population as a whole, 89.2 thousand rubles (in other regions it is within 103.7–114.8 thousand rubles). This is driven by the significant lag of its group 4 from the macroregion's average values (*Fig. 3*).

More precise estimates can be given by taking into account per capita household income. Here we see a more pronounced lag of the Republic of Karelia AZ in most groups, while the leadership of the Nenets AA is less explicit, manifested clearly only in group 5 (80.6 thousand rubles per capita against the macroregion's average of 59.7 thousand rubles per capita). When examining regional distributions of the average values of this indicator for the population as a whole, a significant lag of the Republic of Karelia AZ (31.6 thousand rubles per capita) and a weakly expressed leadership of the Komi Republic AZ (41.8 thousand rubles per capita) are noticeable. At the same time, the values of the Murmansk Region (38.0), the Arkhangelsk Region AZ (38.6), and the Nenets AA (39.3) demonstrate less differentiation (*Fig. 4*).

It is also interesting to compare the results with statistical data, although this can be done only to a limited extent. Rosstat keeps records of sample household surveys data only at the regional level, which does not allow drawing conclusions about the Arctic territories of the regions that are partially

Figure 4. Aspects of the relationship between welfare level and total per capita household income across regions



Source: own compilation.

Table 3. Comparison of per capita household income according to statistics and sociological survey data

Region	Disposable resources (average per household member per month, rubles), Q4 2024, for regions as a whole, Rosstat data	Incomes per household member, for Arctic territories, author's survey data
Murmansk Region	71.2	38.0
Nenets AA	52.0	39.3
Republic of Karelia	63.8	31.6
Arkhangelsk Region (without Nenets AA)	46.6	38.6
Komi Republic	54.1	41.8
Source: own compilation based on Rosstat and field study data.		

included in the AZRF. A correct comparison is possible only for the Murmansk Region and the Nenets Autonomous Area (*Tab. 3*). Moreover, official statistics provide information only for the population as a whole, not by groups corresponding to welfare levels.

Comparison shows that the values of official statistics and field study data differ significantly. This may partly be explained by differences in the methodology for calculating indicators of disposable resources and per capita household income. At the same time, official statistics raise many questions. For example, we see that the value of disposable resources (average per household member per month, rubles) for the Republic of Karelia for Q4 2023 is 41.5 thousand rubles, while the value for Q4 2024 is already 63.8 thousand rubles: more than a 1.5-fold increase in one year. While in the neighboring Arkhangelsk Region (without the Nenets AA), the value for Q4 2023 is 55.3 thousand rubles, and for Q4 2024 is at once 46.6 thousand rubles: a decrease by 15.7%. The explanation of such multidirectional dynamics in neighboring regions, as well as growth rates in the context of individual regions presented in official statistics, is difficult for us as researchers and is probably related to the methodology of surveys conducted by Rosstat. It should be noted that the per capita household income data collected within the sociological survey are more consistent with the data on the distribution of regional households by welfare level presented in Figure 2 and Table 2. A comparison of the author's and statistical data for two regions fully included in the AZRF – the Murmansk Region and the Nenets Autonomous Area – is indicative in this regard.

Territorial differentiation of boundaries of population welfare in the European part of the Russian Arctic at the municipal level

Comparison of income levels across welfare groups implies an immanent accounting of the level of prices for goods and services and the costs of daily life in the territories. In other words, we answer the question "what level of per capita family income is needed on average to maintain a certain level of family welfare in a given territory?". Analysis of municipal-level data suggests a fairly pronounced inter-municipal differentiation of household incomes per family member, which is reflected in the average values for the entire population across municipalities (*Tab. 4*). There is a gap in the indicator values between the deindustrialized periphery and industrial and administrative centers (1.1–2.0 fold). At the same time, we see a number of exceptions. For example, the value of the indicator of average household income per family member in Segezhsky MO is at a fairly low level, despite the presence of a successfully operating industrial enterprise in the administrative center of the okrug.

The boundaries of population welfare of municipal districts and okrugs also demonstrate differentiation both within the entire considered macroregion of the European part of the AZRF and within the economic space of individual regions. As a rule, observations show a gradual and monotonic increase in indicator values when moving from the least to the most financially secure groups. At the same time, in a number of peripheral municipalities, a decrease in the value is observed when moving from group 4 to group 5 (Onezhsky MO, Pinezhsky MO, Tersky MO, Kalevalsky MD), which is also characteristic of individual industrial mono-towns (Kovdorsky MO, Olenegorsk MO). We attribute this phenomenon to three aspects. First, in deeply peripheral and deindustrialized territories, household subsidiary plots significantly increase the welfare of the local population and make more expensive property affordable to them. Second, the cost of expensive property (apartments, houses, cars) in these territories is also relatively lower compared to industrial and administrative centers. For example, in Inta MO, the cost of a well-maintained apartment is one of the lowest in Russia: offers for the sale of apartments started from 70 thousand rubles at the time of the study. Third,

Table 4. Correspondence of average per capita family income and the level of subjective welfare of the population in selected municipalities, thousand rubles

Municipality	Group 1	Group 2	Group 3	Group 4	Group 5	Total
Murmansk Region						
Apatity MO	8.3	26.3	35.1	43.3	50.0	39.0
Kandalakshsky MO	–	24.6	28.6	37.4	40.0	32.9
Kirovsk MO	–	22.3	28.8	52.2	57.1	40.7
Kovdorsky MO	5.0	12.9	34.0	48.9	41.1	39.0
Kolsky MO	–	21.3	29.1	45.2	150.0	40.2
Lovozersky MO	15.8	18.4	24.6	36.8	78.0	27.4
Monchegorsk M*O*	21.0	26.9	31.9	52.0	75.6	42.6
Murmansk UO	23.6	25.5	31.6	47.3	85.5	43.1
Olenegorsk MO	–	16.0	33.9	46.7	42.1	39.5
Pechengsky MO	–	31.2	28.6	36.7	43.1	34.3
Polyarnye Zori MO	13.1	38.2	28.2	51.2	86.2	41.4
Tersky MO	10.0	17.6	22.7	29.0	23.3	25.1
Republic of Karelia AZ						
Belomorsky MO	23.0	25.2	31.9	34.5	48.2	33.3
Kalevalsky MD	–	18.4	23.1	28.6	25.8	23.7
Kemsky MO	8.7	18.9	27.5	38.4	48.2	31.9
Kostomukshsky MO	10.0	18.9	31.4	45.1	66.7	41.8
Loukhsky MD	8.3	19.1	24.0	32.5	43.0	27.3
Segezhsky MO	16.7	17.1	24.9	30.7	48.3	26.0
Arkhangelsk Region AZ						
Arkhangelsk UO	13.8	28.9	36.2	48.1	71.3	44.1
Leshukonsky MO	–	20.0	23.0	39.1	56.0	33.5
Mezensky MO	35.0	36.0	23.0	38.0	43.9	33.1
Novodvinsk UO	25.0	25.0	32.3	42.3	69.5	35.9
Onezhsky MO	18.5	25.0	26.4	37.8	31.2	32.5
Pinezhsky MO	14.1	18.2	26.1	38.5	22.3	28.4
Primorsky MO	18.0	31.1	21.6	34.4	62.0	33.2
Severodvinsk MO	31.7	31.1	38.8	50.1	78.0	46.9
Nenets A*A*						
Zapolyarny MD	19.4	22.9	29.0	36.0	55.8	32.8
Naryan-Mar UO	38.5	30.5	37.8	43.4	93.5	45.2
Komi Republic AZ						
Vorkuta MO	40.0	27.6	37.6	52.1	78.0	45.6
Inta MO	7.3	27.8	29.4	33.7	37.3	30.9
Usinsk MO	17.6	26.9	38.7	57.0	67.9	46.9
Ust-Tsilemsky MD	–	20.8	30.0	34.0	50.0	33.3
Total	**17.0**	**23.2**	**31.0**	**42.8**	**59.7**	**37.4**

Source: own compilation based on field study data.

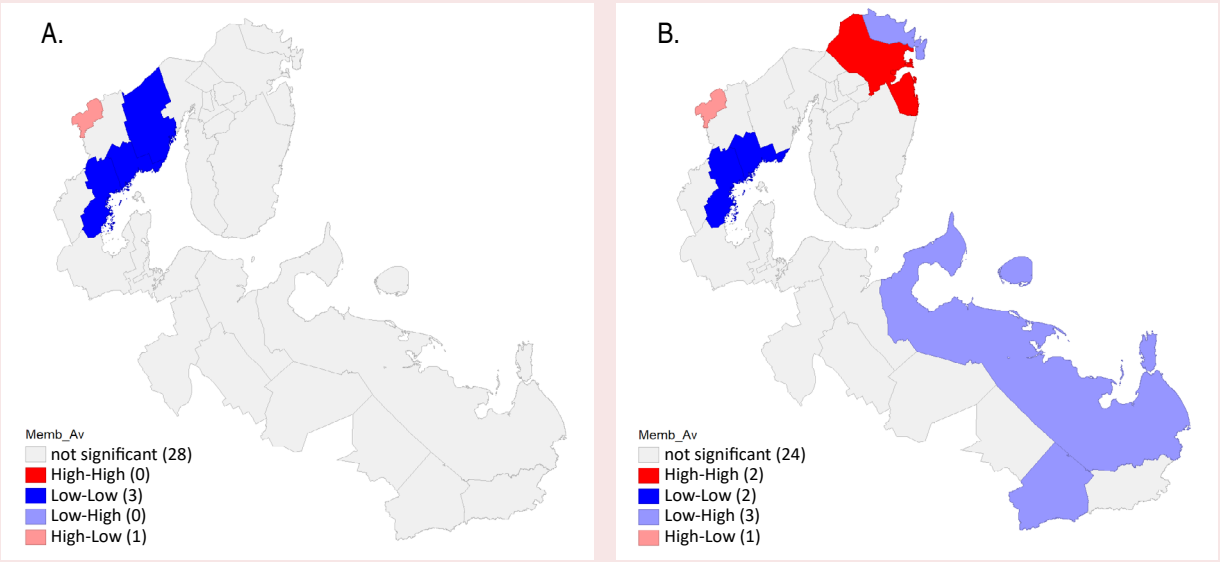
since the number of respondents in the groups with the lowest and highest affluence is relatively small at the municipality level, there is a more pronounced influence of respondents' individual characteristics in a number of cases – considering, for example, large families or, conversely, those living alone. For large families, the indicator value is influenced by a decrease in calculated basic costs per family member and, at the same time, relatively lower final values of per capita income. The latter is also true for industrial mono-towns – expedition results record the relative prevalence of large families with high affluence in these settlements.

The greatest territorial differentiation of indicator values is observed in group 5 with a high welfare level and 6.7-fold difference. At the same time, the most substantiated conclusions can be made for groups 2, 3, and 4, due to the large number of their sample. Territorial differences in average per capita household income for group 2 reach 3-fold, values fluctuate from 12.9 thousand rubles per capita (Kovdorsky MO) to 38.2 thousand rubles per capita (Polyarnye Zori MO) with an average value among municipalities of 23.2 thousand rubles per capita. When examining group 3, we see less pronounced differentiation: territorial values are in the range from 22.7 thousand rubles per capita (Tersky MR) to 38.8 thousand rubles per capita (Severodvinsk MO) with an average value of 31.0 thousand rubles per capita. Group 4 with an average level of affluence is characterized by slightly more pronounced differentiation than group 3. The range of values reaches 2-fold; values fluctuate from 28.6 thousand rubles per capita (Kalevalsky MR) to 57.0 thousand rubles per capita (Usinsk MO) with an average value among municipalities of 42.8 thousand rubles per capita.

Spatial dependencies in the distribution of welfare boundaries at the municipal level

The research on spatial dependencies is the exploratory part of the presented work. We analyzed both the total average per capita household income and each of the five welfare groups. *Figure 5* reflects the spatial dependencies for the first of these aspects,

Figure 5. Spatial effects determined by:
A. territorial neighborhood, average per capita family income;
B. geographic proximity of territories, average per capita family income, average indicator value by territory



Source: own compilation.

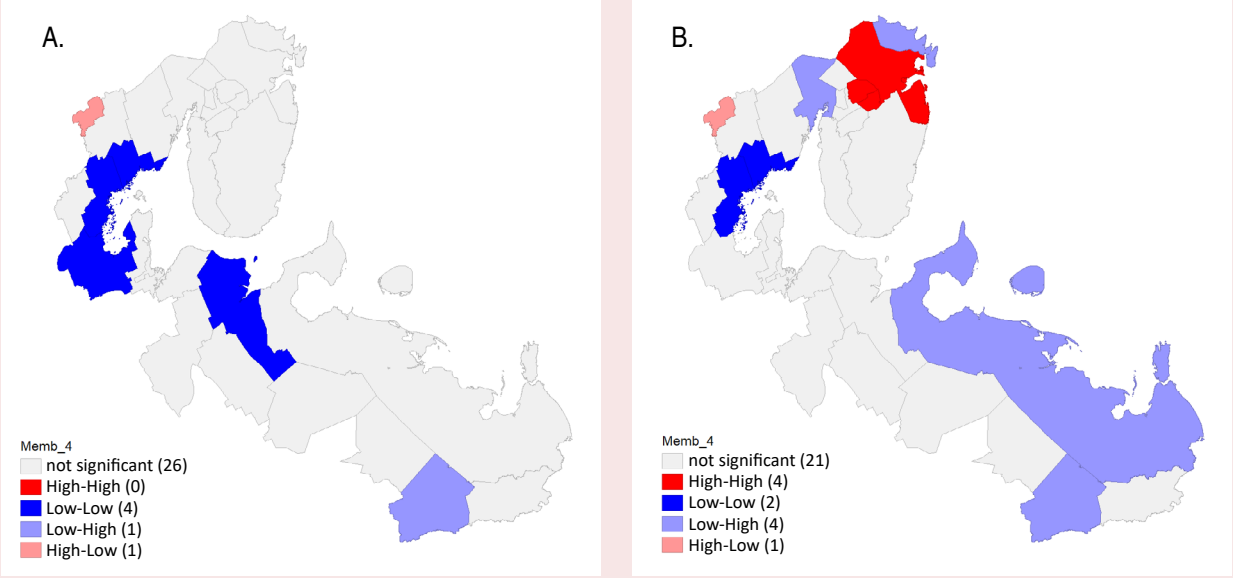
representing a visualization of the distribution of local Moran's indices for the territories of the European part of the AZRF, highlighting the significance level of the relationship and its type.

The most explicit dependencies are manifested under both approaches and are observed in the White Sea territories of Arctic Karelia, characterized by socio-economic stagnation and the same administrative conditions. Kostomukshsky MO – the regional pole of socio-economic development – is characterized by a relatively high level of indicator value despite the socio-economic upheavals of recent years and the closure of a number of medium-sized businesses, which is due to the stable functioning of the city-forming enterprise AO Karelskiy Okatysh. Consideration of geographic proximity allowed identifying a wider range of dependencies. In addition to those already mentioned, we note the relationship of high indicator values in the territories of Murmansk UO and Kolsky District, which we primarily associate with the proximity of administrative and economic centers and the prevalence of commuters among their population. These factors contribute to the territorial distribution of the multiplier effect within broader agglomeration effects. Similar manifestations are recorded for Naryan-Mar UO and Zapolyarny District of the Nenets AA, though their relationship is based on a different dependency. These territories are more heterogenous in terms of their economic development: despite the fact that the main production facilities are located on the territory of Zapolyarny District, they are registrated, as a rule, in Naryan-Mar UO or outside the region.

Analysis within welfare groups also allowed identifying a number of dependencies. They are most pronounced in group 4 (*Fig. 6*).

The analysis of average per capita family income through the lens of geographic proximity allowed identifying more spatial dependencies for group 4, as it was for the previous indicator. Figures 5 and 6 are visually similar. It indicates that the distribution

Figure 6. Spatial effects determined by:
A. territorial neighborhood, average per capita family income;
B. geographic proximity of territories, average per capita family income in group 4



Source: own compilation.

of average income levels correlates in some way with the distribution and spatial dependencies between territorial income values that allow maintaining a certain welfare level (in this case, average and above average). Here, as before, the relationship and mutual influence of Zapolyarny District and Naryan-Mar UO should be noted – the administrative center of the district, Iskateley settlement, is located very close to Naryan-Mar UO, and a significant part of the population commutes to it. Moreover, goods and services, medical care for residents of the most populated settlements and villages of Zapolyarny District of the Nenets AA, located near the administrative center (Iskateley settlement, Krasnoe village, Telviska village, etc.), are also provided by Naryan-Mar UO. Also, interviews with representatives of government and business of the Nenets Autonomous Area show that there is a pronounced local distribution of the multiplier effect between these settlements, which has "Arctic" features and is determined not only by business processes, but also by the redistribution of financial flows as a result of grants and subsidies for business entities.

The established statistical relationship between Inta MO and the surrounding territories is largely driven not by economic ties between territories or resource transfer, but by the persistently depressed state of Inta MO. This municipality faces a significant socio-economic challenge due to the closure of the city-forming coal mining enterprise, which at the peak of its activity employed about 12 thousand residents of the urban okrug. The investor that came to the territory, OOO Carbide and Ferroalloy Plant, provided employment for about 70 people at the time of the study. The situation is aggravated by the virtual absence of road communication between Inta MO and other settlements.

The correspondence between high indicator values of Murmansk UO and Kolsky MO is supplemented in group 4 by a similar relationship between Monchegorsk MO and Olenegorsk MO. In our opinion, this indicates not only a comparable level of incomes in these industrial centers, but also the development of a common consumer market driven by the geographic proximity and improved transport links between these territories.

Conclusion

After the analysis we can make several conclusions. First, the analysis of municipal-level data suggests pronounced inter-municipal differentiation of household incomes per family member. There is a gap in the indicator values between the deindustrialized periphery and industrial and administrative centers, reaching two-fold.

Second, the welfare boundaries of municipal districts and okrugs also demonstrate differentiation both within the entire considered macroregion of the European part of the AZRF and within the economic space of individual regions. Most observations show a gradual and monotonic increase in the values of the average per capita household income when moving from the least to the most financially secure groups. At the same time, the greatest territorial differentiation of values is observed in the group with a high welfare level. For the most numerous groups, represented by households with average affluence and adjacent groups, the differentiation of income values is from one and a half to three-fold.

Based on the experience of personal interviews with respondents, we note that these differences in welfare boundaries are primarily driven by:

– differentiation of the general price level (for example, the cost of goods in Vorkuta MO is objectively higher due to a lack of road communication and difficulties of delivery by railway; the gradual reduction of the list of goods subsidized under the "Northern Delivery" program leads to a general increase in prices in the deeply peripheral territories of Zapolyarny District of the Nenets Autonomous Area, etc.);

– level of prices for some groups of goods (in particular, Inta MO, as well as peripheral territories are characterized by relatively low costs of housing and some other basic expenditures (for example, transport costs for intra-territorial movement), which contributes to respondents' self-classification into groups with a higher welfare level);

– the prevalence of household subsidiary plots in a number of territories with a milder climate (subsidiary plots are a significant source of increasing the welfare of those living in deeply peripheral and deindustrialized territories, as they save monetary incomes to purchase more expensive property).

The most explicit spatial dependencies are recorded in the group with average welfare. A mutually low level of income to achieve this welfare level is observed among the White Sea territories of the Republic of Karelia, and a mutually high level – for Murmansk UO, Kolsky MO, Monchegorsk MO, and Olenegorsk MO. A contrast between low and high levels of income to achieve an average welfare level is observed in Zapolyarny District of the Nenets AA and Naryan-Mar UO, as well as in Inta MO and surrounding territories.

Overall, we highlight that the findings of this research significantly supplement and clarify statistical information on per capita household income at the regional level; the increase in data at the municipal level is even more valuable.

The practical significance of the study lies in the development of analytical foundations for a more correct application of income values to compare the standard of living of the Arctic territories population, as well as for better monitoring of the implementation of the national project "Family" and the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security up to 2035. In particular, the findings will be useful in substantiating the territorial specification of material support for large families and childbearing to achieve one of the key indicators of the national project "Family" by 2030 – poverty reduction. Further prospective analysis of spatial dependencies will allow identifying a range of significant regularities in the development of regional economies, related both to the action of the same or similar territorial factors and administrative conditions, and to aspects of the mutual influence of municipalities.

Further research prospects include determination of income intervals corresponding to local welfare levels, as well as calculation of spatial dependencies considering the transport links of the administrative centers of the studied territories.

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International Migration in Russia's Northern Regions: Spatial Patterns and the Role in Provision of Human Resources

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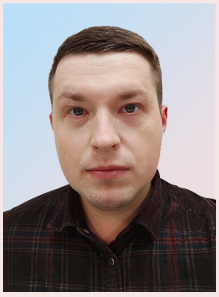

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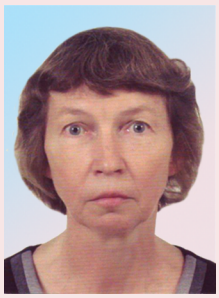

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Abstract. For most northern and Arctic territories, international migration is the only type of population movement with a positive net migration rate, which underscores the relevance of this research. The study examines international migration flows in the regions of the Russian North during the late Soviet and contemporary periods. The object of the study is 13 regions fully included in the list of Far North territories and areas equated to them. The aim is to reveal the spatial patterns of international migration in the northern regions of Russia and to assess its role in providing them with labor resources for the economy. The methodological framework includes the use of official migration statistics, census data, and scientific network methods to analyze data network structures. A network approach is applied to analyze the largest international migration flows. It is shown how migration trajectories have shifted during the transition from the development of the North in the late Soviet period to the contemporary system of international labor migration, with the Urals North and Central Asian countries playing an increasing role in migration exchange. Migration hubs and territorial clusters within migration networks are identified. The classification of migration flows allowed identifying groups of countries which have social, economic, cultural relations with the regions of the Russian North. The study highlights the special role of the Sakhalin Region and the Republic of Karelia as northern regions with the largest migration exchange with non-CIS countries. The importance of the Arkhangelsk Region in international educational migration is also noted. The study confirms the effectiveness of the network approach in analyzing international migration flows. The findings can contribute to further research on international migration and to the formulation of strategic documents for the development of the North of Russia.

Key words: international migration, migration flows, network analysis, Russian North.

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Introduction

According to UN estimates, the number of international migrants exceeded 304 million (3.7% of the world population) by mid-2024, compared to 221 million in 2010 and 154 million in 1990. This is a 74% increase since the beginning of the century and nearly a 2-fold increase (98%) since 1990. The share of international migrants living in the USA was 17.2% in 2024. Germany ranked second with a share 3.1 times smaller (5.5%). Russia ranked tenth (2.5%) but this figure can be underestimated[1]. The sharp drop in the number of international migrants in Russia according to the 2024 UN estimates – from 11.2 million in 2010 to 9.1 million in 2015 and 7.3 million in 2020 – is rather difficult to interpret. The increase to 7.6 million in 2024 is likely to have its roots in forced migration from Ukraine, but its estimate also raises many questions[2].

International migration issues are reflected in the UN Resolution "Transforming Our World: The 2030 Agenda for Sustainable Development". Goal 10 underscores that reduction of inequality within and among countries implies orderly, safe,

[1] Chudinovskikh O.S. (2025). On international migration in the Far Eastern Federal District. Demoskop Weekly=Demoscope Weekly, 1079–1080. Available at: https://www.demoscope.ru/weekly/2025/01079/scientific_digest01.php

[2] Shcherbakova E.M. (2025). Demographic barometer. International migration according to 2024 UN estimates. Demoskop Weekly=Demoscope Weekly, 1081–1082. Available at: https://www.demoscope.ru/weekly/2025/01081/barom01.php

regular and responsible migration and enhanced representation for developing countries in decision-making in global international economic and financial institutions[3]. Other 16 goals are also linked to migration and include eradication of human trafficking, reduction of transaction costs of migrant remittances, promotion of student mobility, etc. (Fauzer et al., 2018, pp. 31–37).

International migration has always fascinated Russian researchers. During the Soviet period, such work was hindered by the lack of open data. In the post-Soviet period, studies have focused on assessing the scale of migration flows and their impact on regional labor markets, as well as on changing attitudes toward migrants in both host and sending communities (Metelev, 2017).

International migration is a coin with two sides: host communities seek skilled personnel culturally and religiously close to the local population; sending communities pursue several goals: reduction of youth unemployment, increase in the income of families receiving remittances, and establishment of "ethnic enclaves" in host countries – "Chinatowns" of their own – to further their "migratory and cultural expansion".

Remittances between countries are very significant for international migration. In 2023, such transfers reached 656 billion dollars in total, with India being the largest recipient. The economies of many former Soviet republics depend on remittances from migrant workers. For instance, according to Central Bank data[4], total amount of remittances from Russia to Kazakhstan in 2024 was 132.8 million dollars, a 44% decrease compared to 2023. However, Russia remains the leading country in terms of money sent to Kazakhstan. In 2024 541.2 million dollars was sent from Russia to Georgia, 65% less than the 1.5 billion dollars sent in 2023. Still, Russia is in the top three countries for remittances to Georgia, it is behind only the USA and Italy. The volume of transfers from Russia to Armenia for the first 11 months of 2024 decreased by 13%: 3.2 billion dollars in January–November 2024 compared to 3.6 billion dollars in January–November 2023. Russia is the primary source of remittances to Armenia. The Central Bank of Azerbaijan has published statistics only for the first nine months of 2024. The volume of transfers from Russia to Azerbaijan in January–September 2024 halved to 410.7 million dollars. Even so, Russia remains the main source of remittances to this country as well. An exception among nearby countries is Kyrgyzstan, where the volume of remittances increased by 12% over the year, reaching about 2.6 billion dollars. Unlike the countries mentioned above, Kyrgyzstan has a significant number of labor migrants in Russia. Remittances from Russia account for virtually all of the country's international transfers.

The study of migration in the North of Russia is especially relevant due to the structure of its economy and demographic trends. The Far North and equivalent areas cover almost 70% of Russia's territories. Mining is the key sector of the economy in the North of Russia. In a number of regions, it accounts for more than half of the value added: Nenets Autonomous Area (83.7%), Khanty-Mansi Autonomous Area (78.8%), Yamal-Nenets Autonomous Area (69.4%), Sakhalin Region (60.5%), Republic of Sakha (57.7%), Magadan Region (55.2%). The indicator of the Komi Republic (47.0%) and the Chukotka Autonomous Area (37.0%) is slightly lower. The Arkhangelsk and Murmansk regions have more diversity: manufacturing industries are developed there (more than 20% of the added value), including shipbuilding and ship repair. Fishing and aquaculture are the

[3] Transforming Our World: The 2030 Agenda for Sustainable Development: Resolution adopted by the General Assembly on September 25, 2015. Electronic database of legal and normative technical documentation. Available at: http://docs.cntd.ru/document/420355765 (accessed: 15.08.2025).

[4] Remittances from Russia to neighboring countries dropped in 2024. Available at: https://www.rbc.ru/finances/31/01/2025/6798f1b39a79475c4660f40a (accessed: 15.08.2025).

most important economic sectors in the Kamchatka Territory. There are no predominant industries in Karelia and Tyva, and the share of the social sphere is high. A significant proportion of oil, gas, coking coal, diamonds, non-ferrous metals, and apatite concentrate are produced in the North. Due to this, the share of the Russian North regions in federal budget tax revenues is 32.3%, although only 5.1% of the country's population lives in them.

The North is mosaic in terms of social development and quality of life. Thus, the regions of Western Siberia specializing in oil and gas production show high values in almost all indicators. At the same time, the Republic of Tyva and the Chukotka Autonomous Area are among the least prosperous. Demographically, the northern regions are characterized by a slightly higher birth rate due to the residence of a number of indigenous peoples in the North, shorter life expectancy and the highest migration outflow. From 2010 to 2025 alone, the North lost 8% of its population, and in some regions significantly more: Komi Republic – 20.7%, Republic of Karelia and Arkhangelsk Region – 19.4% each, Murmansk Region – 18.1%. In the vast majority of northern municipalities (205 out of 294), intraregional and interregional decline is observed simultaneously. In this regard, international migration, along with rotational employment, has become one of the tools for attracting workforce to labor-scarce territories, which are of great importance for economic development and the realization of Russia's geopolitical potential. It is necessary to assess the scale, trajectories, and characteristics of international migration.

The article aims to reveal the spatial patterns of international migration in the northern regions of Russia and assess its role in providing labor resources for the economy. We address the following tasks: examine the migration exchange between Russia, the Russian North, and foreign countries using official statistics, as well as traditional and network analysis; identify spatial patterns of international migration; assess the migration turnover between Russia's northern regions and foreign countries. The time frame of the study covers two periods – the late Soviet and the contemporary. The object of the study is 13 constituent entities of the Russian North that are fully included in the list of Far North territories and areas equated to them[5]. Municipal-level data are analyzed across all territories on the list. The subject of the study is international migration in Russia and its northern regions.

Interest in international migration to Russia's northern regions stems from the fact that their territory covers almost 70% of the country's area. Due to large-scale natural resource extraction, the economy of the northern regions accounts for 32.3% of tax payments and contributions to the federal budget[6]. Meanwhile, the population of the Russian North[7] decreased from 12 807 752 to 9 350 079 in 1989–2024, a loss is 3 457 673 people (Fauzer, 2025, pp. 35–36). Other Russian regions cannot fully compensate for these losses, which underscores the importance of studying international migration.

The theoretical significance of the study lies in the fact that international migration in the North is often selective, temporary, and specialized. Therefore, a detailed analysis of migration trajectories allows us not only to understand the geography of migrants and their routes, but also to identify stable connections between countries and regions, as well as to assess the significance of international migration for northern societies and labor markets. The results of the study can

[5] On the approval of the list of Far North territories and areas equated to Far North territories for the purpose of providing state guarantees: RF Government Resolution 1946, dated November 16, 2021.

[6] Finance of Russia 2024. Rosstat. Available at: https://rosstat.gov.ru/folder/210/document/13237

[7] We use in our works the term "Russian North" when referring to the 13 northern regions and "North of Russia" when considering all 24 northern constituent entities.

be applied in the development of demographic forecasts, spatial development planning, and social infrastructure management.

Literature review

International migration is as popular as internal migration among scholars. Classical works on migration stem from the foreign research and begin with the founder of migration theory E.G. Ravenstein who formulated 11 laws of migration, many of which are still valid today (Ravenstein, 1885). He argued that migration has mainly economic roots. E. Lee's model has also been highly influential, positing that within each territory there are factors which hold people, attract or repel them, determining areas of origin and destination (Lee, 1966). Western sociologists W. Thomas and F. Znaniecki made a significant contribution to the study of international migration with their five-volume work "The Polish Peasant in Europe and America" analyzing the consequences of migration processes and migrant adaptation using qualitative methods (Thomas, Znaniecki, 1958).

M.S. Blinova's monograph provides a detailed analysis of sociological theories of migration, both Russian and foreign, including those of international migration (Blinova, 2009). V. Piché's publication on migration theories in contemporary foreign literature is also noteworthy (Piché, 2015). In the context of this study, the network theory of migration within R. Jenissen's model is particularly relevant, according to which migration networks are, on the one hand, a result of migration, and on the other, act as a mechanism for a further increase in the number of migrants within the same flows (Jenissen, 2004).

Among Russian scholars, L.L. Rybakovskiy provides a comprehensive overview of global migrations and their history in his monograph "World Migrations: Historical Fragments and Their Determinants". Considering the development of global migrations, the author identifies three historical eras, the first of which covers the period from the appearance of humans on Earth up to the beginning of the Age of Discovery. The second and third eras cover approximately 1.5 millennia, with almost 14 centuries belonging to the second era and approximately the last 100 years to the third (Rybakovskiy, 2016, pp. 5–7).

V.A. Iontsev's work "International Migration: Theory and History of Studies" can be considered a classic publication on international migration. It examines contemporary theoretical directions in explaining international migration, provides a classification of major scientific approaches to its study, identifies key migration concepts and definitions, and highlights historical and contemporary features of international migration in Russia (Iontsev, 1999).

Notable monographs and articles by S.V. Ryazantsev on labor migration cover virtually all countries of the world. In his monograph "Labor Migration in the CIS and Baltic Countries" the author discusses terminology and classification issues of labor migration, factors and dynamics of labor migration to and from the CIS and Baltic countries, and the impact of labor migration on the demographic, socio-economic, and political development of these countries (Ryazantsev, 2007). In another work, he examines objective (ecological and geographical, ethnic, military and political, economic, social, demographic) and subjective (eco-psychological, ethno-psychological, political-psychological, socio-psychological, demographic-psychological) factors of migration (Ryazantsev, 2001, pp. 21–22).

I.P. Tsapenko's work explores the causes and contemporary features of migration to developed countries, the impact of international migration on host societies, and the mechanisms for managing migration processes. The author shows how international migration affects ethnic entrepreneurship, how interethnic tensions grow, and discusses in detail the conditions for integrating migrants into host communities (Tsapenko, 2009).

In a collective monograph (V.I. Mukomel, K.S. Grigor'eva, G.A. Monusova, G.S. Smidovich, A.Yu. Tolmacheva, O.S. Chudinovskikh, A.A. Endryushko), researchers focus on issues such as integration indicators, attitudes toward migrants in Russian society, migrant employment in the Russian labor market, working conditions of migrants in Russia, labor mobility of migrants, values of migrants and the host population, etc. (Mukomel et al., 2022).

Hundreds of articles have been written on international migration, many published in the specialized journal "World Economy and International Relations", a leader in international topics. At Lomonosov Moscow State University, a series titled "International Migration: Russia and the Modern World" has been published since 1998 and edited by Professor V.A. Iontsev. The following review will be limited to articles relevant to the research topic.

O.V. Neterebskiy writes about the role of international migration, noting that it infuses "new blood", is beneficial in terms of introducing new experience and knowledge, prevents the indigenous population from becoming complacent, and fosters competition in the labor market (Neterebskiy, 2016, p. 231).

L.L. Rybakovskiy and O.L. Rybakovskiy note that labor immigrants in Russia predominantly occupy niches in the economy where wages are the lowest, jobs in these "niches" are not prestigious for the country's citizens, and do not require any significant skills from the workforce. These are primarily trade, construction, agriculture, and municipal services (Rybakovskiy, Rybakovskiy, 2016, p. 208). A.V. Topilin explains that increasing inequality (economic, social, political, demographic) and globalization are two mainsprings determining the nature and scale of migration processes in the modern world (Topilin, 2016, p. 44).

We concur with I.V. Ivakhnyuk's assertion: "Labor migration cannot be interpreted solely as a desperate flight from poverty... people choose migration not only as a survival strategy but also as a development strategy. And this development does occur – through return flows of remittances, experience, ideas, and people" (Ivakhnyuk, 2015, p. 44).

International migration in the Russian North is relatively understudied compared to internal migration, but there are some individual works. An article by V.V. Fauzer and colleagues provides data on the contribution of the most numerous nationalities of Russia and foreign countries to the population composition of the Russian North. It is noted that the Russian labor market is attractive for people from Central Asia and the South Caucasus. It shows that, except for the Republic of Belarus, northern regions have a positive net migration with former Soviet republics (Fauzer et al., 2017, p. 38). The impact of the COVID-19 pandemic on international migration in the Arctic regions of Russia has been studied (Smirnov, Lytkina, 2022).

The migration of Russia Germans, who made an invaluable contribution to the development of the North and Siberia, is of particular interest. They were among the top ten largest nations in Russia until 1989. They ranked 7th in 1926–1939, 9th in 1959–1989, then became 23rd by 2010, and 28th by 2021. The maximum number of Russia Germans was in 1939 – 862 504; the minimum was in 2021 – 195 256. Their population decreased by 667 248 mainly due to emigration, as well as assimilation (Fauzer, 2019).

A systematic review of international migration across different world regions is provided in the monograph "The Age of Migration" (Haas et al., 2020). International migration in Northern Europe, including issues of migrant integration, has been systematically studied by the international research institute Nordregio. There is an analysis of international migration indicators at the municipal level in the report "State of the Nordic Region 2022" (Heleniak, Jokinen, 2022). Case studies of

Northern Canada show how the global labor market influences northern communities through migration (Amati et al., 2015) and discuss the channels and mechanisms for attracting migrants (Xhardez, Tanguay, 2024). International migration in the North on a global scale is discussed in the Arctic human development reports for 2004 and 2014, as well as in the Atlas of population, society and economy in the Arctic[8].

At the end of the literature review, we highlight three aspects of international migration that have not been sufficiently addressed in previous works. The first one is migration trajectories reflecting existing socio-economic and cultural relations between the northern regions of Russia and the countries of the world. The second aspect is the age-sex patterns of migration showing how the propensity to move changes at different stages of life. The third aspect is the results of international migration exchange at the municipal level, reflecting local characteristics of northern territories. Addressing these issues requires a detailed (down to the level of individual settlements) and extensive (covering all northern regions) analysis of migration statistics.

Methods and data

The analysis of international migration in northern regions requires making some assumptions. The former Soviet republics were part of the USSR, and population exchange with them was considered internal migration; from the early 1990s, such migrations became international. Consequently, migration exchange with these countries should be divided into two periods: Soviet and post-Soviet. Migration exchange with non-CIS countries can be analyzed using continuous time series or the same periods as for CIS and Baltic countries. There has always been criticism that migration flow records are incomplete and sometimes unreliable. To answer this, we cite Professor L.L. Rybakovskiy: "... our requirement for the numbers is not so much their accuracy as their magnitude, which allows identifying trends and features of migration processes..." (Rybakovskiy, 2016, p. 6).

The Soviet Union's international migration was limited, especially with non-socialist countries; therefore, the data on such migrants, even if recorded, were not intended for open publication. However, population censuses included foreign citizens in data on the national composition of the country. For instance, the 1926 census recorded 157 foreign citizens in the Arkhangelsk Governorate, 398 in the Karelian ASSR, 148 in the Murmansk Governorate, 3,614 in the Yakut ASSR, 233 in the Kamchatka Okrug, and 1,190 in the Sakhalin Okrug, the total number for these territories being 5,740, or 0.54% of the population[9].

In this work we used network analysis developed for studying any data with network structure to examine the aggregate of international migration flows. Within the framework of the network approach (or network science) flows are represented as directed graphs where the weights correspond to the number of movements between nodes (countries or regions). The network approach allows viewing the aggregate of flows, assessing the characteristics of flows, nodes, and the entire network (Smirnov, 2025). It provides an opportunity to cover migration networks consisting of many thousands of flows. The application of this approach is becoming more relevant due to the development of big data analysis tools and the emergence of new extensive sources of information about migration movements in the digital environment. Network analysis is well-suited for combining with more traditional demographic methods and indicators, such as spatial analysis and migration intensity coefficients.

[8] Atlas of population, society and economy in the Arctic. Stockholm: Nordregio, 2019. 80 p. DOI: 10.30689/WP2019:3.1403–2511.

[9] All-Union Population Census of 1926. National composition by regions of the RSFSR. Demoscope Weekly. Available at: https://www.demoscope.ru/weekly/ssp/rus_nac_26.php

The network approach allows describing the structure of migration space, identifying central and peripheral nodes in the migration network, and finding stable migration corridors and clusters. It also aligns with the concept of social capital accumulation through migration, where flows are supported by social networks formed through earlier migrations of friends, relatives, and diasporas. The network approach provides a language and tools for analyzing these self-sustaining mechanisms of migration.

Calculation algorithms were implemented in the Python and Julia programming languages using the NetworkX and Graphs.jl packages. The key migration flows were identified in each network and grouped according to spatial principles. Migration hubs were identified using the PageRank algorithm. It measures the "importance" of nodes in directed networks and considers not only the number and magnitude of edges directed toward a node, but also the importance of the nodes which produce these edges (Page et al., 1998). The graph was drawn using a modified force-directed placement of nodes which minimizes the number of edge crossings and places nodes connected by an edge near each other (Fruchterman, Reingold, 1991). Chord diagrams were created using the chorddiag package in the R programming language (Abel, Cohen, 2019).

Data sources included the results of the 1989 All-Union Population Census and current records from the Unified Interdepartmental Information and Statistical System (EMISS) for 2015–2023. In the case of census data, the exact timing of a move (or even several intermediate moves) is unknown, and it is assumed that residents migrated throughout their lives. For comparability with contemporary data, migration between northern territories and regions of the union republics (excluding the RSFSR) is considered international, although it was internal in the Soviet Union.

There are 110 nodes in the network of migration flows between northern regions and union republics constructed based on 1989 census data, including 13 northern regions and 96 regions of the union republics (with the largest share of the Ukrainian SSR represented by 26 regions). The last node includes foreign countries and those who did not state their place of birth. The number of edges is 2481. A total of 1.9 million people moved, of which 26.8% originated from the North, and 73.2% moved to the North. This more or less corresponds to the share of movements between northern and other regions of the RSFSR. In-migration is three times larger than out-migration. The average number of movements per flow is lower than within the RSFSR (675.5 vs 2614.5). Network density is lower than in the RSFSR, and the number of directions without any movements is much higher – 184.

Contemporary records, in turn, reflect migration for a period exceeding nine months. Since tables of departures and arrivals contained missing values and mutual inconsistencies, data harmonization was performed. If the number of movements was missing in one table but present in another, the value from the table without the missing entry was used. If there were values in both tables but they did not match, their mean value was calculated. This helped minimize the impact of data entry errors. The contemporary international migration network (2015–2023) consists of 182 nodes including 13 northern regions and 169 countries and territories. According to EMISS data, Russia in general had migration exchange with 235 countries and territories. This means that 66 of them did not have migration exchange with the northern regions during the study period. The network has 1644 edges. Network density is significantly lower – 0.05. The total number of movements is 626.6 thousand with 40.3% of outflows and 59.7% of inflows. The average number of movements per flow is lower than in the first network – 377 people.

Municipal-level migration data for 2015–2023 were obtained from the Rosstat database of municipal indicators.

Results

Russia's migration exchange with foreign countries: a traditional approach. International migrations in the USSR played an insignificant role

in population exchange or the formation of labor potential. There were "labor shifts" which included the construction of industrial and hydro-technical facilities in third-world countries[10], and a modest contingent of the Soviet Army and Navy was stationed abroad, but these can hardly be classified as foreign migrants (although most wore civilian clothes).

In the new Russia, international migrations became commonplace and cover over 190 countries. The closest ties developed with 17 states, of which 14 provide a positive net migration, and 3 provide migration loss. Russia's international net migration gain for the period 2015–2023 was 1 837 412 people. To understand the scale of international migration, this number equals 1.3% of Russia's population at the beginning of 2024 (146 150.8 thousand people). Positive net migration was contributed by (%): Ukraine – 27.6, Tajikistan – 24.9, Kazakhstan – 12.7, Armenia – 7.6, Kyrgyzstan – 5.8, Azerbaijan – 4.9, Moldova – 4.6, Uzbekistan – 4.5, Belarus – 2.5, Turkmenistan – 1.4, Georgia – 1.0, Baltic countries – 0.3, other countries – 2.8. Three states showed net migration loss (%): Israel – 0.1, USA – 0.1, and Germany – 0.4.

Three countries accounting for 65.2% of the net migration gain showed unstable positive migration over different periods. For example, there was a continuous decline in positive net migration with Ukraine. Its share was (%): 43.5 in 2015–2017, 25.5 in 2018–2020, 10.4 in 2021–2023; Kazakhstan showed a similar trend – 14.5, 14.4, and 9.1 respectively; Tajikistan, on the contrary, demonstrated a steady increase in its share of international migration – 10.2, 23.0, and 44.1 (*Tab. 1*).

Table 1. International net migration gain (loss) of the Russian Federation, 2015–2023, people

Rank in exchange with Russia	Country	Rank in exchange with Russian North	2015–2017	2018–2020	2021–2023	2015–2023
	Total		**719 210**	**516 431**	**601 771**	**1 837 412**
1	Ukraine	2	312 641	131 836	62 318	506 795
2	Tajikistan	1	73 289	118 822	265 557	457 668
3	Kazakhstan	5	104 633	74 119	54 805	233 557
4	Armenia	7	46 525	47 623	45 717	139 865
5	Kyrgyzstan	3	40 333	25 485	40 681	106 499
6	Azerbaijan	4	29 698	36 635	23 463	89 796
7	Republic of Moldova	8	41 349	16 566	27 249	85 164
8	Uzbekistan	6	21 171	30 858	31 193	83 222
9	Belarus	9	18 806	12 070	15 002	45 878
10	Turkmenistan	11	7611	9926	8278	25 815
11	Georgia	10	8189	6140	4413	18 742
12	Latvia	12	1522	763	1562	3847
13	Lithuania	13	574	514	567	1655
14	Estonia	14	376	-115	76	337
15	Israel	16	-454	-889	-473	-1816
16	USA	15	-1005	-1317	-683	-3005
17	Germany	17	-1764	-5416	264	-6916
	other countries and territories		15 716	12 811	21 782	50 309

Ranked in descending order of net migration gain for 2015–2023.
Compiled based on: 2015–2017 – EMISS data, 2018–2023 – Rosstat statistical bulletins "Population and Migration in the Russian Federation".

[10] For example, the Aswan High Dam, the largest hydroelectric complex on the Nile in Aswan, Egypt, was built between 1961 and 1971 to address important economic issues: to regulate the annual Nile floods, create an efficient irrigation system, and provide the country with electricity.

The Russian North is also involved in international migration, particularly regions specializing in the oil and gas sector. The net migration gain with foreign countries was 151,579 people in 2015–2023. This positive net migration partially offset (by 33.9%) the natural population decline in the Russian North, which from 2015 to 2023 was 447,638 people. The scale of migration is most pronounced when compared with the population of the Russian North at the beginning of 2024 – 7,441,483 people. Thus, the share of international net migration there was 2.0% over 8 years, which is 0.7 p.p. higher than in Russia in general. Considering dynamics, the share of the Russian North in Russia's net migration gain was (%): 5.9 in 2015–2017, 8.4 in 2018–2020, 10.9 in 2021–2023.

Three countries, being the main migration donors, provided a net migration gain of 116,507 people, or 76.9% of the total gain. Notably, these countries also showed varying gains across periods. There was a continuous decline in the share of net migration with Ukraine (%): 51.6 in 2015–2017, 8.1 in 2018–2020, 4.4 in 2021–2023; Tajikistan, conversely, showed a steady increase in its share – 16.0, 35.6, and 62.3% respectively; Kyrgyzstan demonstrated an increase from 11.0% to 24.5% in the first two periods, then its share dropped to 14.8% (*Tab. 2*).

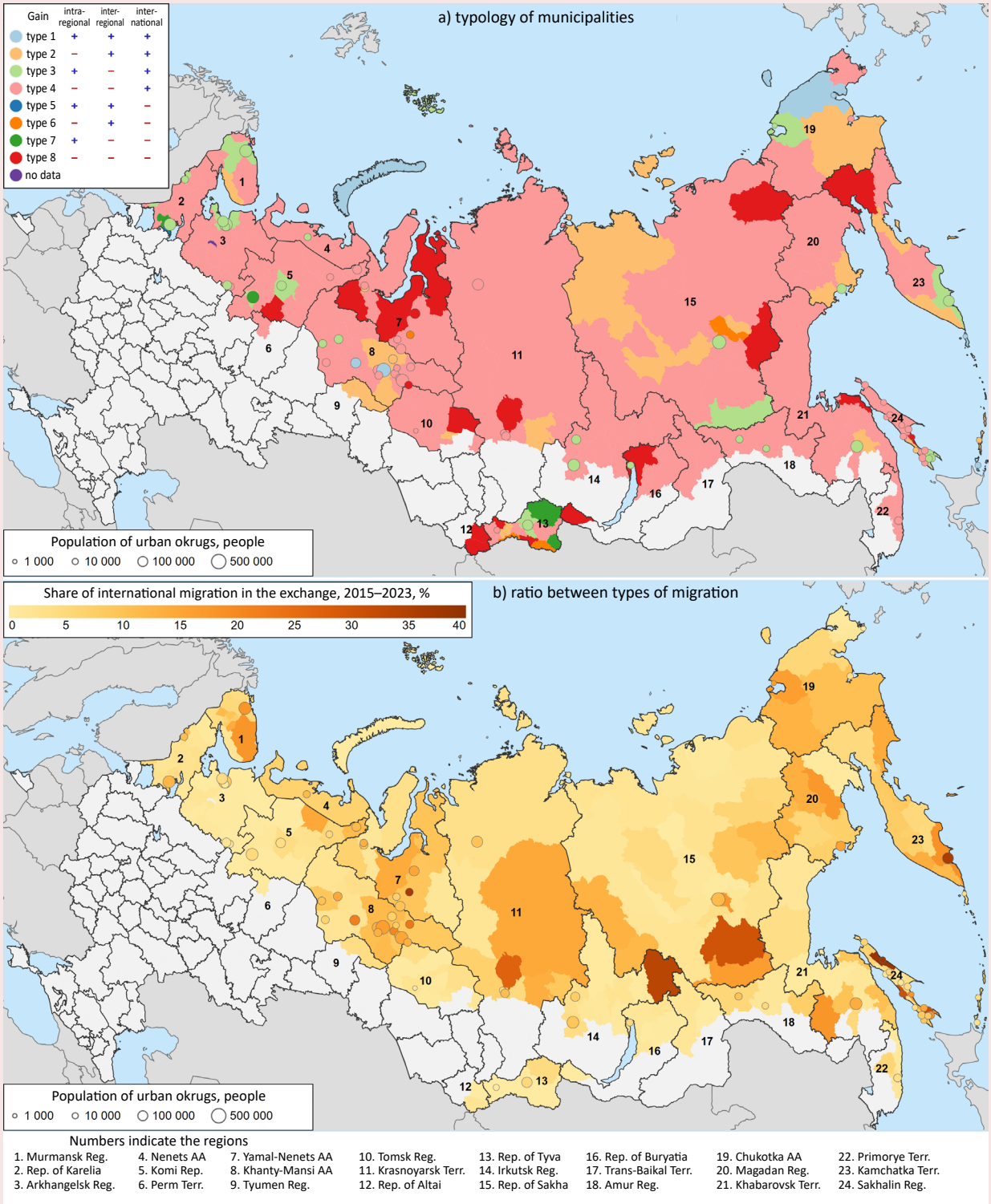
It should be noted that international migration is the only type of migration with a non-negative balance in the vast majority of municipalities in the North of Russia (186 out of 287 for which data are available, or 64.8%). Such municipalities are highlighted in pink in *Figure 1a*. Blue indicates municipalities with positive net migration for all types of migration: intra-regional, interregional, and international. There are only six such municipalities, three of them are island territories (Novaya Zemlya Urban Okrug, Severo-Kurilsky Urban Okrug, and Yuzhno-Kurilsky Urban Okrug), and the other three specialize in the extractive industry (Khanty-Mansiysk Urban Okrug, Surgut Urban Okrug, and Egvekinot Urban Okrug). The median share of international migration turnover in total migration at the municipal level is only 3.3%, but for some territories it exceeds one-third: Nogliksky

Table 2. International net migration gain (loss) of the Russian North, 2015–2023, people

Rank in exchange with Russian North	Countries	Rank in exchange with Russia	2015–2017	2018–2020	2021–2023	2015–2023
	Total		**42 664**	**43 455**	**65 460**	**151 579**
1	Tajikistan	2	6839	15 462	40 768	63 069
2	Ukraine	1	21 998	3530	2869	28 397
3	Kyrgyzstan	5	4708	10 639	9694	25 041
4	Azerbaijan	6	2641	4594	3706	10 941
5	Kazakhstan	3	2214	3079	1595	6888
6	Uzbekistan	8	-958	3827	2925	5794
7	Armenia	4	892	2475	2272	5639
8	Republic of Moldova	7	1870	320	501	2691
9	Belarus	9	1056	310	411	1777
10	Georgia	11	105	77	213	395
11	Turkmenistan	10	31	154	71	256
12	Latvia	12	15	8	31	54
13	Lithuania	13	-2	10	21	29
14	Estonia	14	11	-20	-3	-12
15	USA	16	222	-140	-142	-60
16	Israel	15	-33	-19	-29	-81
17	Germany	17	-137	-107	-29	-273
	other countries and territories		1192	-744	586	1034

Ranked in descending order of net migration gain for 2015–2023.
Compiled based on: 2015–2017 – EMISS data, 2018–2023 – Rosstat statistical bulletins "Population and Migration in the Russian Federation".

Figure 1. Typology of municipalities in the North of Russia by net migration sign and the ratio of international to internal migration, 2015–2023



Source: Rosstat database of municipal indicators.

Urban Okrug (38.4%), Gubkinsky Urban Okrug (36.6%), Petropavlovsk-Kamchatsky Urban Okrug (36.1%), and Bodaybinsky District (33.7%). In ten municipalities, no international migration was recorded during the study period, seven of which are located in the Republic of Tyva (*Fig. 1b*). Municipal statistics confirm the high importance of international migration for the northern regions.

Russia's migration exchange with foreign countries: a network approach. We will sequentially examine the largest flows based on the 1989 census data and contemporary records for 2015–2023.

During the Soviet period, the largest inflows to northern regions exceeded outflows but were smaller than flows from some regions of the RSFSR. Apart from Russian territories, the Donetsk Region of the Ukrainian SSR played the most significant role in shaping the population of the Russian North. It accounts for six out of ten flows. The largest flows were to the Khanty-Mansi Autonomous Area (28.3 thousand movements), Yakut ASSR (20.6 thousand), and Yamal-Nenets Autonomous Area (15.6 thousand). Two large flows originated from the Voroshilovgrad Region (now Lugansk People's Republic). The Khanty-Mansi Autonomous Area also received many people from the Moldavian SSR and the Azerbaijan SSR. The average movement distance for the ten largest flows is 3400 km.

The source of the four largest outflows according to the 1989 census was the Arkhangelsk Region (excluding the Nenets Autonomous Area). The receiving regions were the Crimean, Odesa, Donetsk, and Dnipropetrovsk regions of the Ukrainian SSR. The Donetsk Region also received a large number of residents from the Magadan Region, Komi ASSR, and Sakhalin Region. Migration flows are known to generate counter-flows. The Donetsk Region, being the major contributor of labor resources for the Russian North, also received return flows. The average movement distance (3450 km) exceeded only slightly the average for inflows (*Tab. 3*).

Table 3. Largest migration flows of northern regions outside the RSFSR, 1989 census

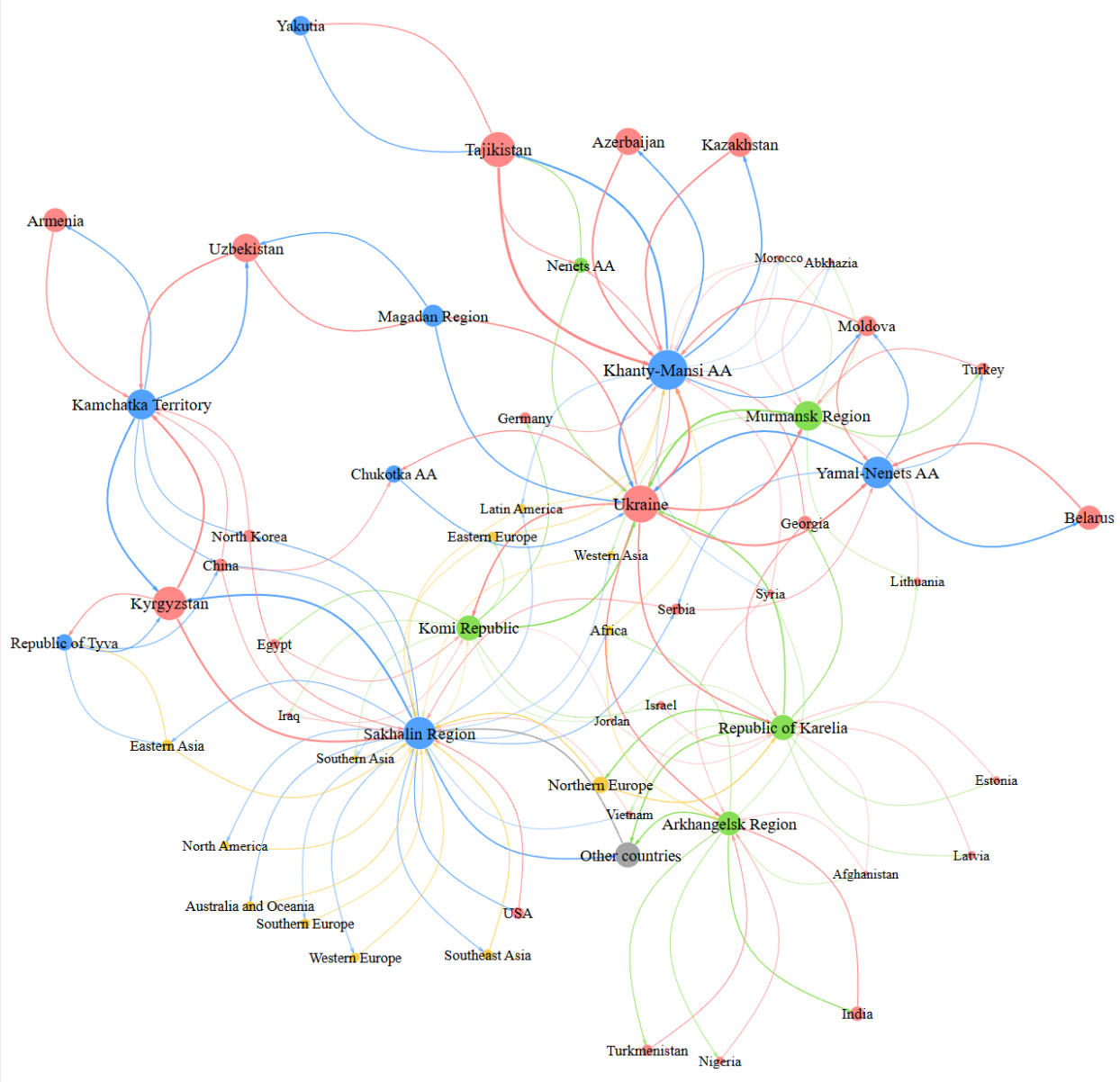
Rank	Region of departure	Region of arrival	Movements, units	Distance, km
Inflows				
1	Donetsk Region	Khanty-Mansi Autonomous Area	28 329	2432.3
2	Donetsk Region	Yakut ASSR	20 636	5379.0
3	Donetsk Region	Yamal-Nenets Autonomous Area	15 564	2630.3
4	Voroshilovgrad Region	Khanty-Mansi Autonomous Area	14 035	2310.6
5	Donetsk Region	Magadan Region	13 720	6337.3
6	Donetsk Region	Komi ASSR	13 562	1722.6
7	Donetsk Region	Murmansk Region	12 482	2335.6
8	Moldavian SSR (without Kishinev)	Khanty-Mansi Autonomous Area	12 478	2962.6
9	Azerbaijan SSR (without Baku)	Khanty-Mansi Autonomous Area	12 158	2623.7
10	Voroshilovgrad Region	Yakut ASSR	11 319	5269.3
Outflows				
1	Arkhangelsk Region	Crimean Region	8 953	2207.1
2	Arkhangelsk Region	Odesa Region	8 477	2089.1
3	Arkhangelsk Region	Donetsk Region	7 884	1842.6
4	Arkhangelsk Region	Dnipropetrovsk Region	6 265	1814.9
5	Magadan Region	Donetsk Region	5 442	6337.3
6	Komi ASSR	Donetsk Region	5 174	1722.6
7	Sakhalin Region	Donetsk Region	5 103	6849.6
8	Murmansk Region	Crimean Region	5 103	2655.6
9	Komi ASSR	Dnipropetrovsk Region	4 256	1766.7
10	Sakhalin Region	Crimean Region	4 114	7217.7

Ranked in descending order of number of movements.
Compiled based on: Demoscope Weekly. Available at: https://demoscope.ru/weekly/ssp/sng_pob_89.php

The largest migration hubs according to the Soviet dataset were the Khanty-Mansi Autonomous Area (PageRank score 85.8), Murmansk Region (63.6), Komi ASSR (48.9), and Yakut ASSR (45.0). Among regions outside the RSFSR, the leaders were the Donetsk Region (23.6), Crimean Region (23.4), Dnipropetrovsk Region (16.7), and Kharkiv Region (15.3).

Visualization of the contemporary network of international migration flows is presented in *Figure 2*. It reflects the largest flows from each node, as well as all flows accounting for at least 5% of the migration exchange. The largest hubs of migration among the regions of the Russian North are the Khanty-Mansi Autonomous Area (PageRank centrality index value 95.1), Sakhalin Region (73.4),

Figure 2. Network of key international migration flows of the Russian North regions, 2015–2023



Compiled based on: EMISS data.

Yamal-Nenets Autonomous Area (47.4), and Kamchatka Territory (42.7), while among countries the leaders are Ukraine (97.5), Kyrgyzstan (65.0), Tajikistan (52.5), and Uzbekistan (34.9).

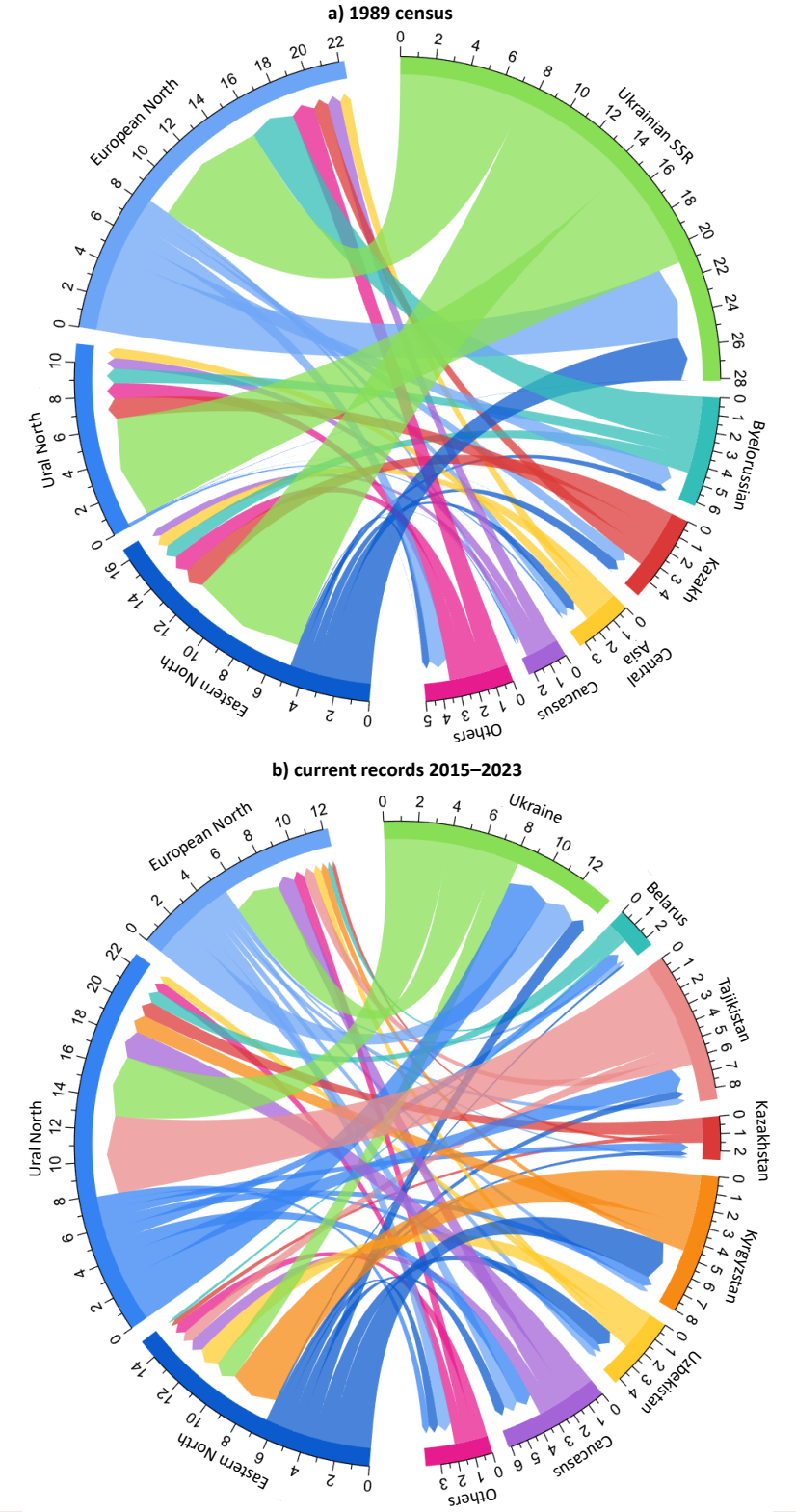
International migration flows based on 2015–2023 data are examined in two directions (*Tab. 4*). The largest inflow exceeding others by a wide margin is from Tajikistan to the Khanty-Mansi Autonomous Area (64.2 thousand people). The second-largest flow is from Ukraine to the Khanty-Mansi Autonomous Area (27.1 thousand), and the third is from Kyrgyzstan to the Sakhalin Region. Unsurprisingly, five out of ten largest flows are directed to the Khanty-Mansi Autonomous Area. There are several reasons for this. First, this region is the largest in the Russian North. Second, it has significant economic influence. The area is the major contributor to gross product and tax revenues for the federal budget. Top ten countries include only Ukraine (four times), Azerbaijan, and the Central Asian republics (Tajikistan, Kyrgyzstan, and Kazakhstan). The average movement distance is 2,857 km. This relatively small distance is explained by the proximity of the Central Asian republics to the Khanty-Mansi Autonomous Area. Outflows mirror the inflows but are smaller. The largest outflows are from the Khanty-Mansi Autonomous Area to Tajikistan (16.8 thousand) and Ukraine (16.6 thousand). The average movement distance for the ten largest outflows is 3439 km, slightly more than for inflows. The longest distance (6,181 km) has the flow from the Kamchatka Territory to Uzbekistan.

Table 4. Largest international migration flows of the Russian North regions, 2015–2023

Rank	Region/country of departure	Region/country of arrival	Movements, units	Distance, km
Inflows				
1	Tajikistan	Khanty-Mansi Autonomous Area	64 188	2478.5
2	Ukraine	Khanty-Mansi Autonomous Area	27 106	2618.5
3	Kyrgyzstan	Sakhalin Region	19 428	5141.8
4	Kyrgyzstan	Kamchatka Territory	15 977	5880.4
5	Ukraine	Murmansk Region	15 000	2058.4
6	Ukraine	Yamal-Nenets Autonomous Area	14 382	2678.1
7	Azerbaijan	Khanty-Mansi Autonomous Area	11 604	2623.7
8	Kyrgyzstan	Khanty-Mansi Autonomous Area	10 938	2226.9
9	Kazakhstan	Khanty-Mansi Autonomous Area	9 028	1107.4
10	Ukraine	Komi Republic	7 611	1757.5
Outflows				
1	Khanty-Mansi Autonomous Area	Tajikistan	16 809	2478.5
2	Khanty-Mansi Autonomous Area	Ukraine	16 641	2618.5
3	Sakhalin Region	Kyrgyzstan	15 884	5141.8
4	Kamchatka Territory	Kyrgyzstan	13 432	5880.4
5	Yamal-Nenets Autonomous Area	Ukraine	13 059	2678.1
6	Murmansk Region	Ukraine	11 923	2058.4
7	Yamal-Nenets Autonomous Area	Belarus	7 110	2501.9
8	Kamchatka Territory	Uzbekistan	6 673	6181.3
9	Khanty-Mansi Autonomous Area	Azerbaijan	5 954	2623.7
10	Khanty-Mansi Autonomous Area	Kyrgyzstan	5 901	2226.8

Ranked in descending order of number of movements.
Compiled based on: EMISS data. Available at: https://www.fedstat.ru/indicator/43513; https://www.fedstat.ru/indicator/43514

Figure 3. Grouping of international migration flows by regional clusters and countries, 1989 census and current records 2015–2023



Compiled based on: Demoscope Weekly, EMISS data.

To facilitate further analysis, the regions of the Russian North are grouped into clusters based on the territorial principle. Three clusters are identified: European (republics of Karelia, Komi; Nenets Autonomous Area, Arkhangelsk and Murmansk regions), Ural (Khanty-Mansi and Yamal-Nenets autonomous areas), and Eastern (republics of Tyva, Sakha (Yakutia); Kamchatka Territory; Magadan and Sakhalin regions; Chukotka Autonomous Area). The grouping of flows clearly demonstrates the huge contribution of the Ukrainian SSR to the composition of the Russian North population, which is more than that of all other union republics together. There are some spatial patterns. While people from the Ukrainian and Kazakh SSRs moved to all three clusters of northern regions, those from the Byelorussian SSR and Caucasian republics moved primarily to the European North. *Figure 3* demonstrates again that inflows exceeded outflows.

In contemporary Russia, the spatial patterns of international migration have become more pronounced. Flows from Ukraine are directed to the Ural North and, to a lesser extent, the European North; from Tajikistan, Kazakhstan, and Belarus to the Ural North; from Kyrgyzstan and Uzbekistan to the Eastern North. The net international migration is positive. In terms of flow magnitude, Ukraine, Tajikistan, and Kyrgyzstan stand out. Next, we examine migration patterns at the level of individual countries (*Tab. 5*). It shows the distribution of migration flows from a country to northern regions.

First, we will consider the countries of the near abroad. During 2015–2023, Ukraine's inflows and outflows were primarily connected with the Khanty-Mansi Autonomous Area (28.8%), Yamal-Nenets Autonomous Area (18.2%), and Murmansk Region (17.7%). Over half of Belarus's migration movements (51.7%) were linked to the Yamal-Nenets Autonomous Area. Over half of Tajikistan's migration flow (68.2%) was associated with the Khanty-Mansi Autonomous Area. Kyrgyzstan exchanged people with the Sakhalin Region (35.1%), Kamchatka Territory (29.2%), and Khanty-Mansi Autonomous Area (16.7%). Uzbekistan exchanged people mainly with the Kamchatka Territory (27.8%), Sakhalin Region (13.5%), and Khanty-Mansi Autonomous Area (13.7%). Over half of Turkmenistan's movements (61.7%) were connected with the Arkhangelsk Region. Nearly half of Kazakhstan's exchange (49.2%) was associated with the Khanty-Mansi Autonomous Area, and 12.6% with the Yamal-Nenets Autonomous Area.

Azerbaijan gravitates toward the Khanty-Mansi Autonomous Area (41.1%), Yamal-Nenets Autonomous Area (13.8%), and Murmansk Region (12.0%). Migration movements of Armenia are more evenly distributed: Kamchatka Territory (17.7%), Khanty-Mansi Autonomous Area (14.3%), Yamal-Nenets Autonomous Area (13.9%). Georgia's migration exchange is more intensive with Karelia (44.4%) and Khanty-Mansi Autonomous Area (24.9%). Moldova exchanges populations mainly with the oil and gas regions: Khanty-Mansi Autonomous Area (41.7%) and Yamal-Nenets Autonomous Area (24.6%).

The Baltic countries gravitate toward the Republic of Karelia and Murmansk Region due to their spatial proximity. Karelia also accounts for 94.1% of migration movements with Finland. The Republic also leads in exchange with Israel. Norway, sharing a border with the Murmansk Region, gravitates toward it (62.0%). India exchanges most actively with the Arkhangelsk Region (84.1%), which can be attributed to Indian students (primarily in medicine) and the construction of naval ships for India in Severodvinsk. Nigeria also shows 87.2% of its movements directed to the Arkhangelsk Region.

China's migration is significant with the Kamchatka Territory (22.7%), Sakhalin Region (23.2%), and Republic of Tyva (20.1%). Almost all

Table 5. Distribution of migration turnover of foreign countries with the Russian North regions, 2015–2023

Country	Migration turnover with Russian North, people	Distribution of turnover between northern regions, %												
		Republic of Karelia	Komi Republic	Arkhangelsk Region	Nenets Autonomous Area	Murmansk Region	Republic of Sakha (Yakutia)	Republic of Tyva	Kamchatka Territory	Magadan Region	Sakhalin Region	Khanty-Mansi Autonomous Area	Chukotka Autonomous Area	Yamal-Nenets Autonomous Area
All countries	**626 603**	**5**	**5**	**4**	**1**	**10**	**2**	**1**	**10**	**3**	**14**	**32**	**1**	**13**
Ukraine	151 734	6	8	4	1	18	1	0	4	5	5	29	2	18
Tajikistan	118 762	3	2	4	1	2	3	0	1	1	7	68	0	8
Kyrgyzstan	100 613	1	2	0	0	6	1	2	29	1	35	17	1	5
Uzbekistan	51 401	2	4	5	0	9	2	1	28	11	14	14	1	9
Azerbaijan	42 733	3	11	4	1	12	2	0	6	1	5	41	0	14
Kazakhstan	29 065	3	3	1	0	8	1	0	5	5	8	49	2	13
Belarus	27 540	4	6	2	1	11	0	3	3	1	4	10	3	52
Armenia	25 855	7	6	3	0	13	5	1	18	2	16	14	1	14
Moldova	13 421	6	5	3	1	8	1	0	3	3	3	42	1	25
Finland	3 619	94	0	1	0	4	–	–	0	–	–	0	–	0
India	3 322	0	2	84	–	1	0	–	–	–	11	0	0	0
Georgia	2 983	42	5	4	0	4	3	1	1	1	4	25	0	8
China	2 465	0	1	2	–	1	16	20	23	1	23	1	12	0
North Korea	2 016	–	0	–	–	–	0	–	41	–	59	0	–	–
Türkiye	1 834	3	3	3	0	43	1	–	4	0	9	7	10	15
USA	1 658	5	3	1	–	3	1	0	4	0	78	3	1	1
Germany	1 343	16	22	8	–	9	1	1	3	1	11	22	0	6
Turkmenistan	1 317	4	1	62	–	10	1	0	0	–	7	14	–	2
Serbia	1 265	0	4	1	–	4	–	–	0	0	46	5	2	36
United Kingdom	1 148	2	1	2	–	2	–	–	0	–	91	1	0	0
Egypt	617	5	62	6	0	9	0	–	–	0	8	7	–	2
Norway	550	7	1	13	–	62	–	–	1	–	16	1	–	–
Mongolia	451	0	–	–	–	0	21	76	–	2	0	0	–	–
Canada	446	7	2	2	–	3	0	1	2	1	70	5	6	1
Latvia	407	26	10	10	1	16	1	1	2	2	7	14	0	9
Philippines	365	1	0	–	–	1	–	–	–	–	97	1	0	–
Nigeria	358	1	1	87	1	–	–	1	–	–	7	2	–	0
South Korea	350	1	1	–	–	1	–	1	2	0	88	6	–	0
The Netherlands	326	4	2	3	–	3	0	0	0	0	85	2	–	–
Israel	312	24	15	8	–	16	8	–	2	3	7	11	–	6
Other 140 countries / territories	38 327	18	6	14	0	9	2	3	5	1	29	8	2	4

Note: “0” denotes value close to zero (less than 0.5%), “–” denotes zero value.
Ranked in descending order of migration turnover.
Compiled based on: EMISS data. Available at: https://fedstat.ru/indicator/43513; https:/ fedstat.ru/indicator/43514

Table 6. Distribution of migration turnover of Russian North regions with foreign countries, 2015–2023, %

Country	Republic of Karelia	Komi Republic	Arkhangelsk Region	Nenets Autonomous Area	Murmansk Region	Republic of Sakha (Yakutia)	Republic of Tyva	Kamchatka Territory	Magadan Region	Sakhalin Region	Khanty-Mansi Autonomous Area	Chukotka Autonomous Area	Yamal-Nenets Autonomous Area
All countries	**32**	**32**	**26**	**4**	**61**	**12**	**6**	**65**	**19**	**87**	**197**	**7**	**80**
Ukraine	29	39	21	28	44	13	1	10	42	8	22	37	34
Tajikistan	10	7	17	35	4	31	2	2	4	10	41	3	11
Kyrgyzstan	2	6	1	2	11	9	34	45	5	41	9	10	7
Uzbekistan	4	7	10	6	8	10	7	22	31	8	4	6	6
Azerbaijan	4	15	7	10	8	8	1	4	1	2	9	1	7
Kazakhstan	3	3	1	1	4	3	2	2	7	3	7	10	5
Belarus	3	5	2	9	5	1	16	1	1	1	1	11	18
Armenia	5	5	3	3	5	11	5	7	3	5	2	3	4
Moldova	2	2	1	3	2	1	0	1	2	0	3	1	4
Finland	11	0	0	0	0	–	–	0	–	–	0	–	0
India	0	0	11	–	0	0	–	–	–	0	0	0	0
Georgia	4	0	1	0	0	1	0	0	0	0	0	0	0
China	0	0	0	–	0	3	8	1	0	1	0	4	0
Türkiye	0	0	0	0	1	0	–	0	0	0	0	3	0
Turkmenistan	0	0	3	–	0	0	0	0	–	0	0	–	0
Other 155 countries and territories	23	10	22	2	7	8	23	5	2	19	2	12	3

Note: "0" denotes value close to zero (less than 0.5%), "–" denotes zero value.
Compiled based on: EMISS data. Available at: https://fedstat.ru/indicator/43513; https:/ fedstat.ru/indicator/43514

exchange of North Korea involves the Sakhalin Region (58.9%) and Kamchatka Territory (40.8%). Türkiye tends to exchange with the Murmansk Region (43.3%), while Egypt shows strong ties with the Komi Republic (61.8% – mostly students). Mongolia exchanges populations primarily with the Republic of Tyva (76.1%) due to spatial and cultural proximity.

A number of far-abroad countries demonstrate intensive migration exchange with the Sakhalin Region, which can be linked to the implementation of international projects in the oil and gas sector. For example, Canada accounts for 69.7% of its movements with the Russian North to Sakhalin, Australia – 71.3%, USA – 77.6%, The Netherlands – 84.7%, Japan – 84.9%, South Korea – 88.0%, United Kingdom – 90.8%, Philippines – 97.0%. Among European countries, Serbia and Germany are also noteworthy. Serbia exchanges populations with the Sakhalin Region (46.2%) and Yamal-Nenets Autonomous Area (36.0%), while Germany's exchange is with the Khanty-Mansi Autonomous Area (22.0%) and Komi Republic (21.8%). Germans have been one of the major nationalities in the Komi Republic since the second half of the 20th century.

Next, we examine the distribution of migrants by country across the northern regions (*Tab. 6*).

Ukraine has the largest share in migration exchange for 7 out of 13 northern regions. Exceptions are the Nenets Autonomous Area, Republic of Sakha, and Khanty-Mansi Autonomous Area, where Tajikistan leads, as well as and the Republic of Tyva, Kamchatka Territory, and Sakhalin Region, where Kyrgyzstan leads. Some unusual but intensive migration exchanges are worth noting: Karelia with Finland (10.7%), Komi with Azerbaijan (15.1%), Arkhangelsk Region with India (10.6%) and Nigeria (1.2%), Yakutia with Armenia (10.8%), Republic of Tyva with Belarus (15.6%), China (8.4%), and Mongolia (5.8%), Sakhalin Region with the USA (1.5%) and North Korea (1.4%), and Chukotka Autonomous Area with Türkiye (2.7%).

Conclusion

In the 21st century characterized by depopulation in most countries the challenge of attracting labor resources to national economies becomes acute. Russia faces a similar issue – a shortage of human resources in both old- and new-developed regions, including the Russian North and Arctic. Attracting population from other Russian regions, which are experiencing similar depopulation issues, is problematic. Remote rotation partially solves this issue but it also creates drawbacks for local communities. International migration is one of the reserves for attracting human resources. However, its volume is not comparable to the losses the Russian North has suffered. The adopted "Concept of the State Migration Policy of the Russian Federation for 2026–2030"[11] was intended to change this situation. However, many experts believe that the new Concept will limit the inflow of migrants into the country[12].

Despite the relatively short period, stable migration links have developed between Russia's northern regions and the countries of the near abroad, largely because they were established during the Soviet era. Some migration flows are based on the territorial principle – cultural and social ties develop due to proximity and ease of movement between territories. Other connections are based on the sectoral aspect: for example, there are coal and oil extraction industries in both the Russian North and other post-Soviet countries (such as Azerbaijan). The findings allow better understanding the spatial mobility patterns in the Russian North and assessing the role of international migration in forming the labor resources of these northern regions.

The article addresses all the tasks set. As a result, an assessment of international migration as a source of human resources for the economy of the Russian North and Arctic is provided. The use of two approaches (traditional and network) to international migration allowed both assessing its effectiveness and studying the entire set of migration flows and their characteristics.

The inter-regional and international migration flows of the northern regions of Russia in the late Soviet period and in 2015–2023 are analyzed. The focus on the configuration and characteristics of migration networks allowed us to introduce an additional perspective into the study of international migration. An analysis of the totality of connections between the nodes made it possible to find groups of territories that are similar in terms of migration trajectories. Three migration clusters have been identified in the Russian North (European, Ural, and Eastern). When finding the main centers of

[11] On the Concept of the State Migration Policy of the Russian Federation for 2026–2030: Presidential Decree 738, dated October 15, 2025.

[12] Changes aimed at reducing the number of migrants have already been recorded in Russia since 2025. These include limitation of the stay of visa-free migrants to 90 days per year, mandatory registration in the Gosuslugi app, increased biometric control, complicated process of getting permits for residence and employment. However, considering the record entry in 2024, the effect of these measures may not be immediate.

gravity, both the absolute volume of migration and the "importance" of those nodes from which the population moves are taken into account, which makes the estimates more comprehensive. The largest migration hubs in each cluster and the key migration flows have been identified.

Network graphs and charts make migration processes more visible. They allow us not only to calculate how many people are moving and where, but also to see the properties of the migration network: where it is dense, where it is broken, where there are bridges between parts of the network. Visualizations of the international migration network of the Russian North regions are constructed. The influence of the Soviet republics on the composition of the Russian North population is assessed. The international migration flows between the countries and the northern regions are considered in detail.

Despite all efforts by the Russian Government to transition the national economy from the fuel and energy oriented GDP toward an alternative innovative development path, the Energy Strategy up to 2030 notes that the response to external challenges/threats is to ensure the contribution of national energy sector to increased efficiency of foreign economic activity of Russia and its better position in the global economic system[13]. This indicates that the extraction of energy resources located in the North and Arctic remains a top priority and will require sufficient human resources in these regions.

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Integration of Labor Migrants: Assessment Based on Sociological Survey Data

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Abstract. The article substantiates a methodological approach to assessing the effectiveness of the adaptation and integration processes of labor migrants in the host community, which is a key element of migration policy. The relevance of the study stems from the need to develop tools for evaluating the qualitative parameters of adaptation processes among labor migrants, a prerequisite for preventing negative social consequences of migration processes. The aim of the study is to develop and substantiate a system of indicators for assessing the effectiveness of adaptation and integration of labor migrants, taking into account the specific characteristics of migration flows to Russia. The research methodology includes systematization of scholarly approaches, formulation of assessment principles and criteria, analysis of normative documents, and the results of a sociological survey of labor migrants from Kyrgyzstan, Tajikistan, and Uzbekistan conducted in the Sverdlovsk Region from March to May 2023. The main results and their novelty lie in the development of a comprehensive system of indicators grouped into three blocks (socio-economic, socio-cultural, and family-legal), which makes it possible to assess adaptation and integration as a multidimensional process and distinguishes this approach from existing ones that focus on individual aspects of adaptation processes. The study confirms the importance of accounting for the length of time migrants have spent in the host territory. The limitations of the study are related to the specific countries of origin, which shape the characteristics of adaptation strategies. The results of the study can be used to improve migration policy, develop regional programs for the adaptation and integration of labor migrants from countries with a visa-free entry regime, and in the practice of migration management in the constituent entities of the Russian Federation.

Key words: labor migrants, adaptation and integration, effectiveness, assessment, time factor, sociological survey, migration policy.

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Introduction

Scientific literature distinguishes between such forms of adaptation as assimilation, integration, segregation (enclavization), and marginalization (Berry, 1997). The choice of adaptation form by labor migrants has a direct impact on the host community, since adaptation is usually two-way (Hellgren, 2016; Demireva, 2019; Safdar et al., 2021). Unsuccessful adaptation can lead to negative socio-economic consequences, such as ethnic nihilism, separatism or nationalism, as well as addictive behavior of migrants (Konstantinov et al., 2022).

In Russia, the issue of choosing the form of adaptation of labor migrants is considered controversial due to the lack of a unified approach to the forms of manifestation of this process in regulatory, methodological, and strategic documents. For instance, the Concept of the State Migration Policy of the Russian Federation for 2026–2030 indicates the unacceptability

of such forms of adaptation as segregation and marginalization[1], while other documents focus on integration[2]. The draft federal law "On Social and Cultural Adaptation and Integration of Foreign Citizens in the Russian Federation", proposed in 2014 was not adopted. There is no unified management structure in the country that would be authorized to regulate these processes. For example, issues of social and cultural adaptation and integration of migrants are assigned to the Federal Agency for Nationalities, while issues of resettlement and adaptation of former compatriots to a new place of residence are assigned to the Ministry of Internal Affairs of the Russian Federation. At the same time, the increase in naturalization cases in the Russian Federation (Cherepanova, Maksimova, 2020) highlights the relevance of research on the adaptation and integration of migrants. In this regard, we agree with the opinion of G.I. Osadchaya, V.Yu. Ledeneva, T.N. Yudina says that the integration migration policy in the Russian Federation requires activation (Osadchaya et al., 2024).

In the regulatory, methodological and strategic documents of the Russian Federation regulating the issues of labor migrants staying in the country, the concepts of adaptation and integration are used in conjunction. Because of this, we also use them together, noting that in terms of content, adaptation and integration are closely interrelated, since integration, as the most preferred form of adaptation for long-term labor migrants, involves their active interaction with the local population, during which, while preserving their culture, they show respect for culture, traditions, standards of behavior of the host community (Akramov, 2021). This form of adaptation is well suited for Russia as a country with a multinational population and a predominance of "temporary-permanent" migration (Konstantinov et al., 2022).

The European Union countries' experience, where migration policy has been shaped over a long period of time based on the priority of the integration strategy, shows that adaptation issues have become sharply relevant after the 2014–2015 migration crisis, when an unregulated flow of refugees poured into the EU countries (Bakhturidze et al., 2023), and depending on the migration policy norms adopted in different countries it has shifted either to bilateral integration, up to the participation of migrants in local government (Tsapenko et al., 2018; Bedrina, Lazareva, 2021), or to assimilation.

In the concept of effective adaptation of labor migrants, we put the qualitative content of adaptation to the social, cultural, economic and regulatory conditions of the host community, which characterizes the desire and depth of perception of local traditions that positively affect the quality of life of both migrants and the local community.

The difficulty in assessing the effectiveness of the adaptation processes of labor migrants lies in the lack of a systematic information framework, which does not provide a clear picture, first of all, of the qualitative aspects of the adaptation of labor migrants and their family members. Information on the legal status of migrants and the number of people who have accepted Russian

[1] On the Concept of the State Migration Policy of the Russian Federation for 2026–2030: Presidential Decree 738, dated October 15, 2025. Garant.ru: Information and legal portal. Available at: https://www.garant.ru/products/ipo/prime/doc/412750335/ (accessed: 13.11.2025).

[2] The Strategy of the State National Policy of the Russian Federation for the period up to 2025 (as amended by Presidential Decree 703, dated December 6, 2018). Available at: http://www.kremlin.ru/acts/bank/43843 (accessed: 05.02.2025); On approval of Methodological recommendations for state authorities of the constituent entities of the Russian Federation "On Social and Cultural adaptation and Integration of Foreign Citizens in the Russian Federation": Order of the Federal Academy of Medical Sciences of Russia 142, dated November 17, 2020. Konsultant Plus. Available at: https://www.consultant.ru/ (accessed: 05.02.2025); General principle of organizations public authorities in the Russian Federation: Federal Law 414-FZ, dated December 21, 2021 (ed. July 31, 2025) (with amendments and additions, entered into force on 01.09.2025), Art. 44, p. 43. Konsultant Plus. Available at: https://www.consultant.ru/cons/cgi/online.cgi?from=404070-0&req=doc&base=LAW&n=499774&rnd=LjiOCA#gMloM2Vm2nDyAvzd1 (accessed: 13.11.2025).

citizenship is publicly available, but it does not reflect the qualitative component of adaptation. In this regard, the scientific literature proposes to conduct sociological surveys of labor migrants to measure the processes of adaptation and integration (Mukomel', 2016), which require generalization and systematization of multiformat information; therefore, it is relevant to work out methodological tools to assess the effectiveness of the processes of adaptation and integration of labor migrants into the host community using the sociological survey results.

Theoretical part

Issues related to assessing the effectiveness of the adaptation and integration of labor migrants into the host community are still controversial. The European Union proposed areas for assessing the effectiveness of the integration of labor migrants in the 2010 Zaragoza Declaration: employment, education, social integration, and active citizenship, as well as indicators in each area[3]. It is worth noting that the proposed methodology is quite time-consuming and most foreign studies evaluate not the effectiveness of the adaptation and integration of labor migrants, but the measures of migration policy related to integration, enshrined in the legislative documents of a particular country (Goodman, 2019; Alaimo et al., 2023).

In the context of our research, several methodological approaches to solving this problem are of interest in the Russian scientific literature. For instance, a system of indicators for the adaptation and integration of labor migrants in the host community was proposed by V.S. Malakhov and I.S. Ivanov (Malakhov, Ivanov, 2014). We can note some disadvantages of this system despite the originality of the methodological approach. First, the heterogeneity of information sources, which, although it increases the reliability of data, complicates their mutual alignment and calculation of effectiveness. Second, the inclusion of indicators in the system is quite difficult from the point of view of its verification, for example, such as "attitude toward the basic norms of the host country", "frequency of contacts with the host community and with the country of origin", the informative insufficiency of the indicator "number of offenses", which directly depends on the level of organization of control over labor migration, as well as indicators that were initially set, but mainly characterize the conditions of adaptation, rather than its result, such as "social security" and "education level". Third, there is a lack of accounting for the time spent by labor migrants in the host territory (Bondaruk et al., 2015; Saryglar, Maximova, 2020; Bedrina et al., 2024; Mokin, 2024; Endryushko, 2024).

Another variant of the system of indicators obtained on the basis of sociological surveys was proposed by A.A. Endryushko. The system includes the following indicators: migrant status, quality of life, transnationalism, language skills, interethnic contacts, identity (Endryushko, 2024). These indicators are divided into levels (low, medium, high). The calculation is made taking into account the time spent by the migrant in the receiving territory. Despite all the advantages of this approach, from our point of view, it also has disadvantages: information limitations of indicators; combining heterogeneous indicators into one group; using such an indicator as the level of education, which characterizes the condition of adaptation rather than its result.

The above has led to the need for further search and justification of a system of indicators that allows for a comprehensive assessment of the effectiveness of adaptation and integration processes, primarily for labor migrants arriving for a long period of time or planning to stay in the country permanently. For Russia, this group of migrants traditionally consists of immigrants from Central Asian countries:

[3] Conclusions of the Council and the Representatives of the Governments of the Member States on Integration as a Driver for Development and Social Cohesion. Council of the European Union. Brussels. 4 May 2010, 9248/10, pp. 14–16.

Kyrgyzstan, Tajikistan, and Uzbekistan, which are subject to a visa-free regime in the country. They are more likely than others to decide to move to Russia with their families and to naturalize. A special place in this group of migrants is occupied by immigrants from Kyrgyzstan, a country belonging to the EAEU, which gives its citizens equal employment conditions with Russians and facilitates the process of adaptation and integration (Osadchaya, 2021). The importance of assessing the effectiveness of adaptation of representatives of these states is related to their active migration flow to Russia, the preservation of elements of traditional society in the countries of origin, which contributes to the formation of migrants' propensity for such a form of adaptation as segregation.

Research methodology and method

The author's development of a system of indicators for the adaptation and integration of labor migrants in the host community is based on the principles of social diversity, comprehensive assessment and consideration of time spent in the host territory. The principle of social diversity in this context refers to the consideration of various social practices implemented in the process of adaptation in all spheres of life (Mekka, 2012). The principle of complexity refers to the completeness and complementarity of indicators, i.e. building a system of indicators in such a way that, collectively, they characterize the migrants' desire to interact with the culture of the host community while preserving their distinctive culture (Smetanin, 2020). The principle of time accounting determines the possibility of comparing the dynamics of adaptation processes depending on the length of stay of labor migrants in the host territory.

In the context of our study, the assessment of the effectiveness of the adaptation and integration of labor migrants in the host community is based on the theory of social capital, consisting of connecting capital, which means the cohesion and mutual assistance of intra-ethnic groups of migrants (relatives, acquaintances), and connecting capital, which characterizes social ties between representatives of ethnic groups of migrants and the local population (Tatarko, 2018). The social capital of migrants increases their awareness, allows successfully navigating new conditions, and creates a favorable psychological attitude.

The methodological development of a system of indicators to assess the effectiveness of the adaptation and integration of labor migrants in the host community and its testing were carried out on the basis of data obtained during a sociological survey conducted by us in March – May 2023 using the case study of the Sverdlovsk Region using a multi-stage combined sample (n = 513). At the first stage, we identified the administrative districts of the Sverdlovsk Region with the highest concentration of labor migrants from Central Asian countries (based on data from the Department of Internal Affairs of the Ministry of Internal Affairs). At the second stage, we revealed points of greatest attraction for labor migrants (markets, construction sites, shopping malls, mosques, and centers providing services to labor migrants) as survey locations within these districts. At the third stage, quotas are determined (by gender, age and countries of origin: Kyrgyzstan, Tajikistan and Uzbekistan, in accordance with the national composition of migrants in the region at the time of the survey). At the fourth stage, the selection of respondents was carried out spontaneously using the "snowball" method to fill quotas.

To reduce the bias of the sample, we used ways to increase trust through the choice of survey locations, its organization together with representatives of national diasporas and religious servants; increase the participation of migrants in the survey by translating the questionnaire questions into the respondents' native language and the possibility of completing the survey in online format; control the distribution of respondents by gender, age, and country of origin.

This combination of sampling methods is a common compromise solution in studies of hard-to-reach groups, allowing for the necessary diversity of respondents in the absence of a complete list of the general population. At the same time, the use of spontaneous selection at the last stage imposes restrictions on representativeness: the results obtained cannot be directly extrapolated to the entire population of labor migrants without amendments. Nevertheless, they provide a reliable idea of the structure of adaptation processes in the studied group and can serve as a basis for comparison between subsamples (in particular, between groups with different length of stay).

Characteristics of the sample. The sample was dominated by men (78%), which is quite expected for migrants from Central Asian countries. A significant proportion (41%) of migrants were young people under the age of 29, 81% of respondents are married or had family experience in the past, and more than 70% of respondents have children.

The distribution of migrants by employment is quite traditional for large industrial regions: the majority of migrants (80%) are employed in such sectors of the economy as construction (36%), trade (17%), social sphere (16%) and industry (11%).

According to the time spent in the host territory, we identified two groups of labor migrants: those who have been staying for less than one year and more than five years. The first group was based on young migrants, including those who combine education and work. The second group was formed by people with families and minor children both in Russia and in the countries of origin.

The system of indicators for assessing the effectiveness of adaptation and integration of labor migrants in the host territory, obtained during the sociological survey, contains three sections by the nature of the occupied status: socio-economic, socio-cultural, and family-legal statuses. From our point of view, each of these sections characterizes a certain aspect of the adaptation and integration of labor migrants into the host community.

The socio-economic section includes four indicators: salary level, employment status, living conditions, place of residence.

The level of remuneration and employment status characterize the migrant's demand in the regional labor market, and the conditions and place of residence provide information about their social and material well-being. According to the survey data, newly arrived labor migrants often settle with their relatives who have already rented or purchased real estate. Here we can talk about the use of migrants' "connecting social capital", which has a significant impact on adaptation, especially during the first period of stay in the host territory, but at the same time can serve as an obstacle in the integration process. As income increases, migrants tend to rent or buy real estate on their own, move to more comfortable housing, and leave their enclave homes.

The socio-cultural section includes six indicators: the level of Russian language proficiency; interethnic contacts at work; contacts with the local population in their places of residence; the frequency of visits to social institutions; children receiving Russian education; seeking assistance from government and public organizations. This selection of assessment indicators reflects the set of connections, relationships, and resources that migrants use to adapt and integrate into the host community (Bourdieu, 1986; Coleman, 1988; Putnam, 1995; Ananicheva, 2024).

Working in a labor collective or living in a territory where the local population has a numerical advantage, contacting legal organizations in case of problems, and territorial government bodies indicate the presence of connecting social capital, i.e. a tendency to integrate. Russian language proficiency reduces the cultural distance between labor migrants and the host community (Riazantsev,

2018; Ryazantsev, Ochirova, 2019; Saryglar, Maximova, 2020), poor knowledge of the language limits communication with local population (Grunt, 2019). At the same time, the intensity of use of the social sphere (medical institutions, kindergartens, schools) may indicate both the availability of connecting capital (which is more typical for family migrants with children) and the level of knowledge of information necessary for life. The desire to provide Russian education to children speaks to the migrants' determination to integrate into the host community.

The legal and family status section includes four assessment indicators: legal status (TRP – temporary residence permit, residence permit, citizenship); formalization of work/business; residence in the host territory with family or other relatives; citizenship of the spouse.

These indicators demonstrate the "migrant's integration path". It is easier for legal migrants, as well as persons who have obtained citizenship of the host country, to find work and housing (Grunt, 2019). The presence of official employment, on the one hand, indicates the legal literacy of a labor migrant, on the other hand, it protects him/her from possible discrimination by the employer. Family relocation contributes to the adaptation and integration of labor migrants (Voinov, Ledeneva, 2025, p. 164). The presence of a marriage concluded with a citizen from the local population also indicates the active integration of a labor migrant (Akramov, 2018), and becoming a citizen of the host country is the final stage of integration (Demireva, 2019).

The duration of the process of adaptation and integration of each particular migrant is determined by many factors: the level of qualifications (Kogan et al., 2018; Kogan, Shen, 2019), nationality (Babayeva, Konstantinov, 2021), knowledge of the language of the host country's population (Written, et al., 2018), etc. For example, persons arriving in the Russian Federation as part of the State Program to Facilitate the Voluntary Resettlement of Compatriots Living Abroad[4] have all the signs of a common language, historical and cultural heritage and are more likely to integrate quickly into the host community than temporary or seasonal workers. Highly qualified specialists can be economically successful, but this does not mean that they will have all the signs of integration into the local community: knowledge of language, culture, traditions, and norms of behavior (Beaverstock, 2005).

The fundamental difference between the proposed indicator system and existing methods (Malakhov, Ivanov, 2014; Andreushko, 2024) is in three aspects. First, unlike approaches focused on fixing the conditions of adaptation (level of education, social security), our system focuses on the measurable results of a migrant's interaction with the host community, operationalizing them through specific social practices. Second, the proposed grouping of indicators into three complementary sections (socio-economic, socio-cultural, family-legal) makes it possible to overcome the fragmentation of analysis typical of many studies and present adaptation as an integrated, multifactorial process. Third, unlike previous works, where the time factor was taken into account statically, our approach allows tracing the dynamics of the migrant's transition between the stages (initial – intermediate – final) simultaneously in all key areas of life, which makes it possible to identify not only the presence, but also the degree of maturity of integration processes.

[4] On measures to facilitate the voluntary resettlement to the Russian Federation of compatriots living abroad: Presidential Decree 637, dated June 22, 2006. Garant.ru: Information and legal portal. Available at: https://base.garant.ru/189653/?ysclid=m7h66f3ee2379985024 (accessed: 05.02.2025).

The proposed criteria system has been developed for migrants from visa-free countries who have more freedom to move in the host territory and to decide on the importation of family members. In this regard, for people from countries with a visa regime, these criteria can only be partially used, which is also a limitation of our study.

Another limitation is the dynamism of migration processes caused by both internal (changes in legislation, stricter migration policy, changes in the economic situation in the country, etc.) and external (changes in the exchange rate due to external factors, the imposition of sanctions and restrictions, competition in the international labor market, etc.) factors.

For each particular indicator, we identified three qualitative states corresponding to the stages of adaptation: initial (low degree of integration, preservation of isolation), intermediate (formation of stable ties with the host community, use of its resources), final (high degree of integration, legal and social consolidation). The assignment of specific characteristics of the indicator to a particular stage was carried out on the basis of:

– theoretical analysis (see, for example, Berry, 1997; Malakhov, Ivanov, 2014);

– expert discussion (researchers specializing in migration issues participated in the work);

– a pilot survey that revealed empirically significant gradations in the distribution of responses.

Weighted average indices are calculated for each section and stage of the process:

$$R_i = \frac{\sum_{i=1}^{n} s_i \times k_i}{\sum_{i=1}^{n} s_i}, \quad (1)$$

where R_i – weighted average index for the section;

s_i – coefficient of significance of i-th private indicator;

k_i – value of i-th private indicator;

n – number of indicators in the section.

To assess the significance of i-th particular indicator, the frequency of its mention in the scientific literature is calculated. We used the platform of the Russian scientific electronic library eLIBRARY.RU for this purpose. The search for scientific papers was carried out on the request "integration of labor migrants". We selected 17 works from the list of the most relevant works, consisting of 1,000 sources. Selection criteria: articles or monographs, a study of Russian migration, the presence of a sociological study in the form of a questionnaire, the indication of at least two of the three parameters: the geography of the study, the year of the study, the sample size (*Tab. 1*).

Based on the analysis, the following performance evaluation criteria were determined: $0\% \le R \le 33\%$ – *low*; $34\% \le R \le 66\%$ – *medium*; $67\% \le R \le 100\%$ – *high*. With the help of calculated indices for each section, the effectiveness of the integration process was assessed at the final stage.

Table 1. Determining the significance of indicators of adaptation and integration of labor migrants based on bibliometric analysis

Author(s), year of publication	Geography and year of research, sample size	Socio-economic adaptation and integration				Socio-cultural adaptation and integration						Family-legal status			
		1	2	3	4	1	2	3	4	5	6	1	2	3	4
Bashirova L.S., Kuznetsov V.A. (Bashirova, Kuznetsov, 2012)	Omsk, 2010, n = 156	+		+	+				+			+	+		+

End of Table 1

Author(s), year of publication	Geography and year of research, sample size	Socio-economic adaptation and integration				Socio-cultural adaptation and integration						Family-legal status			
		1	2	3	4	1	2	3	4	5	6	1	2	3	4
Florinskaya Yu.G. (Florinskaya, 2012)	Moscow, Saint Petersburg, 2010, n = 400; Moscow, Saint Petersburg, Moscow Region, Samara Region, Leningrad Region, Krasnodar Territory, 2010, n = 1169	+	+						+	+					
Mukomel' V.I. (Mukomel', 2013)	All-Russian survey (HSE CSEAMR), 2011	+	+	+	+	+				+			+	+	+
Bondaruk A.F., Golyanich V.M., Perepelkina V.A. (Bondaruk et al., 2015)	Leningrad Region, 2014, n = 252					+	+	+		+			+		
Titova E.V. (Titova, 2015)	Jewish Region, n = 197	+	+	+	+	+									
Shchitova N.A., Solov'ev I.A., Belozerov V.S. (Shitova et al., 2016)	Stavropol Territory, 2012, n = 776	+	+	+		+			+	+		+			
Pis'mennaya E.E., Ryazantsev S.V., Khramova M.N., Grishin A.S., Smirnov A.V. (Pis'mennaya et al., 2018)	Moscow, Saint Petersburg, Kaluga region, Moscow Region, Leningrad Region, Sverdlovsk Region, Tyumen Region, Khanty-Mansi AA, Stavropol Territory, Primorye Territory, Khabarovsk Territory, n = 1,000	+				+						+			
Grunt E.V. (Grunt, 2019)	Yekaterinburg, 2018, n = 400	+				+							+	+	+
Saryglar S.A., Maximova S.G. (Sarvglar, Maximova, 2020)	Altai Territory, Amur Region, Astrakhan Region, Volgograd Region, Khabarovsk Territory, Republic of Tyva, n = 449	+	+	+	+	+					+			+	
Endryushko A.A. (Endryushko, 2020)	All-Russian survey, 19 regions (head is V.I. Mukomel'), 2017, n = 8577	+	+	+		+	+	+	+	+			+	+	
Akopyan E.A., Akopyan A.R. (Akopyan, Akopyan, 2021)	Saint Petersburg, Leningrad Region, n = 200	+		+								+	+	+	
Osadchaya G.I. (Osadchaya, 2021)	Moscow, 2019-2020, n = 823	+		+					+	+					+
Titova T.A., Frolova E.V. (Titova, Frolova, 2022)	Kazan, 2018, n = 300					+	+	+							+
Rostovskaya T.K., Vinogradova M.V., Nikiporets-Takigava G.Yu. (Rostovskaya et al., 2024)	Moscow, Saint Petersburg, Novosibirsk Region, Krasnoyarsk Territory, Krasnodar Territory, Rostov Region, Samara Region, Primorye Territory, Tyumen Region, Yamal-Nenets AA, Khanty-Mansi AA, Moscow Region, Irkutsk Region, Sverdlovsk Region, 2018	+	+			+						+			
Eremina E.V., (Eremina, 2024)	Penza Region, 2024, n = 200	+	+			+	+	+					+	+	
Endryushko A.A. (Endryushko, 2024)	All-Russian survey, 19 regions (head is V.I. Mukomel'), 2017, n = 8,577			+		+	+	+				+			
Mokin K.S. (Mokin, 2024)	Moscow and Moscow Region, n = 3,533	+	+			+	+			+				+	
frequency, s_i		14	9	9	4	13	5	5	5	7	1	6	6	6	4

Source: own compilation.

Results of the research

The survey results presented in *Tables 2–4* characterize the effectiveness of the adaptation and integration of labor migrants.

The data in *Table 2* shows that the Socio-economic adaptation and integration section is characterized by an average level of performance, 36% of labor migrants have it, including 32% who have been in the region for less than one year, and 36% who have been in the region for more than five years.

The assessment of the performance in *the socio-economic section* demonstrates the concentration of migrants at the intermediate stage of adaptation, regardless of the length of stay in the region. At the same time, 74% of the migrants who participated in the survey have permanent jobs, which indicates that they are motivated to find employment and receive stable earnings. At the same time, the time factor has little effect on the transition to the final stage of adaptation and integration: even after five years of living in the region, only 36% of migrants reach high values according to a set of criteria. This statement allowed concluding that economic adaptation occurs mainly in the early years, but then stabilizes without reaching the final level, which is explained by the structural constraints of the regional labor market and continued employment in segments with low skill requirements.

The socio-cultural section is characterized by an average level of performance: 56% of labor migrants who arrived in the region from Central Asian countries, including 43% who have been in the region for less than one year, and 58% for more than five years (*Tab. 3*).

According to the criteria of interethnic interaction, a significant share of labor migrants found themselves at an intermediate stage of adaptation and integration. At the same time, migrants preferred to turn to friends, relatives, and acquaintances to solve problematic situations, distrusting legal institutions.

There is an uneven dynamic of adaptation and integration in *the socio-cultural section*: knowledge of the Russian language and orientation toward children's education demonstrate steady progress with increasing length of stay. For example, the number of migrants who are fluent in Russian

Table 2. Assessment of the effectiveness of socio-economic adaptation and integration of labor migrants from Central Asian countries in the Sverdlovsk Region, %

Criteria	Stage of adaptation and integration											
	initial	a	b	c	intermediate	a	b	c	final	a	b	c
Salary level	below the industry average	25	28	28	industry average	52	45	48	above the industry average	23	27	24
Employment status	unemployed, temporarily unemployed	15	13	9	temporary jobs	13	22	17	permanent job	72	65	74
Living conditions	dormitory, office space	29	13	10	rental of real estate	58	51	66	own housing	13	36	24
Place of residence	area of compact residence of labor migrants (CRLM)	23	31	33	area with a relatively low real estate value that is not part of the CRLM zone	60	63	44	area with a relatively high real estate value	17	6	23
R_i		23	21	19		45	43	44		**32**	**36**	**36**

Note: a – labor migrants who have been in Russia for less than one year; b – labor migrants who have been in Russia for more than five years; c – all labor migrants, regardless of the time spent in the region.
Source: own compilation.

Table 3. Assessment of the effectiveness of socio-cultural adaptation and integration of labor migrants from Central Asian countries in the Sverdlovsk Region, %

Criteria	Stage of adaptation and integration											
	initial	a	b	c	intermediate	a	b	c	final	a	b	c
Level of knowledge of the Russian language	do not speak the language	21	5	10	speak the language at household level	25	22	26	fluent in the language	54	73	64
Interethnic contacts at work	mostly with compatriots	46	17	22	mixed groups (locals and migrants)	33	49	40	mostly with the local population	21	34	38
Interethnic contacts in places of residence	mostly with compatriots	38	13	19	mixed groups (locals and migrants)	27	45	45	mostly with the local population	35	42	36
Frequency of appeals to social institutions	do not apply	22	14	23	sometimes apply	28	33	20	often apply	50	53	57
Getting Russian education for children	no desire to give Russian education to children	17	5	13	hesitated to respond	43	35	11	have a desire to teach children	40	66	70
Requesting assistance	appeal to friends, relatives, acquaintances	51	44	47	appeal to the consulate, to the diaspora	8	9	21	contacting law offices, territorial government bodies, or NPOs	41	47	32
R_i		27	10	16		30	33	27		43	58	56

Note: a – labor migrants who have been in Russia for less than one year; b – labor migrants who have been in Russia for more than five years; c – all labor migrants, regardless of the time spent in the region.
Source: own compilation.

has increased by 19% over the five years of their stay in Russia (from 54 to 73%). The desire of 70% of respondents to teach children in Russian schools indicates both the high effectiveness of the adaptation and integration of migrants according to this indicator, and the prestige of Russian education among the respondents. At the same time, the frequency of appeals to social institutions, interethnic contacts and appeals to legal institutions remain at an intermediate level even among "old-timers", which we interpret as a manifestation of the connecting social capital formed in the diaspora and the continuing distrust of formal institutions.

According to the family-legal status section, labor migrants generally have an average level of adaptation and integration effectiveness – 40%, including 46% who have been in the region for more than five years (*Tab. 4*).

However, we revealed the most pronounced dependence on the time of stay for this section: labor migrants who have been in the region for less than a year have a low rate of adaptation and integration – 26%. The share of migrants with a residence permit or citizenship increases from 27% (less than a year) to 46% (more than five years) in this section; and the share of those living with a family increases from 28% to 71%, i.e. the high share of migrants with more than five years of experience who pass the final stage in terms of "staying in the host territory with their family" can be considered not only as an indicator of adaptation, but also as a factor that accelerates adaptation processes (through the expansion of social ties, increasing motivation for legal registration). In general, according to the criterion of "legal status", most migrants are at the initial stage of adaptation

Table 4. Assessment of the effectiveness of adaptation and integration of labor migrants from Central Asian countries in the Sverdlovsk Region under the family-legal status section, %

Criteria	Integration stage											
	initial	a	b	c	intermediate	a	b	c	final	a	b	c
Legal status	temporary stay	54	35	43	temporary residence permit	19	19	19	residence permit, Russian citizenship	27	46	38
Formalization of labor activity/ business	employment relations (business) are not registered	26	33	31	oral, contract	35	18	22	written contract / completed business	39	49	47
Staying in the host territory with family or other relatives	no family	33	11	16	together with people from the country of origin	39	18	25	with family	28	71	59
Citizenship of the spouse	not married	74	11	19	citizenship of a non-host country	26	83	77	citizenship of the host country	0	6	4
R_i		44	24	28		30	30	32		**26**	**46**	**40**

Note: a – labor migrants who have been in Russia for less than one year; b – labor migrants who have been in Russia for more than five years; c – all labor migrants, regardless of the time spent in the region.
Source: own compilation.

and integration, but according to the criteria of "formalization of work/business" and "staying in the host territory with their family or other relatives" – at the final stage.

We correlated these results with the theoretical model of the integration path, showing that legal legitimization and family reunification are key markers of the transition from temporary residence to long-term rooting. Additional interpretations are proposed based on criteria such as "staying in the host territory with the family" and "the spouse's citizenship".

In addition, the data obtained confirm the model of J. Berry (Berry, 1997): among migrants with more than five years of experience, an integration strategy prevails (preserving their culture while actively interacting with the host community), while newcomers more often have elements of segregation (compact living, reliance on community networks). Based on the concepts of social capital by P. Bourdieu (Bourdieu, 1986) and R. Putnam (1995), we have shown that at the initial stage, connecting capital dominates (contacting relatives, diaspora), and with increasing length of stay, the role of connecting capital increases (interethnic contacts at work, contacting territorial authorities). The importance of the time factor has been empirically confirmed, but with an important clarification: its effect is uneven in different areas – it is most pronounced in the family-legal spheres, least in the socio-economic. This conclusion complements existing research (Endryushko, 2024; Bedrina et al., 2024), where the time factor was considered primarily as universal.

Conclusion

Methodological approaches to assessing the processes of adaptation and integration of labor migrants in the host community, based on the sociological survey results, made it possible to quantify these processes and formalize them. The assessment of the adaptation processes of labor migrants using the case study of the Sverdlovsk Region in all three sections of criteria: socio-economic, socio-cultural, family-legal status – as a whole showed an average level of effectiveness. At the same time, in the socio-cultural section, the assessment of the effectiveness of adaptation and integration of labor migrants is higher than in others,

which can be explained by the predominance of family migration in the region, which presupposes more active interaction of labor migrants with the host community. Poor performance in the socio-economic sector is primarily due to the relatively low level of education and qualifications of labor migrants arriving in the region.

The study confirmed the need to take into account the time spent by labor migrants in the host territory. The results obtained confirm the conclusions of K.S. Mokin: the longer the migration state lasts, the more the migrant is focused on staying in the host territory (Mokin, 2024). This trend is evident across all sections, as well as the stages of adaptation and integration. At the same time, the effect of the time factor is insignificant for changing the socio-economic situation of labor migrants, but it is of great importance in resolving issues of family-legal status.

The theoretical significance of the research lies in the creation of tools that make it possible to verify existing theoretical models of adaptation (assimilation, integration, segregation, etc.) at a quantitative level, identifying real practices of migrant adaptation. The practical significance lies in the fact that the proposed approach can be used by public authorities and local governments to monitor the effectiveness of migration policy, assess the long-term effects of adaptation programs, as well as to develop targeted support measures, differentiated depending on the stage of integration and the set of indicators for which the lag is recorded. Testing of the methodology on data from the Sverdlovsk Region has confirmed its operability and sensitivity to the time factor, which makes it possible to recommend it for other Russian regions, taking into account the specifics of local migration flows.

Further studies on quantifying the effectiveness of the processes of adaptation and integration of labor migrants in the host territory can be carried out taking into account a larger number of criteria and indicators, which will allow extending this methodological approach to other ethnic groups of labor migrants, as well as assessing the long-term effects of adaptation to develop more effective adaptive strategies to improve Russian migration policy.

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Digital Platforms in the Russian Labor Market: Paradoxes and Contradictions of Transformation

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Abstract. The relevance of the study is substantiated by the contradictory role of digital platforms: being the dominant infrastructure of the Russian labor market, they do not solve but reproduce the problems of informal employment and regional inequality. The aim of the work is to go beyond the observation of the quantitative growth of platforms and to reveal the mechanisms of institutionalization of these disparities. Scientific novelty lies in the synthesis of structural and institutional approaches, which for the first time allows conceptualizing the key paradoxes of the Russian model: technological formalization of informality, reinforcement of regional inequality, and algorithmic autonomy. The methodological framework was based on a combination of qualitative and quantitative methods: secondary analysis of data from Rosstat and platforms (2020–2025), the author's content analysis of job descriptions (N = 4500) to identify informal hiring practices via lexical markers, and modeling of vacancy closing time to assess regional efficiency (N = 9600). The findings demonstrate that platforms serve as an infrastructure for the mass institutionalization of informal relations, with the share of informal vacancies in mass segments reaching 60–85%. It has been revealed that platform infrastructure does not smooth regional asymmetries but technologically reinforces them, concentrating high-income digital jobs in the capitals and preserving low-skilled, insecure employment in the periphery. It has been shown that the flexibility of platform employment leads to either strict algorithmic control (in the gig segment) or increased instability (in freelancing), both of which result in the transfer of social risks to the employee. The limitations of the study include the lack of open official data on informal employment, which determines the prospects

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for further research on the long-term social consequences of platformization and the effectiveness of differentiated regulatory measures.

Key words: transformation paradoxes, digital platforms, Russian labor market, institutionalization of informality, regional asymmetry, algorithmic control, income polarization, social vulnerability.

Introduction

The rapid digitalization of the economy has led to the emergence of digital platforms as a key element of new economic interactions. In the field of labor, they are transforming traditional employment models, formalizing connections between consumers and service providers, minimizing transaction costs, and acting as the technological foundation for the evolution of the labor market. In this regard, the position of the ILO is particularly relevant, asserting that the future of employment is determined not just by technology, but by society's ability to reap the benefits of digital transformation while mitigating its negative consequences. The ILO considers the growth of international cooperation, the implementation of inclusive policies, and the development of new models of social dialogue as key conditions for this[1].

The global trend toward platform-based and remote work is also reflected in Russia, where this model shows accelerated growth.

According to research from HSE University, by the end of 2024, the share of platform workers in Russia reached 4.4%, representing an absolute number of 2 to 5 million people using digital platforms for professional purposes[2]. This estimate encompasses both those employed on managed gig platforms (delivery men, taxi drivers) and freelancers working through specialized exchanges (FL.ru, Profi.ru, etc.).

Russian platform employment market shows stable positive dynamics. A joint study by Data Insight and Ventra Go! estimates the monetary turnover of this segment grew by 40% in 2025, equivalent to an increase of 239 billion rubles[3].

Freelance work (professional services) deserves particular attention, as it demonstrates accelerated growth rates. PwC experts predict that by 2025, the volume of the Russian freelance market could reach 102 billion dollars[4], allowing Russia to enter the top ten global leaders by this indicator, second only to the US in growth rate. It is important to underscore that this estimate includes only intellectual labor and does not include those employed in delivery, taxi, and other types of physical work on platforms.

Government policy, expressed in national projects, also views platforms as a foundation for transitioning the economy and social sphere to "qualitatively new principles of operation"[5]. However, there is a deeply dualistic nature of their impact behind the declared efficiency and integration into the official agenda. The following contradiction forms the key scientific problem of the study: technological expansion of digital platforms, intended to optimize and formalize the labor market, is paradoxically connected to preservation and reproduction of unstable, informal forms of employment and increasing regional inequality.

[1] ILO Centenary Declaration for the Future of Work (2019). Available at: htatps://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40ed_norm/%40relconf/documents/meetingdocument/wcms_715175.pdf (accessed: 14.11.2025).

[2] Sinyavskaya O.V., Biryukova S.S., Kareva D.E., Stuzhuk D.A. (2024). Platformennaya zanyatost' v Rossii: dinamika rasprostranennosti i klyuchevye kharakteristiki zanyatykh: ekspertnyi doklad [Platform Employment in Russia: Prevalence Dynamics and Key Characteristics of the Employed: Expert Report]. Moscow: Higher School of Economics Publishing House.

[3] Russian platform employment market. Available at: https://datainsight.ru/DI_employment_2025 (accessed: 26.02.2026).

[4] The present and future of freelance in Russia. Available at: https://trends.rbc.ru/trends/social/60c8e3139a79472ba64fde35?from=copy (accessed: 16.11.2025).

[5] National project "Data economy". Available at: http://government.ru/news/50469/ (accessed: 16.11.2025).

Therefore, the *aim* of this research is a comprehensive analysis of the paradoxical role of digital platforms in the transformation of the Russian labor market, covering more than the fact of their expansion. The research is based on the hypothesis that digital platforms, contrary to expectations, act not as a tool of formalization but as a mechanism for the institutionalization of informality and the reinforcement of regional inequality. Achieving this aim and testing the hypothesis required addressing several interrelated tasks: first, analyzing macro-structural shifts in the labor market in the context of platform expansion; second, empirically assessing the scale of informal hiring practices; third, identifying regional differentiation in platform efficiency; fourth, conceptualizing the key paradoxes of employment transformation within the Russian model of the platform economy.

The *scientific novelty* of the research lies in integrating the author-developed toolkit for empirically identifying informal hiring practices with the theoretical understanding of their role in transforming the Russian labor market.

First, an original method for quantitatively identifying informal hiring practices was proposed and tested, based on content analysis of job postings texts (N=4500) using a system of lexical markers. This allowed, across different digital platforms and professional categories, capturing the scale of the gray sector and identifying its connection to algorithmic barriers.

Second, through a synthesis of structural and institutional approaches, an analytical model was proposed that connects micro-level informal practices with macro-structural shifts and institutional gaps. This model not only addresses the fragmentation of existing research but also conceptualizes for the first time the key paradoxes of the Russian model of platform employment, enabling a transition from stating isolated effects to understanding the systemic mechanisms through which social vulnerability is reproduced via digital platforms.

Overall, this approach allows moving from enumerating individual effects toward a holistic understanding of the mechanisms reproducing inequality in the context of digital platforms.

The r*elevance and significanc*e of the research are determined by the scale and contradictory nature of the transformation. The Russian market, demonstrating rapid growth in the platform economy and ranking among global leaders in its level[6], represents a relevant and representative field for studying the dialectic contradiction between technological opportunities and social risks. The findings can serve as a basis for formulating recommendations aimed at strengthening the pro-social component in the development of the digital employment ecosystem.

The problem of labor market transformation under the influence of digital platforms is analyzed in the works of Russian authors (Bobkov, Chernykh, 2020; Chernykh, 2020; Dolzhenko et al., 2024; Kapeliushnikov, Zinchenko, 2025; Kolesnik, 2025) and foreign researchers (Dun et al., 2020; Bieber, 2022; Giustini, 2023; Martindale et al., 2023), where the dualistic nature of the phenomenon is emphasized: platforms act as drivers of efficiency and flexibility but also as a factor of precarization and social vulnerability. The contemporary literature is structured around several key blocks, the analysis of which reveals both achievements and significant gaps that define the direction of this study.

1. Structural shifts and the new architecture of the market. The study of digital platforms shows that they form a new tripartite structure of relations: worker – platform – client. In this model,

[6] Sinyavskaya O.V., Biryukova S.S., Kareva D.E., Stuzhuk D.A. (2024). Platformennaya zanyatost' v Rossii: dinamika rasprostranennosti i klyuchevye kharakteristiki zanyatykh: ekspertnyi doklad [Platform Employment in Russia: Prevalence Dynamics and Key Characteristics of the Employed: Expert Report]. Moscow: Higher School of Economics Publishing House.

the platform acts as a new institutional subject, assuming coordination and management functions. This architecture, as noted in the scientific literature (Klimenko, 2024), contributes to the decentralization and individualization of labor. Researchers (Schmidt, 2017; Petrovskaya, 2021; Sadovaya, 2022; Alauddin et al., 2024) emphasize that this approach does not only involve flexibility but entails a systemic transformation of labor relations into a civil law framework. Many acknowledge this fact, yet little attention is paid to how this substitution of labor exacerbates regional inequality in Russia. High-income digital professions concentrate in capital agglomerations, leaving regions with low-skilled and often informal jobs. This study aims to fill this gap by focusing on the territorial aspect of this phenomenon.

2. The dialectic of flexibility and algorithmic control. E.A. Chernykh notes that schedule flexibility and the pursuit of autonomy are the main drivers determining user activity on digital platforms (Chernykh, 2021). As noted by E.S. Sadovaya and foreign researchers (Laursen et al., 2021; Sadovaya, 2022; Alauddin et al., 2024), the flexibility and formal freedom provided by employers are increasingly giving way to rigid algorithmic control. This phenomenon is termed the "paradox of double autonomy" (Pulignano et al., 2023). It is important to emphasize that existing studies, while recognizing this paradox as a general trend, rarely analyze its uneven impact on different categories of workers. We investigate how platform architecture can simultaneously serve as a "channel of exploitation" (Chernykh, 2021) for some, and a space where others find opportunities for development, thereby increasing internal social stratification.

3. Social stratification and polarization. Studies indicate that vulnerable groups (youth, women, migrants) dominate the low-paid segment (Giustini, 2023; Martindale et al., 2023; Baimurzina et al., 2024). Platforms not only reflect inequality but also reinforce it through algorithms, regulations, and legal gaps, thus institutionalizing it. This research focuses on this mechanism.

4. Institutional gaps as a systemic problem. Contemporary academic discourse emphasizes that legal regulation lags behind technological development, creating legal uncertainty (an "institutional vacuum" (Petrovskaya, 2021)). There are problems in defining the legal status of platform workers, a lack of regulation and social protection, which can lead to the risk of "deferred poverty" (Chernykh, 2020; Leshkova et al., 2025). However, existing studies often have a general character. This work proposes a more specific approach, assessing these regulatory gaps in the context of government programs for labor digitalization. Accordingly, the task is to understand why the state-proclaimed goals of transitioning to data-driven management do not lead to filling these legal gaps and often do not affect them, creating a field for the "platformization of informality"[7].

The conducted literature analysis shows: despite an in-depth exploration of individual aspects of platform employment, there remains a deficit of comprehensive studies that would link structural shifts, regional differentiation, internal stratification of the platform sector, and institutional failures within the Russian context. Consequently, this research aims to bridge this gap by offering a holistic analysis of the paradoxes of transformation in the Russian labor market, where a technological tool designed to optimize and smooth out disparities becomes, in practice, a factor in their preservation and reproduction.

Methodology

The methodology is based on the integration of structural and institutional approaches, which allows linking macroeconomic trends, regional differentiation, and micro-level labor practices.

[7] Shevchuk A.V. (2023). Rol' tsifrovykh trudovykh platform v transformatsii zanyatosti: ekonomiko-sotsiologicheskii analiz: dis. ... d-ra sotsiol. nauk [The Role of Digital Labor Platforms in Employment Transformation: Economic and Sociological Analysis: Doctor of Sciences (Sociology) Dissertation]. Moscow.

Conceptual framework. For a correct analysis, it is necessary to distinguish key concepts that are often conflated in the academic discourse on digital employment. Within the framework of this study, the author will adhere to the following definitions:

1. Digital job boards are online infrastructure facilitating communication between employers and job seekers and providing traditional employment relationships (HH.ru, Superjob, Trudvsem.ru). They act as intermediaries at the search stage but do not participate in the work process itself nor determine its conditions.

2. Transaction (service) platforms or gig platforms are platforms that not only connect clients and contractors but also set the rules for performing work, process payments, and often algorithmically manage the work process (YouDo, Profi.ru, Avito, Yandex.Taxi, delivery services). This is where platform employment, as a new type of relationship, is formed.

3. Platform employment is a form of labor relationship where a worker's activity is organized through a digital platform, involving the performance of tasks for external clients, using algorithmic management, and, as a rule, without concluding an open-ended employment contract.

4. Remote (distance) work is a form of labor organization that can be implemented both within a traditional employment contract (Chapter 49.1 of the Labor Code of the Russian Federation) and within platform employment. This concept describes the location of work, not the method of organizing hiring.

5. Freelance is a type of self-employed work, often (but not exclusively) realized through digital platforms, involving the performance of project-based work primarily of an intellectual nature. A freelancer has greater autonomy in choosing clients and working conditions compared to workers on managed gig platforms (taxi, delivery).

Distinguishing these concepts is fundamental to understanding the paradoxes described below: the tool (digital job boards) is not identical to the employment model (gig platform), and the remote work does not guarantee autonomy or social protection.

Data sources and analysis period. The empirical base included official statistics (Rosstat data 2020–2025), data from digital platforms (open data from websites HH.ru, Trudvsem.ru, Avito, Superjob, FL.ru, YouDo, Profi.ru for 2020–2025 (analytical reports and own compilation results)), and regulatory documents (national projects, digitalization strategies, ILO declarations).

Methodology for identifying informal hiring practices through content analysis of job postings (to assess the prevalence of gray vacancies):

– The sample consisted of 4,500 job postings (500 per each of 3 platforms across 3 categories of mass professions (common laborers, delivery men, household staff)). Platform selection rationale: HH.ru – leader in corporate recruitment, Avito – largest classifieds site, Trudvsem.ru – a state multifunctional labor market ecosystem. FL.ru and Profi.ru were excluded from this stage of analysis because their business model focuses on project-based employment and self-employment, making the application of the gray marker methodology in its classic sense inappropriate.

– The study relies on data collected in September–October 2025. To compile data on vacancy lifetime across regions, automated parsing was used, processing 9.6 thousand postings across eight Russian regions for the period 2020–2025. However, we could not study the text of job postings (4.5 thousand units) for informal wording using parsing due to technical limitations and platform security policies blocking mass text collection. Consequently, the content analysis was performed exclusively manually.

– Tools. A dictionary of lexical markers (created based on 200 pilot postings) was used, including: mentions of formal registration ("official employment", "Labor Code", "benefits package",

"officially"); calls for informal contact ("WhatsApp", "Telegram", "call now", "cash payment", "work by the day", "side job").

Methodology for assessing regional vacancy lifetime. The author's selective monitoring method was applied to analyze territorial differentiation in hiring efficiency.

– Rationale for territory selection. Eight territories were selected, divided into two groups based on their administrative status. The first group consisted of Russian regions – Moscow and Saint Petersburg (leading regions demonstrating minimal vacancy lifetime), along with the Amur Region, representing regions of the Far Eastern Federal District with pronounced personnel shortages and maximum hiring times. The second group included administrative centers – large cities from various federal districts (Krasnodar, Novosibirsk, Yekaterinburg, Saratov, Tyumen), allowing for the analysis of platform efficiency in urban agglomerations outside the capitals and identifying leaders and outsiders at this level.

– Data collection and calculation procedure:

1. Manual collection, quarterly (January 2020 – October 2025). On the first day of each quarter, 50 job postings were selected from HH.ru and Trudvsem.ru in the categories of mass professions (salespeople, drivers, delivery men, common laborers) and IT specialists.

2. Sample size of 9600 postings (8 territories × 2 platforms × 2 categories × 50 postings × 12 quarters).

3. Calculation. The date of the vacancy removal (status "filled" or removed) was recorded; vacancies available for >365 days were excluded. The median time (the median value was chosen due to outliers) was calculated for each category and platform, then averaged for each territory.

Institutional and comparative analysis. A comparative analysis included functional capabilities and moderation rules of platforms (Trudvsem.ru, HH.ru, Avito) and regulatory documents of the Russian Federation to identify paradoxes and contradictions between technological development and legal regulation.

Operationalization of professional categories. To ensure comparability of analysis results across different stages of the research (macro-structural shifts, informal practices, income, regional structure), a unified system of professional groups was used. It is based on the classification used by Rosstat when analyzing the need for workers. Accordingly, the following broad groups are identified: highly qualified specialists (including IT, management, finance); service and trade workers (delivery, sales); skilled workers (drivers, construction workers, common laborers); unskilled workers (household staff, assistants). The selection of specific professions within these groups (e.g., "delivery men" for the "service and trade workers" group) was determined by their representativeness for analyzing specific aspects of platform employment (informality, algorithmic control, income) and their presence on the platforms under study. This approach allows for transitioning from scattered observations to a holistic analysis of labor market transformation.

Limitations of the study

1. The presence of markers (e.g., "you can WhatsApp us") is not absolute proof of informality, as large companies may also use messengers for initial contact. Therefore, estimates should be considered as an indicator of the upper limit of informal practice prevalence, reflecting the parties' desire to minimize formal procedures at the hiring stage. Markers validity is supported by their low frequency (<5%) in job postings of large public companies in the same categories.

2. Manual data collection limits the ability to extrapolate the obtained values to the population of vacancies. Lack of access to platforms' internal statistics prevents verification of the true reason for vacancy removal (actual hiring or removal for other reasons), nor does it exclude the effect of inactive vacancies left available by employers after actual hiring, which may overstate actual lifetime.

3. Average indicators of heterogeneous categories (mass professions and IT) obscure sectoral specifics but allow characterizing regional labor market efficiency in general terms. When interpreting results, it is important to consider the heterogeneity of administrative units in the sample: comparing regions and cities requires caution, so the analysis of regional differences was conducted primarily within groups of the same territorial level, and the joint presentation of data aims to demonstrate the overall spread of values and dynamics. Therefore, the values presented should be considered indicative, reflecting the direction of territorial differences rather than precise statistical measurements.

4. When forming the empirical base, the risk of duplicate observations arising from the same vacancy being posted by an employer on multiple platforms simultaneously (cross-posting) was considered. Direct control for duplicates was hindered by manual data collection and the absence of unified vacancy identifiers across platforms. However, this limitation is not critical for the purposes of this study. For content analysis, duplication does not distort the assessment of gray marker prevalence, and for monitoring vacancy lifetime, the probability of duplicates falling into the sample is minimized by its small size and quarterly collection principle. Nevertheless, the impossibility of completely eliminating duplicates is acknowledged as an additional limitation inherent in research using open platform data.

Thus, the combination of methods described, despite limitations, allows for a multi-level analysis and linking macro-trends with the micro-level labor practices.

Results

Digital platforms as labor market infrastructure: scale, structure, and macro-trends

Analysis of data from digital platforms and official statistics for 2020–2025 indicates their transformation into the dominant infrastructure of the Russian labor market. Quantitative indicators demonstrate not only the massive reach of economic agents but also the platforms' ability to adapt to structural economic changes, promptly reflecting shifts in labor demand.

Scale and structure of the platform ecosystem. The Russian market of digital job boards represents a developed multi-level ecosystem. The total audience of leading platforms amounts to tens of millions of users. Services like Trudvsem.ru and HeadHunter form national databases with tens of millions of resumes and millions of vacancies, making them key communication channels between job seekers and employers. The growth dynamics of key players are impressive. HeadHunter's resume database grew from 30 thousand in 2002 to 85 million by mid-2025[8], while Trudvsem.ru has accumulated around 23 million users and nearly 11 million vacancies[9].

However, behind these aggregate indicators is significant latent structural heterogeneity. Alongside growth in users, platforms are characterized by specialization development: from classic recruitment (HeadHunter, Rabota.ru, Superjob) and giant horizontal marketplaces (Avito.Rabota with 50 million monthly users[10]) to niche freelance (FL.ru) and service platforms (YouDo, Profi.ru). *Table 1* presents the key players shaping the digital infrastructure of the labor market, along with their main characteristics.

The data presented in the table illustrate not only the scale but also the functional differentiation of platforms: some act as infrastructure for candidate search, while others organize the interaction process themselves and act as regulators of payments (transactional). This distinction is fundamental to

[8] 22 years together with hh.ru: Retrospect. Available at: https://twotwo.hh.ru/story?from=main (accessed: 20.11.2025).

[9] Trudvsem.ru: Portal statistics. Available at: https://trudvsem.ru/analytics/portal-stats/ (accessed: 20.11.2025).

[10] Avito: Avito.Rabota – Avito.Podrabotka. Available at: https://www.cnews.ru/book/Avito_-_Авито_работа_-_Авито_подработка (accessed: 20.11.2025).

Table 1. Classification of leading digital job boards in Russia

Year established	Platform name	Platform type	Employment relations	Reach (users)
1999	Rabota.ru	Infrastructural platform	Employment predominantly under Labor Code	Approximately 250 thousand vacancies and 16 million resumes published daily; monthly audience is over 10 million users.
2000	HeadHunter (hh.ru)	Infrastructural platform	Employment predominantly under Labor Code	As of June 2025, database contains 84 million resumes, 1.19 million vacancies, 2.24 million registered companies.
2000	Superjob.ru	Infrastructural platform	Employment predominantly under Labor Code	Monthly audience is about 8 million people; 1.5 million users visit daily. 31 million resumes are published.
2005	FL.ru	Transactional platform (freelance exchange)	Civil contracts, self-employment	Over 1500 freelance projects are posted daily; millions of registered freelancers and 19 thousand clients.
2009	Trudvsem.ru	Infrastructural platform (state)	Employment under Labor Code (via employment centers)	About 1.47 million active vacancies, formed based on data from regional employment services and information from direct employers.
2012	YouDo	Transactional platform (crowdsourcing)	Civil contracts, self-employment	Over 10 million users, including more than 3.5 million providers; over 6.5 thousand clients are represented.
2014	Profi.ru	Transactional platform (service marketplace)	Civil contracts, self-employment	Database includes more than 15 million clients and 3 million specialists across over 900 types of services.
2014	Avito.Rabota	Hybrid, transactional platform	From direct employment to one-off civil contracts	Over 50 million monthly users, job postings cover all regions of Russia.

Compiled based on: Rabota.ru official blog. Available at: prosto.rabota.ru (accessed: 20.11.2025); Hh. Statistics: Open labor market analytics service. Available at: https://stats.hh.ru/ (accessed: 20.11.2025); About the Superjob.ru portal. Available at: https://www.superjob.ru/info/ (accessed: 20.12.2025); How to work with the FL platform. Available at: https://system-itc.ru/biznes/kak-rabotat-s-ploshhadkoj-fl/ (accessed: 20.11.2025); Report "Socio-economic situation in Russia" for 2025. Available at: https://rosstat.gov.ru/storage/mediabank/Dok_01-2026.htm (accessed: 20.01.2026); I want to establish three big businesses in my life. I've already done one. Available at: https://secrets.tbank.ru/lichnyj-opyt/denis-kutergin-you-do/?utm_referrer=https%3A%2F%2Fwww.perplexity.ai%2F&internal_source=copypaste (accessed: 20.11.2025); Case study: Profi.ru and Rocket10: How to attract 85 thousand app users in a year. Available at: https://adindex.ru/case/2025/03/20/331866.phtml (accessed: 25.03.2025); Avito.Rabota: There is a 2-fold increase in the number of invitations for internships from employers. Available at: https://www.cnews.ru/news/line/2024-01-31_avito_rabota_rabotodateli (accessed: 20.11.2025).

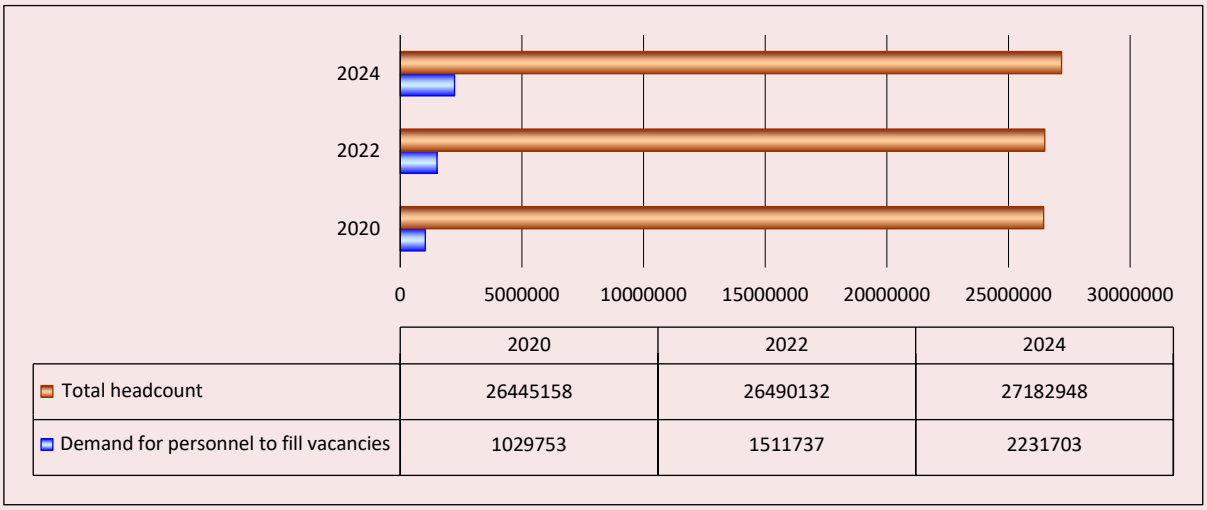
understanding how platforms integrate into the structure of labor relations – as intermediaries at the hiring stage or as direct organizers of the work process.

Macroeconomic context and shifting demand. Platform infrastructure growth does not occur in a vacuum but in response to objective changes in the labor market. This growth directly correlates with the consistently rising need for personnel among organizations. According to Rosstat, the absolute number of vacancies reported by employers increased significantly in recent years: from 1.03 million in 2020 to 1.51 million in 2022, reaching 2.23 million by 2024 (*Fig. 1*). Such rapid increase creates critical pressure on traditional recruitment methods, which digital platforms absorb, becoming the primary tool for filling the growing number of vacancies.

In absolute terms, the need for personnel shows steady growth, exceeding 2 million open vacancies by 2024. However, this indicator, dependent on the overall economic scale, has limited value for analyzing structural shifts. Therefore, *Table 2* presents more representative data showing the share of personnel needed to the total number of jobs. This excludes the influence of extensive growth and shows the dynamics of labor demand, which is characterized by positive growth during the analyzed period from 3.7% in 2020 to 7.59% in 2024.

It should be emphasized that Rosstat statistics reflect not only the growth in the total number of vacancies but also a qualitative change in the sectoral structure of labor demand. While in

Figure 1. Demand of Russian organizations for personnel to fill vacancies, people



	2020	2022	2024
Total headcount	26445158	26490132	27182948
Demand for personnel to fill vacancies	1029753	1511737	2231703

Compiled based on: Rosstat data.

Table 2. Share of demand for personnel to fill vacancies by key personnel categories, % of total jobs

Personnel categories	2020	2022	2024	Absolute change, 2024–2020
Total specialists (economy-wide)	3.7	5.4	7.59	+3.89
Real sector and import substitution				
Skilled workers in industry, construction, transport	4.7	7.0	10.56	+5.86
Skilled agricultural and forestry workers	4.8	7.2	13.03	+8.23
Digital economy and technology				
IT specialists	4.1	5.7	6.60	+2.50
IT technicians	3.5	4.6	10.73	+7.23
Services and mass hiring				
Service, trade, security workers	5.3	7.7	7.94	+2.64
Salespeople	6.9	9.2	7.32	+0.42
Skilled personnel				
Highly qualified specialists	3.3	4.3	5.98	+2.68
Managers	2.1	2.9	4.45	+2.35
Calculated based on: Rosstat data.				

2020–2022 the personnel shortage was largely characteristic of the service sector (where the share of vacancies for certain professions – notably salespeople – reached 6.9–9.2%), by 2024 the priority shifted toward the real sector and high-tech fields.

This structural shift has a pronounced quantitative dimension and allows for several key conclusions:

1. Accelerating shortage in the real sector as an indicator of import substitution. The most noticeable increase in personnel demand is shown by activities related to import substitution and growing technological sovereignty. For instance, the share of vacancies in agriculture almost tripled (from 4.8% in 2020 to 13.03% in 2024), and among skilled industrial and construction workers it more than doubled (from 4.7% to 10.56%). These indicators quantitatively confirm the economy's reorientation toward import substitution and the increased demand for blue-collar professions, which intensifies the burden on platform-based recruitment tools that are effectively becoming a key channel for filling such vacancies.

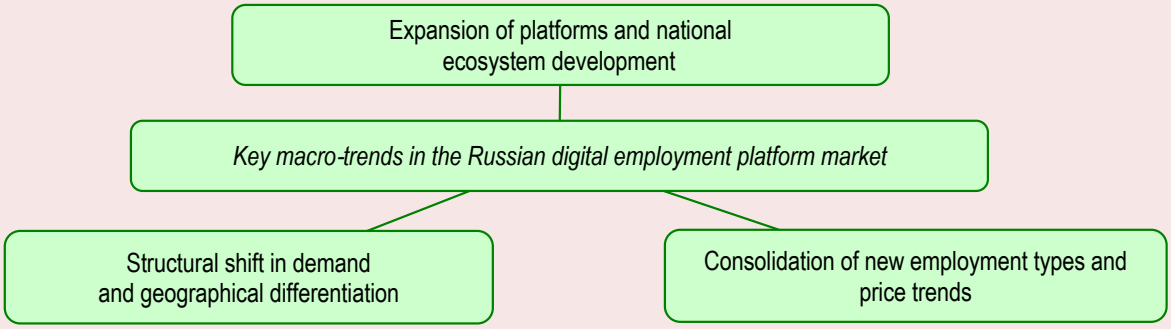
2. Polarization of demand in the digital sector. Demand for mid-level IT specialists grew significantly (from 3.5% to 10.73%), indicating an acute need for maintaining existing digital infrastructure rather than for its development. There is a contradiction: while public discourse focuses on the shortage of highly qualified developers and software architects, Rosstat data show an even more explosive growth in demand for mid-level technical specialists. This means that there are different employment trajectories within the technology cluster, and digital platforms become the infrastructural field where this contradiction is most acute: for the former, they offer a model of high-income but risky project employment (freelance exchanges); for the latter, they often serve as a hiring channel for positions with formal labor relations or, conversely, push them into informal employment.

3. The service sector paradox. Meanwhile, labor market tension in trade and services remained high (7.32–7.94% in 2024), but the dynamics here are uneven. While overall demand for service workers stabilized, the need for salespeople, after peaking in 2022 (9.2%), declined by 2024 (to 7.32%). Consequently, the decrease in the number of sales vacancies may be linked either to a decline in demand for this profession or to the growth of informal employment and the gig economy, which are often not captured in official statistics. In the latter case, digital platforms play a paradoxical role: on the one hand, they formalize the hiring process; on the other, they reinforce informal labor relations, removing a significant portion of work in trade from legal protection.

Thus, Rosstat statistics show that the Russian economy is simultaneously reorienting toward import-substituting industries and becoming more technologically complex. Digital platforms respond to these changes by acting as important tools for addressing personnel needs in both traditional sectors facing shortages (agriculture, construction) and high-tech fields. All these processes together form stable macroeconomic trends, summarized in *Figure 2*.

The conducted analysis allows us to identify three key characteristics of the current stage of transformation. First, digital platforms have become the dominant infrastructure of the labor market, ensuring massive reach of economic agents. Second, the platform ecosystem is internally differentiated: different types of platforms perform different functions in organizing employment. Third, platforms promptly adapt to structural changes in the economy, reflecting the shift in demand toward the real sector and highly skilled labor.

Figure 2. Main structural changes in the Russian labor market mediated by digital platforms



Source: own compilation.

However, even at this stage of examining scale and structure, there are the first signs of contradictions. The quantitative growth of platform infrastructure and its deep differentiation (from digital job boards to transactional platforms) do not automatically imply the formalization of labor relations – on the contrary, different types of platforms create different employment regimes, some of which remain outside labor law. The adaptation of platforms to the structural shift in demand toward the real sector and high technologies, in turn, raises the question of the distribution of new opportunities among different categories of workers and across different territories. Consequently, the described phenomena not only characterize the new face of the Russian labor market but also define the problem area for analyzing its internal contradictions.

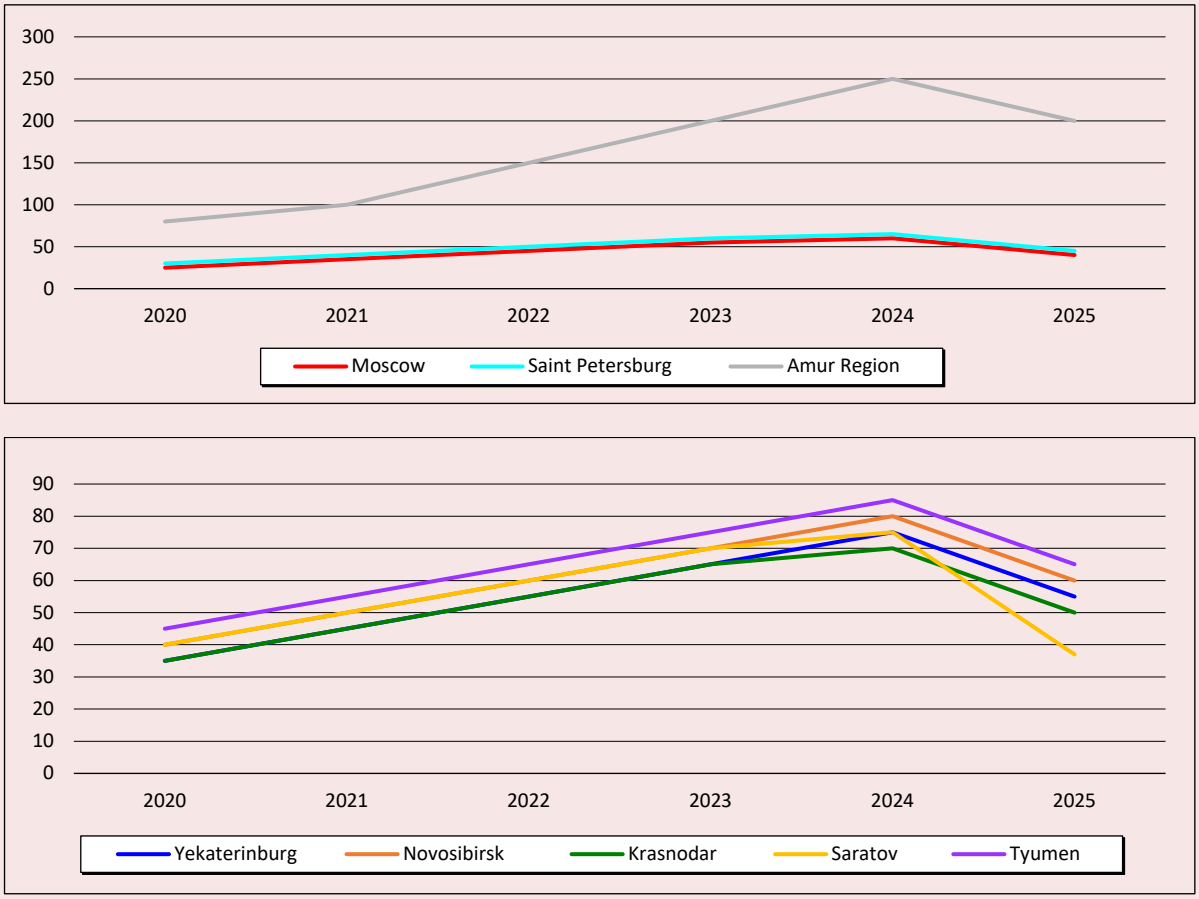
Regional differentiation in the efficiency of digital platforms

Digital platforms are positioned as a tool for overcoming spatial barriers, providing universal access to vacancies regardless of a candidate's place of residence. However, empirical verification of this thesis using Russian data casts doubt on its universality. Analysis of vacancy lifetime on the Trudvsem.ru and HH.ru platforms in 2020–2025 demonstrates reinforcement of territorial disparities instead of their decrease, with the nature of this process differing significantly depending on whether we consider Russian regions as a whole or their administrative centers.

The data presented in *Figure 3* indicate high variability in vacancy lifetime and allow us to identify several significant paradoxes.

Paradox one – reproduction of structural disparities. Among the Russian regions (group 1), the capital agglomerations, as expected, show minimal hiring times, and platforms operate as highly efficient recruitment tools there. However, the contrast with the outsider region reveals a deep contradiction: in the Amur Region, despite having the same digital infrastructure (Trudvsem.ru, HH.ru), vacancy lifetime peaked at 250 days in 2024, which is four times higher than in Moscow. This creates a paradox of inequality reproduction: in regions where the labor market is initially developed (capitals), platforms develop it even more; in regions where it is underdeveloped (periphery), they cannot compensate for structural problems, and often merely highlight them, reinforcing the territories' status as outsiders.

Figure 3. Median vacancy lifetime for selected Russian regions, 2020–2024 and Q1–Q3 2025, days



Source: data from Trudvsem.ru and HH.ru.

Note: since median vacancy lifetime is published fragmentarily for Russian regions during the period under review, Figure 3 presents an estimate based on samples of mass and IT vacancies.

Paradox two – local outperformance. Analysis of administrative centers (group 2) allows for a more detailed picture, revealing internal heterogeneity among cities traditionally considered successful. The general trend for Yekaterinburg, Novosibirsk, Krasnodar, and Tyumen is similar: a peak shortage in 2024 (65–85 days) and a correction to 50–65 days in 2025. However, in this context, Saratov stands out sharply. Without obvious competitive advantages over other cities in the sample, it demonstrates a record reduction in hiring time – from 75 to 37 days. This creates a paradox: contrary to the logic that leaders should be capitals or million-plus cities with developed economies, Saratov shows the best dynamics. This identified anomaly leaves a choice between two interpretations: either we are witnessing a rare case of successful digital transformation of a local labor market, or – what seems more likely – there is an effect of statistical compression, and high performance is achieved at the cost of low representativeness and quality of hiring.

Paradox three – the illusion of leveling. Public and academic discourse often expresses the expectation that digital platforms will help smooth regional disparities (Gavrilova, 2025)[11]. However, comparative analysis of hiring time dynamics shows the opposite. While in 2020 the gap between leaders (Moscow) and outsiders (Amur Region) was 55 days, by 2025 it had grown and stabilized at around 160 days. The paradox is that digital platforms, instead of eliminating structural barriers, give regional inequality better stability. The periphery's lag ceases to be temporary and is reproduced on a technological basis.

Thus, the analysis shows that digital platforms do not have a uniform vector of impact on regional labor markets. Instead, they integrate into the existing territorial stratification, improving the positions of developed regions, highlighting the problems of underdeveloped regions, and creating anomalies where federal-level trends are shaped by local specifics. Consequently, platform infrastructure manifests and reinforces spatial heterogeneity in employment rather than helps overcome it. The overall outcome is not leveling but technological fixation of the existing structure of the labor market, within which platforms become an environment for exacerbating structural contradictions, and their effect is fundamentally mediated by the territorial context.

Institutionalization of informality and income polarization

Beyond quantitative growth trends, data from digital platforms reveal qualitative risks associated with employment transformation, defined in the literature as "digital precarization" (Yanchenko, 2022; Manokhina, Mityaeva, 2022). The analysis demonstrates that the flexibility and accessibility provided by platforms are accompanied by drawbacks, such as increased instability, informality, and the reproduction of labor market segmentation. A key contradiction of digital platforms is the divergence between the technological formalization of the hiring process and the actual legal status of employment. Data indicate a high prevalence of informal relations, with their visibility and scale varying depending on the business model and moderation standards of each platform. The most common Russian websites (HH.ru, Trudvsem.ru, Avito, SuperJob) reflect this phenomenon to varying degrees; however, direct statistical samples on the share of informal vacancies are not published by Rosstat or the platforms themselves for 2024–2025, confirming the informal nature of the phenomenon itself.

Our analysis produced estimated values. The largest classified site Avito shows the highest proportion of postings (up to 70–85% in certain categories) that ignore formal procedures and urge job seekers to contact them using phrases like "Telegram, WhatsApp us" or "call now, cash". On HH.ru, a similar indicator is significantly lower (10–50% depending on the job), due to stricter moderation and a corporate audience. Notably, informal vacancies are also found on the Trudvsem.ru portal: their share is estimated at 20–35% in 2024–2025, indicating the systemic nature of avoiding formalization even with oversight.

Summary data on the estimated share of informal vacancies in mass categories on Russian digital platforms are presented in *Table 3*.

Comparison across regions shows considerable differences in the spread of informal practices, correlating with the personnel situation and the degree of formalization of the economy. The highest share of informal postings (up to 50–75% in categories like common laborers and household staff) is found in the Far Eastern and Southern federal districts. In the capital agglomerations –

[11] Sinyavskaya O.V., Biryukova S.S., Kareva D.E., Stuzhuk D.A. (2024). Platformennaya zanyatost' v Rossii: dinamika rasprostranennosti i klyuchevye kharakteristiki zanyatykh: ekspertnyi doklad [Platform Employment in Russia: Prevalence Dynamics and Key Characteristics of the Employed: Expert Report]. Moscow: Higher School of Economics Publishing House.

Table 3. Share of informal vacancies on digital platforms (2024–2025)

Personnel categories	Jobs	Share of informal vacancies, % (total)	Distribution by platform (peak values), %	Typical markers in postings
Skilled workers	Common laborers, construction workers, loaders	50–65	Avito – up to 55 HH.ru – up to 30 Trudvsem.ru – 15–25	"Call now", "Work by the day", "Cash payment"
Service workers	Delivery men	30–45	Avito – up to 35 Trudvsem.ru – 10–20	"Via Telegram bot", "Without registration", "Side job"
Unskilled workers	Household staff (babysitters, nannies, cleaners)	60–75	Avito – up to 40 HH.ru – up to 30 Trudvsem.ru – 15–25	"WhatsApp us", "Trial day", "By arrangement"
Source: own compilation.				

Moscow and Saint Petersburg – values are significantly lower (around 20–35% in comparable categories), which can be explained by stricter moderation on the websites and a greater share of large employers. However, it is important to emphasize: there is no open statistics by region or federal district, so these estimates should be treated as indicating the direction of the regional trend, not as precise quantitative measurements.

As a result, digital platforms in Russia create a fundamental paradox: being a tool for the technological formalization of hiring, they simultaneously become a channel for the institutionalization and normalization of informal practices. This is especially evident on mass-market and local platforms, because instead of smoothing regional differences, they integrate them into the technological infrastructure and reproduce them, expanding the zone of employment that remains largely invisible to the state.

Simultaneously, a pronounced polarization of income is observed, determined not only by skill level but also by the type of platform employment. In the permanent employment segment (HeadHunter, Rabota.ru), there is growth in offered wages, especially for IT specialists and managerial positions. Conversely, in the freelance segment (FL.ru, Profi.ru), earnings are typically project-based and irregular, while on managed gig platforms (Yandex.Taxi, delivery services), income levels directly depend on algorithmic order distribution and the number of shifts worked.

Comparative analysis (*Tab. 4*) allows detecting this heterogeneity and identifying a key paradox – in high-skilled digital professions (IT, web design), a freelancer's potential income, even at 50% capacity, can significantly (by 15–30%) exceed the median wages in traditional job postings. High earning potential here, however, is accompanied by risks of underemployment and lack of social guarantees.

In sales or mass services segments, parity is observed between platform employment and traditional hiring, whereas in the low-skilled informal segment (common laborers, household staff on classifieds), income is entirely dependent on verbal agreements and lacks any social guarantees.

This polarization means platforms create two coexisting segments. One is for high-income but risky project work (freelancing), the other is for low-income, completely informal employment, to which managed gig platforms with their algorithmic control and income instability also belong.

The data presented in the table suggest that digital platforms do not form a single labor market but rather two qualitatively different segments, each with its own logic of operation and local peculiarities.

Table 4. Incomes in different segments of the digital labor market: paradoxes of formality, flexibility, and precarization, Q1–Q3 2025, rubles

Personnel category	Job	HH.ru	FL.ru and Profi.ru	Yandex.Taxi and Avito	Key paradox and conclusion
		Median wages	Median earnings per project	Average earnings	
Segment 1: Freelancing (high qualification, project work)					
Highly qualified specialist	IT-specialist, programmer	Moscow – 225 000 rubles Steady growth of about 5%	150 000 rubles per project; Growth of about 25%, but continuous workload is not guaranteed.	-	Paradox of choice: between stable wages and high but risky freelance income. Conclusion: platforms create illusion of freedom while shifting risks to the worker.
	Designer	Russia – 160 000 rubles Growth of more than 14%	80 000 per project. Growth of 33%	-	Paradox of skill value: project value growth outpaces growth in wages, but monetization requires continuous workload not ensured by the platform.
Segment 2: Managed gig platforms and informal hiring (low qualification, algorithmic / direct control)					
Service worker	Delivery man and driver	Russia – 45 000 rubles Formal hiring in logistics	-	35 000 – 65 000 rubles, depending heavily on the number of shifts and orders	Paradox of technological archaization: the platform, offering a flexible schedule, de facto reproduces an archaic “work by the day” model characterized by income instability, lack of social guarantees, and worker dependence on algorithmic management and demand fluctuations.
Skilled and unskilled worker	Common laborer and household staff	Around 40 000 rubles	-	25 000 – 50 000 rubles, often marked “cash”	Paradox of informal legitimization: the platform (e.g., Avito) technologically legitimizes completely informal hiring, removing it from the legal environment while making it convenient and mass-scale.
Compiled based on: aggregated data from HH.ru, FL.ru, Profi.ru, Avito, industry reviews, and expert estimates.					

The first segment is freelancing, where high-skilled services are offered through specialized platforms (FL.ru, Profi.ru, etc.). It allows for effective monetization of niche professional skills, with project costs growing at higher rates than wages in traditional employment. However, higher income is accompanied by risks of irregular employment and lack of social protection, so the worker has to choose between financial autonomy and stability, which creates a paradox of choice. Also, this segment is characterized by pronounced regional asymmetry: the most lucrative orders and clients are concentrated in capital agglomerations. Freelancers from other Russian regions are forced to compete for projects in conditions of lower local market solvency, which exacerbates existing territorial disparities.

The second segment combines two types of laborers: those working on gig economy platforms (for example, providing transport or delivery services), and those finding orders through classifieds (e.g., Avito) as common laborers or household staff. Although the technological basis of these models differs (algorithmic management

on gig platforms and direct agreements on classifieds), they share a feature: workers in both cases lack autonomy, social guarantees, and stable income. The platform acts as a tool that technologically legitimizes archaic "work by the day" models, removing labor relations from the legal environment. Regionally, this segment dominates in peripheral territories, reinforcing their role as suppliers of low-skilled labor and preserving the existing type of employment.

From the above, it follows that the platform economy does not contribute to leveling but, on the contrary, reinforces and programmatically fixes the bifurcation of the labor market. On the one hand, there is high-paid but risk-prone freelancing, concentrated in large cities. On the other hand, there is a segment of unstable, often informal employment, prevalent in remote regions. This dichotomy is manifested not only in different jobs but also in a clearly expressed geographical aspect, confirming: digital platforms do not erase regional disparities but integrate into them, making them less visible but no less significant.

Reproduction of social vulnerability and regional asymmetry

Considering findings presented in the scientific literature, it is crucial to emphasize that the substitution of labor relations with civil contracts is characterized not only by legal implications but also by pronounced regional features. While previous research (Bobkov, Chernykh, 2020; Yanchenko, 2022) pointed to a general trend toward increasing socio-economic instability under platform development, analysis of regional statistical data allows us to detail this aspect concerning the Russian labor market.

Platforms, optimizing personnel selection through algorithms, implicitly create new barriers for the most vulnerable categories of job seekers. A key indicator here is the share of vacancies requiring resume (*Tab. 5*). A diverging trend is observed: although the overall share of vacancies requiring resume is decreasing by 10–20% (due to the growth of informal practices with direct contact and automatic selection of candidates through tests), in highly competitive skilled segments, the demand for

Table 5. Paradoxes and contradictions of resume requirements by categories of personnel employed on the platforms (2024–2025)

Personnel category*	Share of vacancies requiring resume, %	Changes in share, % 2024–2025	Paradox, contradiction
Information technology	90–95	Increased by 20–30	Contradiction of accessibility: an industry symbolizing digital progress creates a maximum entry barrier through the ideal algorithm-friendly resume, screening out candidates with non-standard or practical (but not formalized) experience.
Finance and banking	85–90	Increased by 15–25	Contradiction of conservatism: high formalization of selection via resume preserves a personnel model favoring candidates with traditional career paths and education, limiting access for specialists from adjacent or new digital fields.
Management (office specialists)	85–90	Increased by 44	Paradox of mass formalization: significant growth in resume requirements on mass platforms (Avito.Rabota) indicates technological replication of corporate hiring practices, which does not guarantee improved selection quality but automatically screens out applicants unwilling to comply with such formalization.
Mass professions (delivery men, common laborers)	20–40	Decreased by 10–20	Paradox of digital archaism: platforms offering technological hiring tools in this segment legitimize and massify an archaic hiring model with direct contact, minimizing formal procedures and social guarantees.

* The categories presented are the elements of the broader professional groups used in the study.
Source: own compilation.

structured resumes is increasing. For example, the share of vacancies requiring a response via resume on the Avito.Rabota platform grew by 44%[12], which correlates with the growing share of office specialists among applicants.

This trend creates a digital divide in access to good positions. For youth without experience, older individuals[13], migrants, and women returning from maternity leave, the requirement for an ideally structured and "algorithm-friendly" resume is a significant hindrance. Their professional experience and competencies, which do not fit into standard systematization framework, are often invisible to automatic initial screening systems. Paradoxically, platforms designed to expand access to the labor market reproduce traditional forms of exclusion, but at a new technological level.

Platformization's contradictory nature is most evident at the regional level (*Tab. 6*).

The data presented in Table allow moving from general discussions of inequality to its quantitative assessment. The analysis demonstrates growth (not a decrease) in structural differences between leading regions (Group 1) and the administrative centers of Group 2.

In capital agglomerations (Moscow, Saint Petersburg), the share of vacancies in high-income segments – IT (24–30%), management (20–25%), finance (11–15%) – is not only consistently high but continues to grow. In these particular areas the substitution of labor relations with civil law schemes (freelance, project work) creates an illusion of flexibility while maintaining substantial monetization of skill (Tab. 4). In this case, platform employment acts as an alternative way of organizing labor, without changing the professional profile of the leading regions.

Conversely, the demand structure is qualitatively different. The share of vacancies in blue-collar work (32–48%) and transport/logistics (20–33%) is significantly higher in the administrative centers (Saratov, Tyumen), while the share of IT and management is noticeably lower – only 8–15% of vacancies. In these particular high-demand professional categories the maximum share of informal vacancies (up to 60–85%) and informal hiring practices is recorded. In the case of Group 2 regions the platform (e.g., Avito) paradoxically acts not as a formalization tool but as infrastructure that reinforces the retreat from labor guarantees, which

Table 6. Changes in regional asymmetry in vacancy structure based on HH.ru data, 2023–2025, % of total vacancies in region

Vacancy type	Group 1 (%) Moscow, Saint Petersburg		Group 2 (%) Saratov, Tyumen		Gap, %,
	2023	2025	2023	2025	2025
IT and high technology	18–24	24–30	3–6	5–8	+19–25
Management and administration	16–22	20–25	5–9	7–11	+13–18
Finance and consulting	9–13	11–15	2–4	3–5	+8–12
Blue-collar staff (mass professions)	14–19	13–19	45–58	42–55	-29–36
Transport and logistics	11–15	11–16	28–40	27–38	-16–22
Source: own calculation.					

[12] Avito: Avito.Rabota – Avito.Podrabotka. Available at: https://www.cnews.ru/book/Avito_-_Авито_работа_-_Авито_подработка (accessed: 20.11.2025).

[13] Note: the share of older individuals among applicants on Avito increased by 90% over the year, indicating active job searching through this channel.

contrasts sharply with the dynamics identified for Saratov, where the anomalous reduction in vacancy lifetime may be the consequence of the growth of such informality.

To sum up, we can state the following: the quantitative growth of platform infrastructure does not lead to equalization of opportunities but technologically reinforces the existing regional hierarchy. Platforms provide a highly competitive skilled labor market for capital agglomerations – though there are elements of precarization in the freelance segment. On the contrary, platform infrastructure of administrative centers and similar territories reproduces a low-skilled, often informal employment model. The paradox is that digital platforms primarily provide the least protected employment for territories with initially less developed labor markets, and quantitative growth (number of vacancies) cannot improve job quality.

This imbalance is a significant driver of migration of the active and skilled part of the workforce to capital agglomerations. Platform websites, providing open information about hundreds of thousands of vacancies across regions (e.g., Avito. Rabota), objectively facilitate migration flows and contribute to the concentration of human capital in growth centers, exacerbating personnel shortages elsewhere. There is a vicious circle: informal and low-paid employment in administrative centers encourages the most active workers to leave, reinforcing the role of these areas as suppliers of cheap labor, while platforms act as infrastructure legitimizing this process. Consequently, platform employment exacerbates and accelerates the institutionalization of regional and professional segmentation, transferring vulnerability into a digital environment through algorithmic filters. Consequently, administrative centers and similar regions concentrate predominantly low-skilled and informal types of employment, while capital agglomerations accumulate more profitable segments of the digital labor market. Technological expansion of platforms does not resolve contradictions; on the contrary, it often intensifies them, creating an illusion of choice and accessibility while simultaneously reproducing structural inequality.

Intensification of algorithmic control and deficit of social protection

While remote work market is expanding (42–63% in 2023–2025), algorithmic regulation of employment on digital platforms is noticeably intensifying. Rating systems transform into tools of constant monitoring and pressure, setting parameters for worker behavior. According to A.V. Shevchuk, algorithmic management structures interactions, "rewarding and punishing certain user behaviors" (Shevchuk, 2023), creating an "invisible cage" (Rahman, 2021) with unclear and variable criteria for success. Ranking metrics tied to ratings and response speed encourage users to be constantly available, blur the boundaries of the working day, and increase psychological pressure. As a result, platform users have to be always online not to miss offers.

It is important to note that the nature and degree of algorithmic management vary significantly across different platform types. Therefore, it is more correct to identify multiple practices and regulatory regimes rather than a single, uniform mechanism. The key contradiction is caused not by algorithmization itself but by its pronounced differentiation: there are multiple control models across platforms, and two distinct employment regimes are identified.

Regime one – managed gig platforms (total algorithmic control). Algorithmic management is best described using the example of taxi and delivery services: the algorithm performs functions of both a digital dispatcher and a manager. It organizes the entire work cycle – from order assignment

(based on undisclosed rules) to navigation, time and speed measurement, and application of sanctions for mistakes. The worker's income level is determined by the algorithm, and the scope for independent decisions is sharply limited – opportunities to decline tasks are restricted, and deadlines are strictly set. All this creates a regime of constant and comprehensive control under which the worker is functionally embedded in the digital system.

Regime two – freelance exchanges and service marketplaces (algorithmically mediated competition). On professional service platforms (FL.ru, Profi.ru, YouDo), algorithmic management manifests itself primarily in rating mechanisms, search result ranking, and recommendation systems. Although the contractors are legally and organizationally not tied to a fixed employer and can manage their own time, their real freedom is constrained by dependence on the platform's demand infrastructure. To secure orders, the freelancer has to maintain metrics important to the algorithms: respond quickly, increase conversion rates, accumulate reviews, and compete for positions in search results; at the initial stage, this often involves working at reduced rates. The result is a softer but quite effective vicious system based on market discipline and opaque success criteria.

However, the autonomy is lost differently under these two regimes. It is completely lost in the case of algorithmic management, whereas it is only limited in the case of platform-based employment as the price of access to the market and orders. Nevertheless, in both cases, a common result is reproduced: the platform is not in charge of the worker, it imposes both entrepreneurial costs and the social consequences of employment instability on them. Thus, digital intermediation modernizes coordination methods but does not guarantee the inclusion of labor relations within legal regulation.

Consequently, algorithmic management not only matches supply and demand but also institutionally supports the lack of social guarantees, leaving workers in conditions of "digital feudalism" (Shevchuk, 2023). In this context, the platform functions acts as a private regulator, defining the rules of access to work and distribution of rewards, without having corresponding obligations to the performers. The paradox of the Russian situation is that the expansion of digital platforms and their involvement in state policy do not lead to consistent formalization of employment: on the contrary, the platform model often reproduces unstable and informal forms of labor. This is confirmed by observations of freelance platforms (FL.ru, YouDo, Profi.ru): due to short turnaround time (several hours or a few days), labor relations often remain episodic, project-based, and do not involve formal employment, social security, or pension contributions.

Conclusion

This research offers a comprehensive examination of the changes in the Russian labor market under the influence of digital platforms. The starting point was the hypothesis that platformization, contrary to expectations, leads not to the prevalence of formalization and the reduction of structural imbalances, but to the institutional entrenchment of informal practices and the intensification of regional differentiation. The empirical results confirmed this assumption. The findings show that the technological expansion of platforms is accompanied by significant social contradictions: while simplifying and formalizing job search procedures, they simultaneously create infrastructure that supports the reproduction of unstable employment, and their stated potential for overcoming spatial barriers is limited by their ability to technologically fix existing territorial stratification.

The development of a holistic analytical model makes the study theoretically significant. Based on this model, the platform transformation of the labor market is interpreted as a complex social phenomenon with multiple levels and internal contradictions, rather than as a linear technological shift. The work proposes and tests for the first time a methodology for quantitatively identifying informal hiring practices based on content analysis of job postings. It allowed for the empirical identification of the divergence between the technological form of platform intermediation and its social content. Additionally, the research develops the conceptual framework by identifying types of algorithmic management and demonstrating its heterogeneous effects across different employment segments – from total control regimes in physical labor to algorithmically mediated competition in intellectual services. Thus, the work contributes to the theory of digital precarization and to explaining the mechanisms of vulnerability reproduction in contemporary economic conditions.

The applied significance stems from its focus on practical issues of labor relations. The research findings expand the evidence base for revising state approaches to regulating digital employment, emphasizing the need to shift priorities from supporting infrastructural solutions to targeted mechanisms for protecting workers' rights. The results show that uniform regulatory measures are ineffective under conditions of pronounced regional and sectoral asymmetry; this necessitates the development of differentiated approaches that account for the characteristics of different types of platforms and territories. For businesses and HR departments, the work reveals the dual role of platforms as a recruitment tool: the uncontrolled implementation of gig models creates long-term reputational and managerial risks and may potentially reduce the human capital of regions where companies operate.

Thus, the conducted research makes a significant contribution to the development of economic and sociological approaches to the study of labor, offering methodological solutions and a conceptual model for the critical analysis of platform employment. At the same time, the results show that the key factor in employment transformation is not technology itself, but the ability of institutions and society to make it an effective tool in realizing benefits while simultaneously preventing social losses and ensuring the stability and inclusiveness of the labor market.

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New Forms of Employment in Russia: From Legal Uncertainty to Systemic Regulation

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Abstract. The relevance of the study stems from the rapid proliferation of new forms of employment in the context of economic digitalization, a process that is outpacing the development of adequate institutional frameworks and thereby generating systemic socio-economic risks. The aim of the paper is to conduct a comparative analysis of expert assessments regarding the current level, barriers, and prospects for the institutionalization of new employment forms in Russia, drawing on a regional case study. The scientific novelty lies in the application of a structured research-expert seminar (focus group) methodology to purposefully juxtapose the perspectives of two key stakeholder groups: labor market professionals (n = 23) and young people directly engaged in new forms of employment (n = 25). The main findings confirm a consensus on the relatively low level of institutionalization. The study reveals a fundamental duality in the perception of the phenomenon under analysis: professional experts predominantly view institutionalization as a "project", focusing on macro-level regulation and investment, whereas young people tend to see it as an "outcome", emphasizing practical guarantees, rights protection, and technological infrastructure. Both expert groups identify legal uncertainty and a crisis of trust in the state – an entity simultaneously regarded as the principal agent of change and a source of systemic obstacles – as the key barriers. The groups' recommendations diverge: professionals primarily propose systemic modernization of regulatory and analytical institutions, while young people express a demand for specific digital services and protective tools. A limitation of the study is its regional focus. A promising avenue for future research is the quantitative verification of the identified criteria and hypotheses using broader datasets.

Key words: digitalization, new forms of employment, institutionalization, labor market, comparative analysis, expert assessments, youth, professional community.

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Introduction

The rapid digitalization of the economy, the transformation of the demographic structure and the revision of traditional models of social and labor relations have led to profound changes in the modern labor market (Toshchenko, 2020). In these conditions, new forms of employment (hereinafter referred to as NFE) are becoming widespread: platform work, remote and hybrid work, project and freelance employment (Ilyin et al., 2024). Their spontaneous development outstrips the formation of adequate institutional frameworks, which creates systemic risks (Nekhoda et al., 2025). The legal vacuum, unadapted social security and taxation systems, as well as mechanisms for protecting workers' rights lead to increased socio-economic instability, rising inequality, and the formation of a "wild digital capitalism" where technological dynamics dominate social guarantees (Sinyavskaya et al., 2022).

International experience shows that targeted institutionalization of NFE (the process of turning new practices into sustainable, regulated structures) is the key to minimizing socio-economic risks and an important condition for realizing the potential

of the digital economy (Radaev, 2022). Developed countries apply a set of measures to integrate flexible work formats into the legal field (Lopez et al., 2024). The Netherlands has legislation guaranteeing the right to request a flexible schedule[1]. Germany has introduced a special social and legal status of an "employee–like employee", which expands social protection measures for certain categories of the self-employed and freelancers (Strebkov, Shevchuk, 2022). The UK is known for court decisions recognizing platform employees as employees with full employment rights (Peters, 2020). A significant example is Spain, where a special tax and legal regime has been introduced for remote workers, and labor legislation is being reformed to limit the abuse of temporary contracts (De Stefano, Aloisi, 2018). In France, a social insurance system has been established for the self-employed, and platforms have been judicially held liable for accidents involving couriers[2]. Scandinavian countries enter into collective agreements with platforms in the gig economy sectors, setting minimum wage rates and working conditions (Valente, Graham, 2025). At the level of the European Union, a directive has been adopted aimed at improving the working conditions of platform employees[3]. These examples illustrate a general trend: states are gradually moving from reactive judicial conflict resolution to the proactive creation of adaptive legal statuses, hybrid social protection systems and social dialogue mechanisms, which allows legitimizing new employment forms without suppressing their flexibility (Zhao, Voronov, 2023).

Despite the existence of separate initiatives (special regimes for the self-employed, digitalization of employment services), the level of institutionalization in Russia remains insufficient (Tomashevskii, Chichina, 2024). At the same time, there remains a shortage of research focusing on a comparative analysis of the perception of this problem by key stakeholders whose interests and experience directly determine the success of any reforms: the professional community (HR specialists, regulators) and the direct "users" of new labor formats – the youth (Biryukova, Sinyavskaya, 2025).

The aim of our study is to conduct a comparative analysis of expert assessments of the level, barriers and prospects for the institutionalization of new employment forms in Russia in the context of digitalization, obtained from two groups: labor market professionals and young workers. We solved the following tasks within the framework of achieving the goal: 1) identification of intuitive and criteria-based assessments of the level of institutionalization of the NFE; 2) identification of key systemic obstacles to this process; 3) formulation of recommendations on the development of the institutional environment from each expert group, as well as a comparison of the assessments of the analyzed phenomenon by each group. The article is based on the materials of a series of scientific and expert seminars held at the Institute of Economics and Management of Tomsk State University in May 2025 as part of the Russian Science Foundation project.

The scientific novelty of the work lies in the application of a qualitative methodology of structured expert workshops (focus groups) for

[1] Prospects for employment and social protection in the world (2021). The role of digital labor platforms in the transformation of the world of employment: ILO report.

[2] OECD Digital Economy Outlook 2024 (Volume 2): Strengthening Connectivity, Innovation and Trust, Paris: OECD Publishing, 2024. DOI: 10.1787/3adf705b-en

[3] New Forms of Employment, Publications Office of the European Union. Luxembourg: Eurofound, 2015. DOI: 10.2806/937385

a comparative analysis of the positions of two critically important but rarely compared groups of stakeholders. This allows not only identifying problems, but also revealing dualism in the perception of institutionalization as a "project" (the view of regulators and professionals) and as a "result" (the view of direct participants). This perspective provides a comprehensive, multidimensional understanding of institutional gaps.

The work contributes to the development of the theory of institutional changes in the labor market by proposing the operationalization of the concept of "institutionalization of NFE" through a set of criteria generated by the stakeholders themselves. The results obtained can become the basis for the development of a balanced public policy synthesizing macro-regulation with micro-level guarantees. It is expected that the findings of the study will be useful for legislative and executive authorities, representatives of business associations and educational institutions that form the agenda in the field of future work.

The hypothesis of the study is that the level of institutionalization of new forms of employment in Russia is assessed by key stakeholders as low, while labor market professionals and young people perceive this process in fundamentally different ways: the former as a macro-regulatory project, the latter as a practical result, which creates institutional gaps that can only be overcome by taking into account the positions of both groups in a comprehensive manner.

Research methodology

In our study, we understand new forms of employment as ways of organizing work that arise under the influence of the digitalization and go beyond the standard model of an indefinite full-time employment contract. These include platform employment, remote and hybrid work, project employment, freelancing and other flexible formats characterized by the decentralization of the labor process, the use of digital management tools, as well as institutional uncertainty, expressed in the absence of a clear legal status and full-fledged social and labor guarantees.

The research was based on a qualitative methodology implemented in the format of structured scientific and expert seminars (Zaitseva et al., 2014; Casati et al., 2020). This choice is due to the complexity and relative novelty of the phenomenon of institutionalization of new forms of employment, for which ready-made theoretical models have not yet been formed and there is insufficient systematic statistical data (Geliskhanov, 2024, Nosulenko, 2021). In these circumstances, an in-depth seminar based on a group discussion is an adequate tool for identifying hidden meanings, subjective assessments, and cause-and-effect relationships underlying the perception of the problem by key stakeholders (Guseltseva, 2017). The study is structured as an in-depth case study, focusing on analyzing the situation in a particular Russian region. The authors are fully aware of the limitations associated with the uniqueness of the local context, however, in the context of insufficient knowledge and fragmentary data on NFE, this approach seems quite justified and correct. It allows generating a detailed, content-rich understanding of processes, formulate working hypotheses and conceptual frameworks that can later be verified in quantitative studies on broader data sets[4]. The presented work, therefore, follows an established scientific approach, according to which qualitative methods are aimed at achieving a deeper level of interpretation of social phenomena, going beyond their superficial description (Tambovtsev, 2024).

[4] Belanovskii S.A. (2022). In-depth interviews and focus groups: Textbook on qualitative methods of sociological survey. Moscow: OOO DirektMedia.

There were 48 participants in the seminars, 23 of whom worked in the first group and 25 in the second group. The groups worked on different days. The working definition of the key concept was used as the conceptual foundation of the seminars. The moderators suggested that the experts proceed from an understanding of the institutionalization of NFE as a process of transformation of new, episodic social practices into stable, long-term norms, taking shape in the form of formal and informal institutions[5]. The preliminary discussion and coordination of this definition with the participants of the seminars provided the necessary conceptual unity and created a common semantic field for subsequent productive discussion.

The work of the groups was based on a specially developed algorithm that provides a logical transition from general diagnostics to specific solutions. The work within the framework of the seminars was organized as a sequential analytical process consisting of three key stages:

1) intuitive integral assessment: based on personal experience, participants gave an overall assessment of the degree of institutionalization of NFE in Russia on a scale from "critically low" to "high (excellent)";

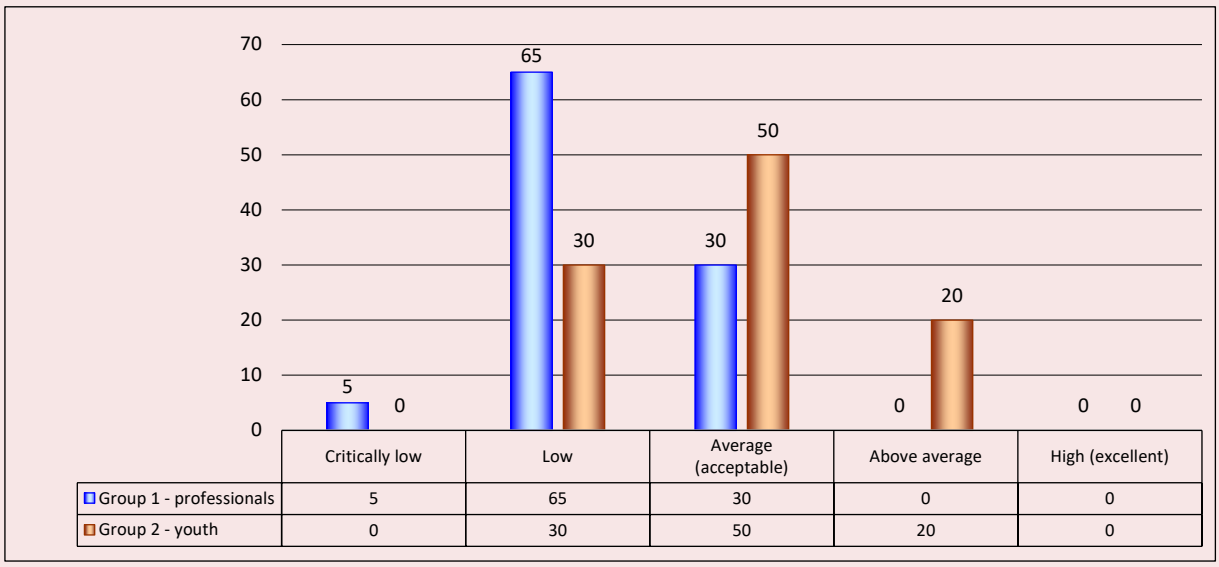
2) operationalization of the concept and development of criteria: we determined quantitative features (criteria) reflecting the level of institutionalization of the NFE during the group discussion, as well as we formed verification matrices that characterize it in the range from the maximum to the minimum level;

3) diagnosis of systemic barriers and generation of practical recommendations: at this stage, the experts' focus shifted to identifying obstacles hindering the institutionalization process and developing specific measures and proposals aimed at overcoming systemic barriers; the results obtained were ranked by experts according to the degree of importance.

To increase the reliability and depth of conclusions, the study applied a data triangulation strategy based on the inclusion of two contrasting but relevant groups of stakeholders (Kosharnaya, Kosharnyy, 2016). The first group consisted of professional experts: managers and specialists of recruitment agencies, practicing HR managers, representatives of HR services of large companies, specialists in the field of labor law and employment regulation. All of them have a systematic, macroeconomic view of the labor market and have direct experience of interacting with new forms of employment in their professional activities. The second group of experts consisted of students and recent graduates of Tomsk universities with personal experience in platform employment (courier services, taxi, freelance exchanges), remote project work, hybrid employment with flexible schedules, and occasional self-employment. The subsequent comparison and convergence of the assessments, criteria, and proposals of these two groups made it possible to build a multidimensional, three-dimensional picture of the phenomenon under consideration, to identify both consensus areas and fundamental differences. This approach significantly enhances the validity of the study and corresponds to the complex nature of the analyzed socio-economic phenomenon (Mel'nikova, Khoroshilov, 2015). The chosen methodological framework ensured the collection of relevant and meaningful empirical material.

[5] The definition is based on information provided in the Great Russian Encyclopedia.. Available at: https://bigenc.ru/c/institutsionalizatsiia-7753b9 (accessed: 02.02.2026).

Figure 1. Expert (intuitive) assessment of the level of institutionalization of new forms of employment, %



Source: own compilation.

Results of the research and their discussion

At the first stage of the work, experts intuitively assessed the overall level of institutionalization of the NFE. According to *Figure 1*, participants in both groups defined it mainly as low or medium (acceptable). Moreover, professional experts gave more conservative estimates (65% of them rated this level as low and 30% as average). Young people expressed more optimism: 30% – low, 50% – acceptable, and 20% – above average.

The intuitive assessment of the level of institutionalization of NFE by the seminar participants demonstrates, on the one hand, their consensus, and, on the other, the nuances of perception. First, the thesis about the underdevelopment of the institutional environment has been confirmed. The vast majority of experts in both groups do not assess the situation as favorable (the "high" level was not chosen by any participant), which empirically confirmed the presence of a systemic problem. Second, a significant gap was found in the participants' perception of the depth of the problem. Professional experts with a systematic view of regulation and macroeconomic processes gave significantly more conservative and critical assessments – two thirds (65%) define the level as "low". This may indicate that they are aware of the scale of legal gaps, administrative obstacles, and strategic challenges that are not always obvious to direct participants in the new labor market. Although young workers state the problem, they assess its severity more moderately: half choose the "average" option, and one in five choose the "above average" option. Such optimism may be due to several factors: greater adaptability and tolerance to uncertainty, characteristic of the "digital generation"; their assessment of the situation is mainly through the prism of personal experience, which may not have encountered serious conflicts yet; a focus on the operational capabilities of technology, which partially compensate for institutional gaps in their perception.

Thus, the discrepancy in integral intuitive assessments is not a contradiction, but, on the contrary, enriches the understanding of the problem, reflects the difference between the view from the outside – from those who see systemic failures and regulatory imbalances, and the view from the inside – from those who, adapting, find opportunities for work and income even in conditions of imperfect institutions.

At the second stage of the seminars, the participants initially worked in small groups. In the format of a free discussion, the experts discussed, justified, and came to a common decision on the five main features (quantitative criteria) for assessing the current level of institutionalization of the NFE and proposed approaches to quantifying their severity. Next, small groups joined together, compared the suggestions of colleagues, selected the most frequent and similar in meaning from the proposed quantitative characteristics of the phenomenon under consideration, and combined them into final formulations. Then the participants of the seminars formed verification matrices to quantify the level of institutionalization of the NFE. For this purpose, they determined thresholds for each of the five levels of institutionalization (from "critically low" to "high") according to each criterion. At the same time, experts were asked to express quantitative estimates in fractions (from 0 to 1) or as a percentage, depending on the convenience of interpreting a particular indicator. The choice of percentage (or share) indicators as quantitative criteria is determined by the very nature of institutionalization as a process of spreading and rooting new practices. The dynamics of the share or percentage of certain objects of analysis (for example, employment contracts, employees, laws, etc.) is a clear indicator of how well a new practice has become officially recognized and ingrained.

After filling in the matrices, the participants also assessed the actual state of the NFE institutionalization at the moment according to the same criteria (*Tables 1, 2* give these values). This stage of the seminars was held in the format of individual work and ended with the averaging of expert proposals.

A comparison of the criteria proposed by professional experts and young people to quantify the institutionalization of the NFE allows identifying both common features and differences in their professional and life experience, to capture the views of experts on the essence and mechanisms of the analyzed phenomenon. It is worth noting that both groups of experts demonstrated a common understanding of the core of institutionalization as a process requiring formalization and quantifiability of new practices. This is reflected in two overlapping criteria: (1) Professionals proposed the criterion of "percentage of the NFE employment contracts", and young people proposed the criterion of "percentage of the NFE employees in the total number of employees". Both of these indicators are aimed at measuring the prevalence and rootedness of new forms of employment in the structure of the labor market, which is a basic indicator of any emerging institution; (2) the criterion of professionals "percentage of coverage of the NFE by legislation and regulatory legal acts" and the criterion of youth "percentage of regulatory legal acts on new forms of employment in labor legislation" are practically synonymous. This indicates a consensus in recognizing the state as the main legitimizing actor, whose function is to set the "rules of the game". Both groups agreed that a full-fledged institutionalization of the NFE is impossible without formal legal consolidation.

Table 1. Quantitative criteria for assessing the level of institutionalization of the NFE (group of professional experts)

Criteria (in fractions from 0 to 1)	Assessment of the level of institutionalization of new forms of employment				
	critically low	low	average	above average	high
1. Percentage of employment contracts with new forms of employment	0.09	0.24 (0.22)	0.48	0.70	1.00
2. Percentage of the NFE coverage by legislation and regulations	0.11	0.31 (0.26)	0.55	0.72	1.00
3. Percentage of labor income from digital employment in the structure of GDP or GRP	0.07	0.21 (0.34)	0.42	0.67	1.00
4. Percentage of public investment in the development of new forms of employment	0.12	0.27 (0.22)	0.48	0.71	1.00
5. Degree of satisfaction of employees with working conditions within the framework of new forms of employment: from 0 (complete dissatisfaction) to 1 (complete satisfaction)	0.13	0.31 (0.44)	0.55	0.76	1.00
Note: the average expert estimates of the actual level of institutionalization of the NFE for each criterion at the time of the survey are given in parentheses. "High" rating corresponds to complete institutionalization (1), and "critically low" rating corresponds to a complete lack of institutionalization (0). The criteria and thresholds were formed by the seminar participants themselves during a group discussion.					

Table 2. Quantitative criteria for assessing the level of institutionalization of NFE (youth expert group)

Criteria (in percent)	Assessment of the level of institutionalization of new forms of employment				
	critically low	low	average	above average	high
1. Percentage of the NFE employees in the total number of employees	4.29	12.00	25.71 (23.00)	39.47	53.24
2. Percentage of benefits applied in the NFE	2.41	19.71 (23.40)	44.88	66.18	89.71
3. Percentage of trials won in protecting the rights of employees involved in the NFE	2.12	17.76 (17.50)	40.29	57.35	81.76
4. Percentage of regulatory legal acts on new forms of employment in labor legislation	2.37	7.76 (9.70)	16.12	24.09	34.41
5. The percentage of technologies available to firms that provide the NFE	9.76	20.35 (34.30)	40.00	56.18	75.29
Note: the average expert estimates of the actual level of institutionalization of the NFE for each criterion at the time of the survey are given in parentheses. "High" rating corresponds to complete institutionalization (100%), and "critically low" level corresponds to a complete lack of institutionalization (0%). The criteria and thresholds were formed by the seminar participants themselves during a group discussion.					

Thus, the general opinion of experts is the recognition of the need for the legalization and statistical accounting of the NFE as the first step toward their institutionalization.

Turning to the differences in the opinions of experts, we note that they, as expected, reflect the focus of their attention. The logic of expert professionals turned out to be primarily macro-economic and resource-based. This is evidenced by their criteria "percentage of public investment in the development of new forms of employment" and "percentage of labor income from digital employment in the structure of GDP/GRP". The first indicator evaluates the will and financial efforts of the state as a driver of change, the second – the macro-economic significance and effectiveness of the NFE for the economy as a whole. We also note the uniqueness of the criterion "the degree of employee satisfaction with working conditions within the framework of new forms of employment" proposed by professional experts. Despite its evaluative nature, it introduces a socio-psychological dimension into the discussion of the level of institutionalization of the NFE, showing that the stability of institutions depends not only on external rules, but also on internal acceptance by subjects. Thus, the institutionalization of the NFE is perceived by professional experts primarily as a vertical process "from top to bottom", the success of which is determined by the amount of resources allocated to it, the degree of formal coverage and economic impact.

The logic of young experts in choosing criteria for quantifying the institutionalization of the NFE is rather micro-level. It is also results-oriented, but the main focus is on specific guarantees and protection mechanisms. Criteria such as "percentage of benefits applied in the NFE" and "the percentage of processes won in protecting the rights of employees involved in the NFE" shift the focus from creating rules to their practical implementation and usefulness to the employee. Thus, the institutionalization of the NFE for young people is valuable not just for the fact of its existence, but for real, tangible benefits, as well as a mechanism for restoring justice. The decision of the young experts to include infrastructural security in the list of criteria for quantifying the level of institutionalization of the NFE is of interest. The criterion "percentage of technologies available to firms that provide NFE" reflects the understanding that the digital employment is driven by the technological base, and from this point of view, institutionalization is not only legal norms, but also the infrastructural readiness of the economy to support new practices. Thus, the institutionalization of the NFE is perceived by young participants in the modern labor market rather as a horizontal process of providing specific conditions where accessibility of social benefits, effective law enforcement and the availability of modern technologies as the material foundation of the NFE are important.

The differences identified in the experts' definition of the criteria for the institutionalization of the NFE are not accidental. They can be explained, for example, by the difference in their positions: professionals perceive themselves primarily as "architects" and/or "evaluators" of the system, while young people analyze the situation more from the perspective of "users", which determined their focus on practical results and tools. Another explanation for the differences in expert positions can be given in the logic of the theories of human capital and transaction costs: the youth approach emphasizes the importance of reducing personal transaction costs (spending time and effort on benefits, protection of rights), which directly increases the value of their human capital in the context of the NFE, and the approach of professionals characterizes

Table 3. Main factors hindering the institutionalization of the NFE and necessary changes

Factors hindering the institutionalization of the NFE	Activities contributing to the institutionalization of the NFE
Group 1 (professional experts)	
1. High rate of change 2. Difficulty of identifying the entire diversity of the NFE 3. Corruption 4. No common vision of the labor market 5. Low rate of approval of legislative initiatives 6. Low level of trust in the state 7. Conservatism of institutions 8. Weak legislative framework 9. Distrust of authority 10. Bureaucracy 11. Political situation 12. Gap between laws and reality 13. State has not regulated the taxation mechanism for the NFE participants 14. Government's concern about possible decline in income 15. Lack of reliable sources of information 16. High social uncertainty	1. Extension of state protection measures to the NFE employees (protection against the control of the "digital footprint", leakage of personal data, abuse of authority of the employer, etc.) 2. Creation of system for monitoring and analyzing the labor market using a new methodology that takes into account the NFE 3. Development of mechanisms to support employers who support and create conditions for the development of the NFE 4. Development of new labor market accounting system 5. Stabilization of tax rules (fixed validity period) 6. Setting the minimum tax rate for new (first-time) types of activities 7. Development of a group of indicators/metrics for assessing the NFE 8. Raising income limits for self-employed 9. Creation of digital platform for generation of employment contracts, their registration and accounting 10. Creation of scientific and practical institute in the field of the NFE foresight 11. Destigmatization in the NFE society 12. Restructuring of all levels of education system, taking into account the transformation of the labor market 13. Introduction of "tax holidays" for the NFE 14. Creation of system for monitoring the opinion of stakeholders on the NFE (by type of crowdsourcing) 15. Replication of platform solutions from businesses (jointly government and business) 16. Adding Internet access to the "Human Rights" 17. Elimination of "double standards" in the regulation of the NFE 18. Development of measures of responsibility of public organizations and businesses for the NFE
Group 2 (youth experts)	
1. Low level of trust between labor market and government 2. Lack of appropriate regulatory legal acts 3. Lack of demand for institutionalization of the NFE by employees 4. Bureaucracy 5. Low level of trust in the state 6. Platform and Software limitations 7. Employers' lack of preparedness for risks associated with the NFE 8. No experience/understanding of the NFE 9. Lobbying of interests by large employers 10. Fear of change 11. Insufficient technology development 12. Low digital literacy 13. Desire to work in the "gray area"	1. Creating a common platform for applying for and receiving benefits 2. National project "New forms of employment" / inclusion of new forms of employment in national projects 3. Development of a system of benefits for employees and employers applying new forms of employment 4. Full and up-to-date information about the NFE is available to employees and employers. 5. Conducting regular advertising of the NFE 6. Creation of formats of regulatory legal acts adapted to the expectations of zoomers (reels, podcasts) 7. Creation of regional consulting centers (online) 8. Legislative consolidation of the NFE 9. Organization of events for employees and authorities to evaluate the effectiveness of the NFE 10. Creation of Russian employment platforms with functionality equivalent to the world level 11. Development and implementation of regulatory legal acts at the federal and regional levels 12. Formation of trade union associations for the NFE members / creation of the NFE departments in existing trade unions 13. Development of projects for the analysis of the NFE statistics 14. Reducing the tax burden for companies using the NFE 15. Launch of awareness-raising programs on the NFE for employers / benefits and special features for employees 16. Development of new education standards, taking into account the preparation for the NFE 17. Creation of a committee for the formation of a regulatory framework for the NFE within the Federal Service for Labor and Employment (Rostrud)
Source: own compilation.	

transaction costs for the economy as a whole. Also, differences in expert assessments can be explained in terms of institutional economics. Young people (perhaps intuitively) identified criteria related to institutions for coordinating workers' rights in modern conditions (courts) and infrastructural institutions (technology), while professionals focused primarily on distributive (investments) and regulatory (laws) institutions. This shows the difference in experts' perception of which institutions are the most deficient and critically important.

We should note that both groups of experts, in fact, described two contours of the same process. Professionals formulated criteria for "institutionalization as a project" (decision-making, resource allocation, regulatory design), and young people proposed criteria for "institutionalization as a result" (working protection mechanisms, accessible infrastructure, tangible benefits). Their combination gives a comprehensive idea that a sustainable institution is born not when a law is written about it, but when it is backed by resources, technologically implemented, provides specific benefits and provides reliable protection. Thus, the differences in emphasis are not a disadvantage of the study, but its important result, indicating the need for a comprehensive policy that would synthesize the macro-regulation of the NFE with micro-level guarantees for participants in this process.

The quantitative estimates in tables 1 and 2, shown in parentheses, are of interest. They reflect the expert opinion of each focus group on the actual level of institutionalization of the NFE based on the quantitative criteria they proposed for the verification matrices. In group 1 (professional experts), all five grades belong to the "low" level. In group 2 (youth experts), four values of the proposed criteria correspond to the "low" level of the NFE institutionalization, and only one (percentage of the NFE employees in the total number of employees) corresponds to the "average" level. These values correlate well with the initial expert estimates and confirm the initial judgment of experts about the insufficient degree of institutionalization of the NFE.

At the third stage, participants in scientific and expert seminars were asked to identify the main factors hindering the institutionalization of the NFE and to propose recommendations for the implementation of improving changes. *Table 3* presents the opinions of each expert group. The sequence of obstacles and improving changes corresponds to expert assessments of their significance (ranking corresponds to the priorities of the seminar participants).

An analysis of the factors hindering the institutionalization of the NFE and the proposed measures to overcome them revealed an expert consensus on the systemic nature of the problem (*Tab. 4*). First, both groups are united in recognizing the crisis of institutional trust, considering the low level of trust in the state (or between it and the labor market) as a key symptom of the weakness of emerging institutions, whose formal rules are not supported by social capital. Second, experts demonstrate an ambivalent perception of the role of the state: it is seen as the main agent of necessary changes, but at the same time as a source of fundamental barriers (bureaucracy, legal slowness, inconsistency). Third, the inadequacy of the legislative framework is unanimously recognized as a critical obstacle. Finally, fourth, the recommendations of both groups agree on the need to introduce digital platforms to solve operational tasks (formalizing relationships, obtaining benefits, organizing employment).

Table 4. Summary of the opinions of the seminar participants (both groups) on the obstacles to the institutionalization of the NFE and measures to overcome them

Cluster of obstacles	Main barriers	Recommendations
1. Legal and regulatory institutions	• weak legislative framework; • gap between laws and reality; • low rate of approval of initiatives; • lack of adequate regulations; • lack of common vision of the labor market	• legislative consolidation of the NFE; • development and implementation of regulations at all levels; • stabilization of taxation rules; • creation of scientific and practical institute for foresight
2. Socio-economic and political conditions	• corruption; • bureaucracy; • political situation; • lobbying for the interests of large employers; • high social uncertainty; • government concern about revenue	• elimination of “double standards”; • development of responsibility measures for businesses and public organizations; • reducing tax burden; • introduction of tax holidays
3. Technological and infrastructural base	• insufficient technology development; • platform and software restrictions; • low digital literacy	• creation of Russian platforms; • replication of platform solutions; • creation of digital platforms for registration of relationships and benefits; • access to the Internet as a right
4. Institutional trust and human capital	• low level of trust in the state/government; • distrust between the labor market and the state; • conservatism of institutions; • fear of change; • lack of demand for institutionalization on the part of employees; • desire to work in the “gray area”	• destigmatization of the NFE; • awareness raising (advertising, education); • restructuring the education system; • establishment of consulting centers; • formation of trade unions for the NFE
5. Information and analytical support	• lack of reliable sources of information; • difficulty of identifying the NFE; • lack of experience/understanding	• creation of labor market monitoring system; • development of new accounting methodology; • availability of complete information; • statistical analysis; • stakeholder opinion monitoring and crowdsourcing
Source: own compilation.		

Equally significant are differences in expert opinions on the obstacles to the institutionalization of the NFE and measures to overcome them (*Tab. 5*).

Summarizing the results of the final stage of the seminars, we can note that both expert groups agree that the institutionalization of the NFE is hampered by a set of interrelated barriers, at the center of which are legal uncertainty and the crisis of institutional trust. However, experts see ways to solve this problem in different ways: the professional community is calling for a deep systemic restructuring of regulatory and analytical mechanisms, while young labor market participants are waiting for specific, technological and understandable protection and support tools, as well as active communications to form a positive attitude toward the NFE.

Table 5. Differences in expert opinions on obstacles to the institutionalization of new forms of employment and measures to overcome them

Aspect	Professional experts	Youth experts	Possible explanations
Nature of barriers	High rate of change, corruption, political situation, lack of common vision. Focus on macro issues of governance and regulation	Lack of demand from employees, fear of change, unwillingness of employers to take risks, low digital literacy. Focus on the motivations and competencies of the direct participants	Professionals see the institutional failures of the system, while young people see the practical difficulties and risks of individuals within it
Depth of obstacle analysis	Detailed list, including economic (taxes, investments), political and social aspects	List focused on the state–employee–employer relationship and technological constraints	Professionals have a broader overview of system relationships
Nature of recommendations	Emphasis on the creation of new systems (monitoring, accounting), institutions (foresight), stable rules of the game (taxes), protection of rights	Emphasis on specific tools (platforms, benefits, advertising), adaptation of communication formats (reels, podcasts), education	Professionals strive to rebuild the "architecture" of the labor market, while young people strive to get working services and clear rules based on the "here and now" principle
Perception of the subject of change	Government + business (more complex model of interaction)	State as the main contractor (National Project, committee in Rostrud) More direct appeal to the authorities	Professionals are more likely to act as partners of the state, while young people are consumers of its services.

Source: own compilation.

Analysis of the results, limitations, and prospects for further research

The conducted research, based on the triangulation of the positions of key stakeholders, confirms the hypothesis about the insufficient level of institutionalization of the NFE in Russia. The consensus of experts captures the lack of stable "rules of the game" capable of reconciling technological dynamics with social guarantees.

The key result was the identification of a fundamental dualism in the perception of the problem. The professional community, working in the "institutionalization as a project" paradigm, emphasizes the need for macro-regulation, systemic investments and the creation of a comprehensive analytical framework. Young people, as a "user", evaluate the process in the "institutionalization as a result" paradigm, focusing on the practical accessibility of protection tools, technological equipment, and a subjective sense of justice.

This discrepancy is not a contradiction, but reflects the gap between institutional design and everyday practices. It justifies the need for a two-tier strategy that requires synchronous actions at the strategic (formation of a stable legal framework, monitoring systems) and operational (implementation of digital services, law enforcement and education) levels. Both groups unanimously see the state as the central and ambivalent actor in this process: it is expected to take initiatives to establish rules, but it also identifies a key source of barriers (legal uncertainty, bureaucracy, lack of trust).

Thus, the main conclusion is the need for an integrated approach combining the modernization of formal institutions with measures to reduce transaction costs and increase the adaptability of labor market participants. Promising areas for further research include the development of specific mechanisms for such adaptation, a comparative analysis of international practices, and modeling the effects of proposed institutional changes.

Conclusions

The study has shown the importance of a qualitative methodology of structured expert seminars for the analysis of emerging and poorly formalized socio-economic phenomena. The applied algorithm (from intuitive assessment of the phenomenon through its operationalization to identification of barriers and formulation of recommendations) is a reproducible model for studying institutional changes in the digital economy. The empirically revealed dualism of the perception of institutionalization as a "project" (strategic, resource view) and as a "result" (pragmatic, user view) enriches the theory of institutional change and allows conceptualizing the process of institutionalization of the NFE not as linear, but as a two-circuit, requiring synchronous work both to create formal rules and to ensure their legitimacy in everyday life practices.

The study contributes to the discussion about the "failures of institutions" by shifting the focus from the analysis of norms to the analysis of their perception and implementation by various actors. The sets of quantitative criteria formed during the dialogue with experts to assess the level of institutionalization of the NFE form the basis for the development of specialized indexes and metrics. These criteria, which integrate macro-economic, legal, social and technological parameters, overcome the narrowness of traditional statistical indicators of the labor market and set the basis for new standards for its integrated monitoring in the digital age.

The practical significance of the work consists in presenting a reasoned map of contradictions between the expectations of different actors. A clear distinction between the barriers identified by professionals (system-strategic) and youth (practical-psychological) indicates the need to launch two types of measures in parallel: the first are large-scale reforms of the regulatory and analytical infrastructure; the second are "targeted" tools for digital support and legal assistance, communication campaigns that directly increase the adaptability and security of "digital workers".

The revealed demand for specific protection tools and new formats of social dialogue forms new accents for corporate HR strategies and social partnership initiatives. Recommendations on the creation of specialized trade union departments or associations of the NFE employees set the vector for the development of institutions of collective representation in the new digital reality. The research results also actualize new topics in educational programs on human resource management, labor law and labor economics.

Thus, the study goes beyond stating the problems of the transition period for the new labor market. It offers an analytical framework and practical logic for managing the institutionalization process based on the principle of complementarity of strategic design and operational support. Further ignoring the revealed dualism in the perception of the institutionalization of the NFE and the needs of key stakeholders will exacerbate institutional traps, while its consideration can become the basis for the formation of a stable and fair outline of social and labor relations in the digital economy of Russia.

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Transformation of Labor Values Among High School Students: A Comparative Analysis for 2018–2024

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Abstract. In the context of accelerating digitalization and increasing uncertainty in the labor market, labor values of high school students become a key indicator of adaptation to future professional trajectories, which determines the relevance of this study within the field of social and economic change. The purpose of the research is to analyze the transformation of the structure of labor values among school students based on a comparative assessment of data from 2018 and 2024 and to identify stable typologies of value-based strategies under conditions of uncertainty. The methodological framework includes quantitative research methods: rank analysis to compare the significance of latent value constructs over time, cluster analysis to identify typological groups, and descriptive statistics. Scientific novelty lies in the empirical identification of the "flattening" of the value hierarchy, reflecting a shift from a rigidly hierarchical model to a polycentric configuration of labor expectations. In addition, the study substantiates three distinct value strategies:

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investment-combinational, diffuse-adaptive, and institutional-protective clusters, which represent different modes of value-based adaptation to structural labor market changes. The results demonstrate a substantial increase in the importance of work–life balance and the stability of interest in meaningful work content, alongside a declining priority of traditional markers such as long-term employment stability. These findings indicate the growing role of flexible and situational value orientations associated with Generation Z digital socialization. The main limitation of the study is the regional specificity of the sample, which restricts the generalization of the results. Future research directions include interregional comparisons and longitudinal studies aimed at deepening the understanding of value transformation processes and enhancing the applicability of the findings for career guidance policies and educational practices.

Key words: labor values, career choice, high school students, youth, rank analysis, value hierarchy, typology of value strategies, cluster analysis, labor market.

Introduction

The relevance of this study stems from systemic shifts at the intersection of labor transformation, the value expectations of a new generation, and institutional inertia – factors that create a zone of increased uncertainty for high school students when they make their career choice. We highlight three key contradictions:

– between emerging forms of employment (flexible hours, home working) and outdated organizational practices and career guidance institutions;

– between the value demands of Generation Z and persisting success criteria based on stability and hierarchy;

– between the necessity of early career choice and the radical unpredictability of the future labor market, which diminishes the effectiveness of traditional career guidance models.

In this context, it is essential to examine the dynamics of high school students' labor values: they are developed before the career is launched and serve as a "map" for future decisions. Identification of structural changes in these values helps analyze the fundamental sociocultural shifts that define how the new generation engages with the economy.

The study aims to identify and analyze structural changes in the labor values of high school students in the Omsk Region over the period 2018–2024.

The choice of the Omsk Region as a case is justified by the opportunity to get context-rich data while controlling for external factors, thereby enabling a better isolation of the internal mechanisms driving the transformation of value orientations. Considering high school students in a major Siberian region with a diversified economy yields a typologically significant cross-section relevant to youth in non-metropolitan areas with similar economic profiles.

A review of contemporary literature reveals certain inconsistencies in research on youth labor values. On the one hand, a global trend toward postmaterialist values has been established (Inglehart, Welzel, 2005), manifesting as a growing emphasis on work-life balance, self-realization, and autonomy. On the other hand, the desire for meaning and quality of life coexists in the Russian context with a high valuation of financial security and stability (Magun, Rudnev, 2010; Tikhonova, 2014) and appears more as an emerging trend than a fully realized fact. This duality reflects a

broader trend typical for the era of digitalization and employment precarization, when young people combine pragmatic and postmaterialist attitudes and develop flexible, adaptive strategies for professional behavior (Vorobyova, 2021; Kolesnik, 2022).

Two main traditions dominate the theoretical field. The cultural-evolutionary tradition (Inglehart, Welzel, 2005) explains value dynamics through shifts in generational priorities, emphasizing the role of the macrosocial context. The motivational-psychological tradition (Schwartz, 2012) offers a cross-cultural toolkit for analyzing the structure and conflicts of values at the individual level. However, both traditions have limitations in their standard application for analyzing the current situation. The first tradition may point to generational differences, underestimating the impact of rapid institutional changes (gig-economy, digitalization, flexible forms of employment) and the emergence of nonlinear, adaptive career models[1] (Chirkova, 2023). The second tradition is focused on universal structures and may not always capture the specific nature of labor values in the new realities of social and labor relations, where the emphasis is on self-construction, self-organization, and continuous learning (Zheleznyakova, 2021).

Empirical studies, in turn, face certain methodological challenges. First, mass survey data (WVS, ESS) capture attitudes that may differ from actual behavior in a situation of forced choice in a heterogeneous labor market (Kormakova, Makheeva, 2022). Second, there is a problem of static cross-section. Most studies, including in-depth cross-cultural comparisons (Magun, Rudnev, 2010), provide a snapshot of values at a specific point in time, but do not allow assessing the speed and direction of their transformation within a single social group, especially at the pre-career stage (Tolstoukhova, 2024).

These methodological gaps are complemented by the identified contradictions between the expectations of Generation Z, which is focused on balance, development, and flexibility, and the continued prevalence of "low-quality jobs" that offer neither[2] (Acemoglu, Autor, 2011; Tikhonova, 2014; Varshavskaya, 2019; Badwy et al., 2025).

Thus, contemporary literature demonstrates a shift from analyzing individual motivations to studying the structural configurations of values and adaptive strategies. Nevertheless, the internal heterogeneity of high school students' values at the stage of initial professional self-determination remains understudied.

In this regard, the scientific novelty of this study is determined by the following theses:

1) it is necessary to shift the focus from the statement of value differences to the analysis of their dynamics within a specific, socially and territorially defined group (high school students in a large industrial region) during a period of intensive socio-economic changes (2018–2024);

2) it is essential to overcome the static nature of methodology through a comparative analysis of repeated cross-sections, which will allow recording not just a set of values, but also the direction and nature of structural shifts in their hierarchy;

3) it is advisable to supplement the traditional rank analysis with an empirically derived typology, which will reveal the internal heterogeneity of the "average" request and identify emerging strategies for adapting to uncertainty (for example, "investment-combinational" or "diffuse-adaptive").

[1] OECD (2023). Education at a Glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://doi.org/10.1787/e13bef63-en; World Economic Forum (2023). The Future of Jobs Report 2023. Geneva: WEF. Available at: https://www.weforum.org/publications/the-future-of-jobs-report-2023

[2] OECD (2025). Trends Shaping Education 2025. Paris: OECD Publishing. Available at: https://doi.org/10.1787/ee6587fd-en; Eurofound (2023). Becoming adults: Young people in a post-pandemic world. Luxembourg: Publications Office of the European Union. Available at: https://assets.eurofound.europa.eu/f/279033/8ff5182599/ef23097en.pdf

This study is aimed not at discovering new values but at comprehensively analyzing the dynamics of their structure and typology based on unique empirical data, which allow moving from describing the shift to understanding the mechanisms of the development of new normative attitudes toward labor in a generation whose professional careers are just beginning.

Based on the theoretical analysis and the identified research gap, the following hypotheses have been formulated.

H1. Over the period 2018–2024, there was a shift in the structure of the labor values of high school students in the Omsk Region toward the prevalence of postmaterialist orientations, which was expressed in a statistically significant increase in the rank significance of "work-life balance" and "professional development" while simultaneously decreasing the rank significance of "economic reward" and "employment stability".

H2. The structure of the labor values of high school students has transformed from a rigidly hierarchical to a polycentric (flattened) configuration, which is expressed in a statistically significant convergence of the rank positions of most latent constructs and a decrease in the variance of their aggregated significance indicators in 2024 compared to 2018.

Research design and empirical base

The study is designed using the principles of comparative analysis of repeated cross-sections. The empirical basis comprises data from two mass questionnaires of high school students (grades 9–11) conducted in the Omsk Region at six-year intervals: in 2018 ($N_1 = 11{,}691$) and 2024 ($N_2 = 14{,}357$). Quota samples were used, quotas were based on data from the Ministry of Education of the Omsk Region and Omskstat on the distribution of high school students by type of settlement (town/countryside), school grade (9/10/11). Within each quota, respondents were selected randomly from the student lists of schools included in the study. Post-stratification weighting was applied to correct for minor deviations from the quotas, weights proportional to the quota size in the general population were used. The sampling error was calculated for a 95% confidence level and maximum variance ($p = 0.5$). The databases have author certificates of state registration[3].

Two different, though conceptually aligned, instruments were used to measure labor values, a choice dictated by the evolution of the research objectives:

– 2018 – multiple-choice method; respondents were asked to select no more than three of the most important labor values from a given list; this method allows determining the relative significance of a labor value based on aggregated frequencies but cannot measure the degree of preference or identify value trade-offs;

– 2024 – paired comparison method; respondents were given sequentially 45 randomly ordered pairs derived from 10 core labor values (each value appeared in nine comparisons), ensuring a symmetric and balanced instrument design; respondents assessed each pair by choosing a more important value using a five-point Likert scale, where 1 = "first is much more important", 5 = "second is much more important", and 3 = neutral.

The transition to the paired comparison method was justified by the following considerations. First, paired comparisons simulate a real-world choice scenario, and respondents have to find a compromise between alternatives. So, this approach hinders respondents in assessing positively all values. Second, data from paired comparisons allow calculating integral preference indices with an

[3] Labor values and professional self-determination of schoolchildren: Certificate of state registration of database no. 2025621054, Russian Federation: appl. 25.02.2025, publ. 06.03.2025 / I.V. Dinner, V.S. Polovinko; Career guidance activity of high school students: Certificate of state registration of database no. 2024622974, Russian Federation: appl. 28.06.2024, publ. 08.07.2024 / I.V. Dinner.

interval scale for each value at the individual respondent level. This provides a more precise analytical tool compared to the 2018 binary data.

Since the primary objective was to determine changes in the structure (hierarchy) of values rather than the dynamics of absolute individual indicators, the main focus of comparison was on rank positions, not raw data. This reframes the inquiry from "how much did indicator X change?" to "how did the configuration of priorities change?" To verify the validity of the transition to comparable ranking, an additional analysis of the 2024 data was conducted. Ranking based on calculated preference indices (interval scale) and ranking based on reconstructed choice shares (simulating the 2018 method, where a value was considered "chosen" if its index exceeded the median value) demonstrated high correlation (Spearman's $\rho > 0.85$). This indirectly confirms that the hierarchy of constructs is sufficiently robust to the method of aggregation and reflects the overall structure of preferences. Thus, the applied approach focuses on comparing characteristics invariant to the measurement method – the rank positions of value constructs – ensuring a valid identification of structural transformations over the six-year period.

Analytical strategy

To achieve the study's objective, an approach was adopted that focuses on comparing the relative rank positions of latent constructs within each survey wave, rather than absolute values. This mitigates the impact of differences in the measurement instruments used in 2018 and 2024 and shifts the analysis toward examining changes in the configuration and hierarchy of priorities. This strategy is implemented in the following three-tiered sequence.

1. Reconstruction of latent constructs and comparability provision. Despite near-complete semantic correspondence in the wording of labor values across the two survey waves, direct comparison of primary variables was avoided to meet the requirement for data comparability. Instead, a two-stage procedure was implemented to transition to a common conceptual space. Based on a theoretical model of labor values and a substantive analysis of the questionnaires from both waves, a unified list of eight latent constructs was developed, as presented in *Table 1.*

To establish an algorithm for deriving comparable indicators for each time point, an aggregated measure of significance was calculated for each latent construct. For 2018, this measure was the proportion of respondents who selected at least one value belonging to the construct among their top three most important choices. For 2024, it was the average value of the integral preference indices, calculated using the Bradley – Terry – Luce model, for all values comprising the construct. The resulting eight indicators (one per construct) for each year were then ranked within their respective datasets in descending order. Consequently, for a valid comparison between 2018 and 2024, the relative rank positions of the constructs within each wave are used. This approach smooths out the influence of differing instruments and concentrates on analyzing structural shifts – a standard practice in comparative research.

2. Rank analysis. For each time point, rank hierarchies were constructed based on the aggregated data for the latent constructs. This allowed identifying general trends and macro-level shifts in the value structure.

3. Typological analysis (clustering) of 2024 data. To uncover the internal heterogeneity of the 2024 sample, the k-means algorithm was applied to the standardized values (z-scores) of the latent constructs. The selection of the optimal number of clusters (k) was based on an iterative analysis of formal statistical criteria followed by substantive validation of the resulting solutions.

Formal analysis: metrics were calculated and visualized for k from 2 to 6: the elbow method based on inertia (within-cluster sum of squares) and the average silhouette score. The elbow method did

Table 1. Latent constructs of labor values*

No.	Name of labor value	Conceptual core	Typical definition	Individual definitions
1	Economic reward	income, financial return on labor	"Work as a source of high material income"	•high wages •income level •material well-being
2	Stability and social protection	risk reduction, guarantees, predictability	"Work as a stable and protected source of employment"	•job stability •formal employment •benefits package •guarantees
3	Interesting work rich in content	internal motivation, process enjoyment	"Work as an interesting activity rich in content"	•interesting work •variety of tasks •not a routine work
4	Professional development and skill growth	accumulation of human capital	"Work as a space for professional growth"	•learning opportunities •skill development •professional advancement
5	Career advancement and status	vertical promotion and status benefits	"Work as a means for career and status advancement"	•career prospects •promotion •status •prestige
6	Autonomy and independence	Sense of agency, control over work	"Work as a space for independent decision-making"	•independence •freedom of decision-making •responsibility for outcomes
7	Work-life balance	preservation of personal resources	"Work as part of a balanced life"	•flexible schedule •remote work •work-life balance •comfortable working conditions
8	Social significance and recognition	external and internal social value of labor	"Work as a socially significant and recognized activity"	•benefit to society •recognition of merit •respect •team (as a social environment)
Source: own compilation.				

not reveal a pronounced "kink", which is common for sociological data where group boundaries are often diffuse. Silhouette analysis showed the highest average score for $k = 2$ (silhouette score = 0.25); however, the score for $k = 3$ (silhouette score = 0.22) also fell within a range suggesting an acceptable clustering structure. For $k = 4$ and $k = 5$, the silhouette coefficient declined, indicating a deterioration in the distinctiveness of cluster membership.

Substantive interpretation and validation: since formal metrics did not provide a definitive preference between $k = 2$ and $k = 3$, both solutions were constructed and substantively analyzed. Clustering with $k = 2$ divided the sample into a group with pronounced instrumental priorities and a group with an undefined profile, thereby obscuring a significant qualitative distinction between value strategies observable in the data. The $k = 3$ solution yielded statistically and substantively differentiated groups: one cluster with clear, high priorities; a second with a "diffuse" profile; and a third with a marked orientation toward security. Pairwise comparisons of means (t-tests with Bonferroni correction) confirmed that the clusters identified with $k = 3$ differed significantly ($p < 0.001$) on the key constructs forming their unique profiles. Clustering with $k = 4$ led to the fragmentation of the largest "diffuse" cluster into two subgroups that showed no statistically significant differences in mean values for any of the latent constructs ($p > 0.1$), indicating an artificial division that violated the principle of parsimony.

The final decision to adopt k = 3 was considered optimal, satisfying two key criteria:

1) it is consistent with the formal metrics (acceptable silhouette score);

2) it ensures maximum substantive interpretability and statistical differentiation among clusters, aligning with the research aim of identifying qualitatively distinct types of value strategies.

All calculations were performed in Python 3.11 using the scikit-learn library (v.1.4.0). Algorithm parameters: n_init = 50, random_state = 42 to ensure reproducibility.

Thus, the chosen research methodology combines the advantages of quantitative rigor and conceptual interpretability. The combination of rank analysis and clustering allows both identifying trends in the transformation of labor values and capturing internal heterogeneity and typological diversity in school students' labor values.

Research results

Rank structure of labor values in 2018 and 2024

In the first stage of analysis, rank hierarchies of labor values were constructed for the two time points. Table 2 presents the comparable ranks of key values, grouped by latent constructs to ensure a valid comparison. For each time point, an aggregated significance indicator was calculated for each latent construct. Thus, the comparison focuses not on raw data (binary vs interval) but on the relative rank positions of constructs within each wave, shifting the analytical lens toward structural shifts rather than absolute values.

To statistically verify the significance of the change in the rank structure, Spearman's rank correlation coefficient was calculated between the two rank vectors (2018 and 2024). Its value was = 0.45, which is not statistically significant for n = 8 (p = 0.26). This result formally supports hypothesis H2 regarding a structural reorganization of the hierarchy: the observed changes in rank positions cannot be attributed to random fluctuations but rather reflect a qualitative transformation of the system of priorities.

A comparison of the rank structures of high school students' labor values over the six-year period (2018–2024) yields the following conclusions.

1. Change in the rank position of work-life balance. The value "work-life balance" shifted from a peripheral 8th position to the 1st in the 2024 hierarchy. Within the framework of Inglehart's postmaterialist shift theory, this result may signal a movement from survival values toward self-expression and quality-of-life values among a generation socialized under conditions of relative economic security. An alternative interpretation points to the normalization of the demand for psychological well-being in public discourse and media narratives, setting a "good job" as an a priori normative benchmark for school students. Furthermore, this can be viewed as a new form of pragmatic rationality within the digital economy, where control over time and boundaries becomes a prerequisite for long-term professional stability and productivity.

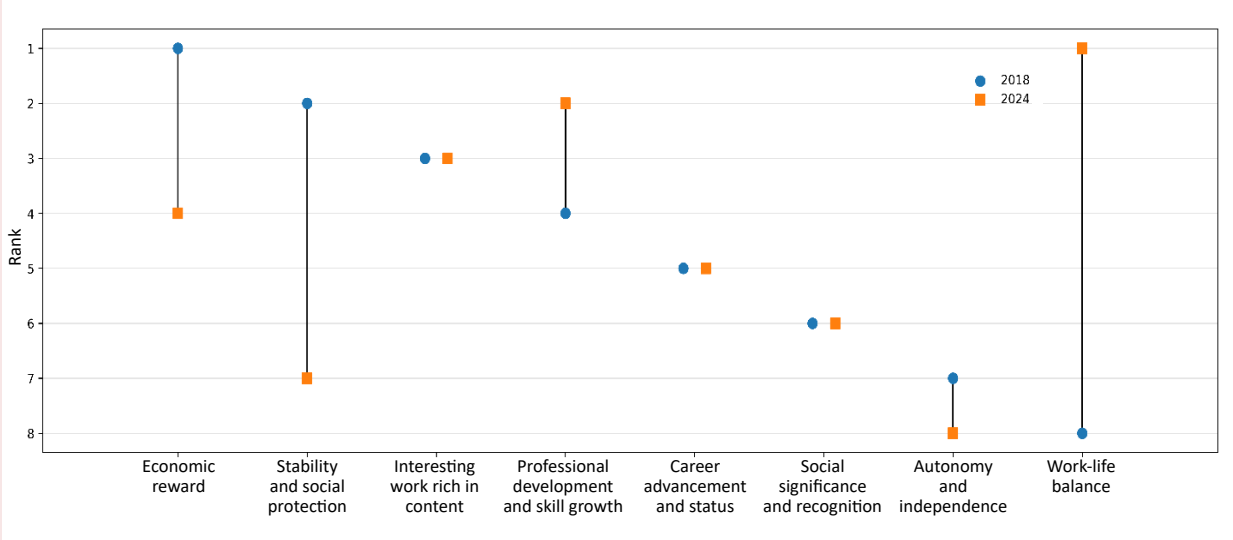
Table 2. Changes in rank positions of labor values among Omsk Region school students

Labor value	2018	2024	Trend
Economic reward	1	4	decrease
Stability and social protection	2	7	significant decrease
Interesting work rich in content	3	3	stability
Professional development and skill growth	4	2	increase
Career advancement and status	5	5	stability
Social significance and recognition	6	6	stability
Autonomy and independence	7	8	decrease
Work-life balance	8	1	significant increase
Source: own compilation.			

The growing significance of work-life balance has also been noted in other Russian studies (Burkhanova et al., 2022; Razumova, Serpukhova, 2022), suggesting the emergence of a stable social demand for psychological well-being in the labor sphere. For the adult population, this often correlates with professional experience or family obligations. For school students, this value is formed a priori, as a normative benchmark for future employment. This suggests not merely a reaction to work experience but rather the formation of a new social standard of "good job", assimilated through cultural narratives (media, intergenerational communication, etc.), observation of hybrid work forms development, and the growing discourse on psychological well-being. Thus, work-life balance may represent not an alternative to career building but an instrument for pursuing it more effectively and continuously.

2. *Decline in the rank positions of material and institutional values.* A pronounced shift in the rank positions of key constructs is evident. "Economic reward" moved from 1st to 4th place, while "stability and social protection" fell from 2nd to 7th. Given that the rank correlation analysis indicated overall instability in the hierarchy ($\rho = 0.45$, $p = 0.26$), these shifts should be interpreted not as random fluctuations but as manifestations of a systemic transformation with instrumental-economic values losing their status as absolute dominants. This trend does not imply that wages and stability have lost significance but may indicate that they have do not have a monopoly on professional choice anymore. Also, an adaptive rationality as a new trend is worth noting as it is characterized by readiness to change roles and skills valued higher than lifelong employment in a single position. This finding aligns with the concept of the "risk society" (U. Beck), where instability becomes a new norm, and for Generation Z, witnessing the rise of the gig economy, adaptability may be prized above permanent employment.

Figure 1. Comparative ratio of labor value ranks among Omsk Region high school students, 2018–2024, rank



Source: own compilation.

3. Transformation of choice logic: from hierarchy to polycentric navigation. A key finding is the "flattening" of the value hierarchy – a statistically significant convergence of the rank positions of most constructs. *Figure 1* vividly illustrates this convergence in the significance of latent constructs in 2024 compared to 2018, confirmed by a reduction in the variance of their aggregated indicators. This attests to a "flattening" of the value hierarchy rather than a mere formal change in the length of the rank scale.

This indicates that the system of professional expectations among school students has lost its clearly defined hierarchy characterized by one or two undisputed dominants. Instead, a polycentric configuration is developing with various values being of comparable weight, forming not a rigid hierarchy but a flexible "repertoire of possibilities" (Wang, Li, 2024). This phenomenon can be interpreted as an adaptation to the "risk society" (Styukhin, 2022) and the fragmentation of life trajectories. In a context where guaranteed, linear career paths (e.g., "university – single enterprise for life") are disappearing and the future is perceived as fundamentally uncertain, the development of rigid priorities becomes ineffective[4]. The "flattened" value structure reflects strategic flexibility: a readiness to actualize different aspects of work depending on contextual opportunities and constraints. This configuration is directly linked to the digital socialization of Generation Z. The culture of multitasking, mosaic thinking, and constant switching between online activities fosters a cognitive style less inclined toward building stable linear hierarchies. What emerges instead is the need to develop skills in value-conceptual navigation – the ability to situationally sort out and combine one's priorities in a changing labor world (Popova, 2021). Thus, the "flattening" of the hierarchy is not a deficit of orientation but a new form of rationality suited to the challenges of instability and complexity.

The identified structural shifts correspond with findings from several other studies on youth labor values, which also note a trend toward the growing importance of work-life balance and a reassessment of the role of material factors (Burkhanova et al., 2022; Poplavskaya, 2023; Tanoto, Tami, 2024). This poses fundamentally new challenges for the education system, career guidance, and human resource management, substantiating a shift from outdated linear models to the development of navigation skills, value reflection, and the design of individualized trajectories within a polycentric labor world.

Typology of labor values in 2024: clusters and their value content

Rank analysis reflects only the overall picture, not revealing how values combine within individual preference structures. In particular, the high rank of work-life balance in 2024 does not mean it dominates across all respondents. On the contrary, there is a question: what specific values does it correlate with, and in what manner? To address it, we performed a typological analysis to identify stable configurations of labor values.

Existing theoretical typologies (e.g., those of R. Inglehart, Sh. Schwartz) were not fully confirmed by our data. Therefore, to derive empirically grounded types, the k-means algorithm was applied, as described in the methodology part of the article. The iterative process substantiated the selection of a three-cluster solution which allows getting conceptually interpretable types of value-based strategies. Their profiles (mean z-scores for the latent constructs) are presented in *Table 3*.

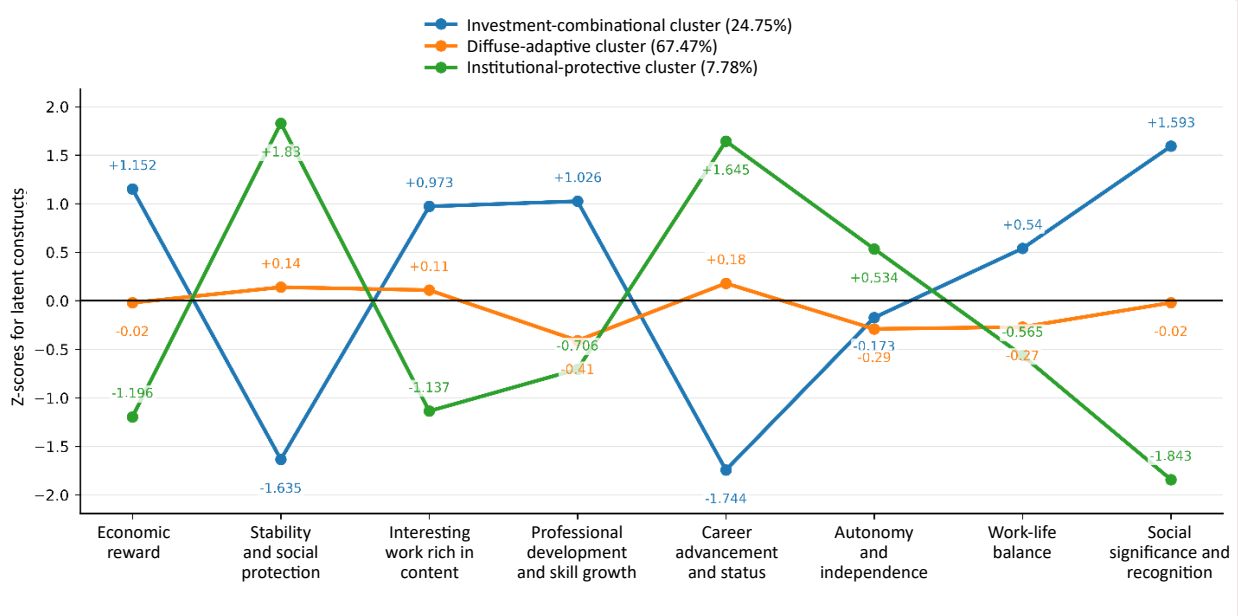
[4] OECD (2025). Trends Shaping Education 2025. Paris: OECD Publishing. Available at: https://doi.org/10.1787/ee6587fd-en

Table 3. Clusters of school students' labor values: mean z-scores for latent constructs, 2024*

Latent construct	Investment-combinational cluster (24.75%)	Diffuse-adaptive cluster (67.47%)	Institutional-protective cluster (7.78%)
Economic reward	**+1.152**	-0.02	-1.196
Stability and social protection	-1.635	+0.14	**+1.830**
Interesting work rich in content	**+0.973**	+0.11	-1.137
Professional development and skill growth	**+1.026**	-0.41	-0.706
Career advancement and status	-1.744	+0.18	**+1.645**
Autonomy and independence	-0.173	-0.29	+0.534
Work-life balance	+0.540	-0.27	-0.565
Social significance and recognition	**+1.593**	-0.02	-1.843

* k-means method: standardization (z), n_init = 50; random_state = 42, N = 14 357.
Source: own compilation.

Figure 2. Internal logic of clusters based on grouped labor values
(z-scores for individual constructs)



Source: own compilation.

To verify the statistical significance of differences between the identified clusters for each latent construct, a one-way analysis of variance (ANOVA) was conducted. Statistically significant differences were obtained for all eight constructs ($p < 0.001$). Post-hoc test results (Tukey's test) confirmed that all three clusters differ significantly ($p < 0.01$) from one another on the key constructs comprising their profiles. This provides statistical justification for the conceptual interpretation of the identified types as stable value strategies. *Figure 2* illustrates the internal logic of the clusters based on grouped labor values.

Investment-combinational labor strategy (24.75% of respondents). This cluster is characterized by multiple positive extremes (professional development, interesting work content, high economic reward, and social recognition of personal achievements) alongside negative scores for stability and status hierarchy. This cluster empirically demonstrates a synthesis of self-realization and instrumental logics of labor: material success, professional development, interesting work, and social recognition function not as alternatives but as complementary elements of a unified investment strategy. It is noteworthy that these values do not compete but form a stable complex perceived by respondents as mutually reinforcing. For this group of school students, material success and professional growth are viewed as interconnected outcomes of a single investment project aimed at building a future career.

It is important to emphasize that the investment-combinational strategy is not reducible to a pragmatic focus on earnings. On the contrary, the inclusion of interesting and varied work indicates a high level of agency and an orientation toward a long-term trajectory in which professional activity is seen as a space for self-realization and the accumulation of human capital. In this sense, this cluster reflects the development of a type of professional consciousness defining success not by a single dominant value but the coherence of multiple significant dimensions.

Comparing with 2018 data, this result can be interpreted as a manifestation of a structural shift: previously, values of development and income were often separate in rankings and did not form stable ties, but by 2024 they became integrated into a unified strategy. This signals a transition from a logic of "choosing between alternatives" to a logic of comprehensive professional project design.

Diffuse-adaptive labor strategy is the dominant cluster in the sample, accounting for 67.47% of school students. All z-scores are clustered within a narrow range, indicating the absence of a statistically distinct value core. This is not a "weakness" but a structural characteristic: values do not form a hierarchy but operate as an adaptive, mutually supportive set of alternatives. It is precisely this strategy that confirms the "flattening" of ranks observed in 2024 and underscores the necessity of moving from rank analysis to typology. Its key feature is the lack of a pronounced value core: none of the labor values demonstrate stable dominance, and scores for most constructs hover near the mean.

The observed profile can be viewed as a manifestation of an adaptive orientation characterized by the rejection of a rigid value hierarchy in favor of situational flexibility. We conditionally label it "diffuse-adaptive" but realize that this pattern may reflect either an emerging strategy for navigating uncertainty or a consequence of an unfinished process of self-determination. However, the prevalence of this profile and its conceptual correspondence with the general trend toward a "flattened" value hierarchy (see above) indirectly support its interpretation as a normative response to the "blurred" institutional trajectories in the labor sphere.

Values such as work-life balance, comfortable working conditions, economic reward, professional development, and job stability coexist without entering into stable hierarchical oppositions. This configuration reflects a contextual rationality with preferences being developed situationally, depending on external conditions and perceived opportunities.

From a scientific standpoint, this finding is of fundamental importance, as it may signal a transformation in the very mechanism of career choice. The observed profile can be regarded as a manifestation of an adaptive mindset rejecting rigid value hierarchy in favor of situational flexibility. The

mass prevalence of this strategy (67.47%) and its conceptual correspondence with the general trend of a "flattened" value hierarchy indirectly support its interpretation as a normative response to the "blurred" institutional trajectories in the labor world. This allows school students to maintain flexibility in conditions of high labor market uncertainty but simultaneously cuts their capacity for early specialization and long-term decision-making.

There are references to a similar phenomenon in recent scientific literature (Gut et al., 2023; Emelin, Rasskazova, 2024). Authors show that contemporary adolescents give priority to an unrealistically broad spectrum of criteria (well-paid, interesting, convenient, with prospects). It should be highlighted that the prevalence of the diffuse-adaptive strategy cannot be viewed solely as an individual psychological phenomenon. On the contrary, it reflects a socially conditioned state of the professional environment with no clear, institutionally anchored paths to success. Thus, this cluster captures not a deficit of orientations but a youth response to the structural uncertainty of the modern economy and labor market.

Institutional-protective labor strategy, represented by 7.78% of respondents, is characterized by a pronounced priority on *job stability*, combined with an orientation toward *career advancement* and formal status markers. Unlike other clusters, this one is focused on predictability and institutional safeguards, while values related to work-life balance, autonomy, and the content of work have relatively low significance. This strategy largely reproduces elements of the classic industrial model, typical of public administration, holding companies, and similar structures, where job security, a formal career ladder, and institutional guarantees played a central role. Notably, this type of value orientation is marginal in the context of the modern economy. Compared to 2018, the institutional-protective cluster has narrowed, which correlates with the decline in the rank significance of job stability. This allows us to interpret this cluster as a "residual" type of career choice, persisting primarily among those school students who consider risk and uncertainty unacceptable.

Conclusion

In conclusion, the comparison of 2018 and 2024 data suggests that the transformation of school students' labor values affects not only the content of individual values but also the very principle of their organization. In 2018, a hierarchical model of career choice prevailed, whereas by 2024, it is giving way to flexible, weakly structured configurations. This is reflected both in the observed rank shifts and in the results of the typological analysis.

The research contributes to the analysis of the qualitative transformation of labor values structure among high school students (a case study of the Omsk Region) across three dimensions.

1. Methodological dimension: a procedure was developed and applied that enables a substantive comparison of data collected using different measurement instruments by focusing on the analysis of the rank positions of latent constructs. This approach minimized the risks of incorrect direct comparison of heterogeneous data and allowed the research to concentrate on identifying structural shifts in the system of priorities. This holds practical value for longitudinal, comparative, and repeated cross-sectional studies involving methodological updates.

2. Empirical dimension: *the study identifies the dynamics and typology of labor values among high school students in a non-metropolitan region over a six-year period.* Based on a comparison of 2018 and 2024 data, the following changes in the structure of labor values were documented:

a) a structural shift in the value hierarchy was established: the value "work-life balance" moved from eighth to first place, while the significance of "economic reward" and "job stability" declined substantially;

b) a trend toward a "flattening" of the value hierarchy was revealed – a statistically significant convergence of the rank positions of most constructs, signaling a transition from a rigidly hierarchical model to a polycentric configuration of labor expectations;

c) cluster analysis of the 2024 data differentiated three statistically stable value profiles: investment-combinational (24.75%), integrating high expectations relating to income, development, interest, and recognition; diffuse-adaptive (67.47%), characterized by the absence of a pronounced conceptual core and situational actualization of different priorities; and institutional-protective (7.78%), oriented toward stability and formal status.

Theoretical-interpretive dimension: *the study conceptualizes new strategies of career choice*. The findings allow us to formulate a hypothesis that there is a new pattern among contemporary youth that can be provisionally named "adaptive polycentricity" in the labor sphere. This hypothesis suggests that, in response to uncertainty, the value system is restructuring from a model optimized for a single career choice to one oriented toward continuous navigation. The mass prevalence of the diffuse-adaptive profile, interpreted here as a possible manifestation of such an orientation, underscores its social significance and substantiates further investigation and conceptual development.

Practical implications of the study are the following:

– for career guidance and education: the results substantiate a shift from merely informing students about professions to cultivating skills in labor market navigation and life trajectory design. This implies the development of new programs that account for the widespread diffuse-adaptive strategy among students and integrate diverse value motives;

– for government and regional policy: the data provide a basis for transitioning from universal to targeted youth support programs (educational pathways, career navigation, institutional guarantees) and for adjusting workforce demand forecasts in light of new value expectations;

– for corporate management: the findings allow companies differentiating HR policies and tools according to the distinct value strategies of future employees (e.g., project-based experience and development for the "investment" type; flexibility and mentoring for the "diffuse" type). They also suggest a need to reassess employer attractiveness factors, giving top priority to work-life balance and working conditions.

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Conceptual Framework for the Development of a Regional Integration Economic Block (EAEU Case)

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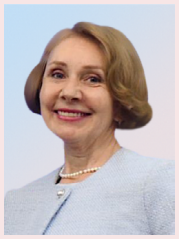

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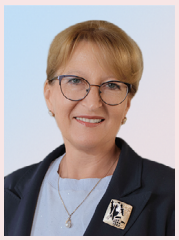

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Abstract. Taking into account the trend toward the formation of a multipolar world, as well as the accumulated problems of regional economic integration, the authors attempted to update the conceptual framework for the development of a regional integration economic block (RIEB). The object of the study is the regional integration economic block of EAEU, the subject of the study is the economic interaction of the block countries in the context of the emerging multipolar world order. A hypothesis has been put forward that, within the framework of distributed leadership, the RIEB countries can act as leaders in certain industries (industry-specific internationalized reproduction processes) and thereby avoid dominance in the block by one country. In theoretical terms, the article reveals the essence of the fundamental principle of a multipolar world order, namely "equal fair cooperation". According to this, the author's approach is proposed, based on distributed leadership, an internationalized reproduction process and cooperation. The article also reveals the concept of "technological cooperation". In terms of methodology, an index of integration interaction is proposed to assess the potential for integration interaction between countries taking into account their weights determined by experts. The results obtained show that, on the one hand, the calculated value of the index 0.88 indicates the insufficient integration interaction, the need to strengthen cooperation ties and increase the economic power of the block. On the other hand, it also indicates the possibility of strengthening the role of all RIEB member countries in the context of specific individual industries (distributed leadership). It allows us to speak about the beginning of the transition from the "center-periphery" model based on a world-system approach to a polycentric structure within the EAEU, the development of which requires the creation of targeted incentive funds within specific industry value chains.

Key words: multipolarity, world order, distributed leadership, regional integration economic block, EAEU, industry value chains.

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Introduction

Many studies have been devoted to issues of integration cooperation within the framework of regional integration economic blocks (hereinafter referred to as the RIEB), including the EAEU. They focus on various aspects, including governance institutions (Perskaya, 2015; Perskaya, Eskindarov, 2016), uneven integration of the RIEB countries (Borko, 2006), leveling the development levels of the RIEB countries (Chupina, 2015), and the creation of a single internal market (Glazyev, Tkachuk, 2023; Kondratieva, 2016). At the same time, among the key problems hindering the successful functioning of integration blocks, there is an increase in the "polarization" of the countries of the region, "the presence of a hegemon country that is fighting for dominance with other Eurasian countries" (Chupina, 2015, p. 17). Scientists cite the inefficiency of the existing model of inter-country economic relations as one of the reasons for this problem. The accumulated shortcomings of the RIEB, as well as the active formation of a new multipolar world order, lead scientists to search for a new model of integration interaction, push for a revision of the paradigm of regional economic

integration development, and the need to transform the very form of economic integration proposed by B. Balassa toward protecting the national and economic interests of peripheral countries (Malakhova, 2018b, p. 5).

The aim of the research is to identify and reveal the essence of the principles of integration interaction between countries in the model of the new world order, based on current ideas about the multipolar world order, as well as on the basis of a reproductive approach that takes into account the contribution of types of cooperation to the creation of added value, to assess the ability of the RIEB (using the example of the EAEU) to act as one of the poles of the world, the center of economic attraction.

Updating the conceptual foundations of the development of the RIEB in the context of the formation of a multipolar world order

Despite the generally accepted and well-established classical theories, in particular, the study of the development of the RIEB through the prism of the successive passage of the stages of the increasingly complex relations between the member countries of the Balassa integration block (free trade area, customs union, common market, etc.), many points of view have emerged regarding international economic integration. We have grouped them into several groups, which are represented by the following most common approaches (in addition to the above-mentioned so-called the "stadium" approach), reflecting various aspects of this complex phenomenon:

1) the institutional approach (Delyagin, 2003; Ratner, 2013) explores the institutions of block functioning, such as foundations, governing bodies, statutory documents, or new criteria for grouping countries; integration processes are based on the interrelation of two components – the cross-border movement of goods and factors of production (foreign trade, foreign investment, migration, exchange technologies) and their institutionalization (industrial cooperation, cooperation in science and education, economic policy);

2) the subordination approach (Baldwin, 1993; Frolova et al., 2011), the meaning of which is that countries interact with each other under pressure from stronger RIEB participants, thus some countries prevail in the integration block and infringe on the interests of others; it is noted that less developed countries are forced to join the integration block due to the risk of declining competitiveness;

3) the redistributive approach (Chupina, 2015; Stiglitz, 2019), which provides for the formation of financial mechanisms for pulling weak countries toward strong ones, in particular, the creation of redistributive funds; it is argued that existing financial assistance programs to independent states from international organizations have the opposite effect to the stated goals, therefore, to reduce inequality and maintain economic growth in the integration block, it is necessary to create new support mechanisms.

In turn, the last of the presented approaches is based on the "world-system" paradigm of the world order by I. Wallerstein (cit. ex: Ishukov, 2020). The essence of this paradigm, as it is known, is the grouping of countries into the "center" ("core", "vanguard"), "semi-periphery" and "periphery", where the former group respectively holds a dominant position over the latter within the framework of the aging world economic order (Glazyev, 2016; Arrighi et al., 1989; Raagmaa, 2003). In our opinion, the adoption of such a paradigm on a non-alternative basis initially provides for the subordination of one group of countries to another, the dominance of strong countries over less powerful ones. Scientists believe that this is one of the reasons for the failure to fulfill the originally stated goals and objectives of the formation of the RIEB (Malakhova, 2018b). The partial decrease in the effectiveness of the RIEB, the

increasing inequality between the countries of the avant-garde and the periphery in recent decades can be also explained by the fact that existing theoretical approaches are based on classical theories of international trade, which became the basis for the establishment of a unipolar (American) liberal world order, and the case of comparative advantage is more appropriately interpreted as the theory of arbitration (purchase and sale transaction with the purpose of making a profit). Such a model of the world is collapsing today, and among modern publications there are more and more suggestions about the need to focus on "non-Western" theories of international relations. The need to rethink the conceptual foundations of international economic integration (IEI) is also indicated by the theory of regionalism, since the "old" regionalism existed in conditions of bipolarity[1] (Mikhailenko, 2014; Cihelkova, Frolova, 2014). In particular, the emergence of geopolitical regionalism, aimed at positioning itself in the global space, taking into account national interests and the interests of allies (Kheifets, 2024), testifies to the rethinking, which is becoming more relevant every year.

The accumulated shortcomings of the RIEB, as well as the active formation of multipolar world, suggest a revision of the paradigm of the development of regional economic integration. As an alternative, scientists propose a design approach. For example, V.I. Mikhailenko sees the development of regional integration by overlapping integration projects on top of each other[2]. In particular, the overlap of the SCO, the EAEU, and the CIS is due to the fact that Russia is a member of each of them. But, in our opinion, T.S. Malakhova's proposal on the development of the RIEB as a "geostrategic economic block" deserves the most attention, especially in the context of the formation of a multipolar world. Based on the works of G. Myrdal and B. Balassa, the author takes into account "the interests of peripheral countries operating in integration groups" (Malakhova, 2018b, p. 5).

When discussing the essence of the new (multipolar) model of the organization of the world order, scientists and practitioners try not so much to identify new leaders among countries as to formulate principles of interaction. The world is going through the most global transformations in recent times regarding the organization of the world order. The 2020 Global Crisis has mercilessly criticized the fundamental paradigms of globalization that seemed unshakable thirty years ago[3]. The modern world order is in an unstable transitional state, and a new model of the world is just being formed, so there is no unity in terminology yet – someone uses the term "multipolarity", some scientists talk about multilateralism. For instance, A. Acharia defines the modern world as a "multiplex world", calling it "multi-component" (Acharia, 2014), J. Mearsheimer understands the "global distribution of power" by the world order[4].

In understanding multipolarity, a political approach prevails in the research of domestic and foreign scientists, in which two world orders are distinguished: the hegemonic one, which presupposes the dominance of one power (the unipolar world), and the balance of power order[5] (Acharia, 2014). Summarizing the available relevant points of

[1] Shkvarya L.V. (2011). International economic integration in the global economy: Studied aid. Moscow: INFRA-M.

[2] Mikhailenko V.I. (2019). For whom is the bell tolling? The Russian Council for International Affairs. Available at: https://russiancouncil.ru/analytics-and-comments/analytics/po-kom-zvonit-kolokol/ (accessed: 15.07.2025).

[3] Kortunov A. (2020). The crisis of the world order and the future of globalization. Report 60. The Russian Council for International Affairs.

[4] Ibidem.

[5] Mikhailenko V.I. (2019). For whom is the bell tolling? The Russian Council for International Affairs. Available at: https://russiancouncil.ru/analytics-and-comments/analytics/po-kom-zvonit-kolokol/ (accessed: 15.07.2025); Kortunov A. (2020). The crisis of the world order and the future of globalization. Report 60. The Russian Council for International Affairs.

view, including those expressed at the 15th BRICS summit[6], we can conclude that the dominant principle of economic cooperation between countries in the new model of the world is the principle of equal and equitable partnership (hereinafter referred to as the EEP), the essence of which is to build relationships between countries with different levels of development as equal partners. On the one hand, international cooperation is considered as a mechanism for the development of the global economy, on the other hand, it is not always fair and mutually beneficial.

As a result, with the introduction of the EEP principle in a multipolar world, well-being, primarily financial, is transferred from the countries of the so-called "Golden Billion" to all countries (in accordance with the resource contribution to the reproductive process, estimated at fair market prices).

Based on the key words that reveal the meaning of the new model of interaction between the countries, we will call this approach to the functioning of the RIEB as a "partnership" as opposed to the "subordination" mentioned above.

The question immediately arises concerning how this fundamental principle can be put into practice. Scientists agree that the RIEB can act as a center in a multipolar, polycentric world, citing the following arguments. J. Knight believes that in the absence of global governance, the security of peoples, their prosperity and well-being, and environmental protection should be taken over by responsible control and regulation by integrated regional organizations[7]. At the same time, the choice of order depends primarily on the (global) distribution of power between the great powers. Let us transfer this principle to the RIEB, since such a block is also a collection of countries. The view that integration blocks can contribute to the formation of a new multipolar world order is shared not only by political scientists, but also by economists (Malakhova, 2018a). In particular, the geo-economic fragmentation taking place in the global world contributes to the strengthening of regional integration economic blocks and, consequently, their strengthening as poles (Chernenko et al., 2024, p. 11).

The RIEB is a system in which there is a core leader and a set of elements, which means it has a certain order and hierarchy. For core – element and element –element relations (for example, between developing countries), we propose an expanded conceptual framework for a partnership approach to the development of the RIEB, based on the following theoretical foundations.

The first is distributed leadership. Authoritative representatives of modern management theories have proved that in the context of ongoing technological transformations, especially digitalization, the concept of distributed leadership is gaining momentum, i.e. "the totality of the independence and initiative of many individuals, ... teams" (Gitel'man, 2021, p. 136). Its essence lies in the fact that "scientific and technical knowledge is becoming more complex on the one hand, and more dispersed (i.e. distributed among groups) on the other; ... their volume exceeds the capabilities of one organization and ... ceases to be their prerogative" (Gitel'man, 2021, p. 136). In addition, digital technologies allow subjects to communicate with each other quickly. In terms of the RIEB, individual countries can be leaders in certain areas of the economy and management, thus we can talk about "industry leadership".

[6] Video message to the participants of the BRICS Business Forum. Available at: http://kremlin.ru/events/president/news/72085 (accessed: 23.08.2023).

[7] Kortunov A. (2020). The crisis of the world order and the future of globalization. Report 60. The Russian Council for International Affairs.

The second is the "internationalized reproduction process" or global value chains (hereinafter referred to as the GVC)[8] (Gereffi, 2016). The architecture of the world has recently been built around the GVC – they determine the organization of international production. Of the many interpretations in the context of our research, we are close to defining them as a sequence of stages of processing resources (intermediates) to the final product, at each of which the added value increases. A country's place in the global economy is determined by specialization in the GVC stage, while the maximum value added and, consequently, part of global income is concentrated in such areas as R&D, brand, and final product trade. They are localized on the territory of developed countries. An example of this theoretical framework is the ASEAN goal of creating a production and commercial ecosystem with a special focus on the development of the GVC within the association, which, in turn, is designed to stimulate investment from partners (Glazatova et al., 2023).

The third is cooperation. We need to return to the basics of the fundamentals of industrial and economic relations, namely cooperation. The integration potential is achieved precisely through mutually beneficial cooperation. This position is confirmed by the recent revival of interest in the Council for Mutual Economic Assistance (CMEA), the purpose of which was to provide assistance to the countries of the socialist camp on the basis of economic, scientific and technical cooperation. We should remember that cooperation is the process of implementing joint development programs through the creation of joint companies and projects of the member countries of the integration block (within the framework of joint value chains). If we take interaction within the industrial reproduction chain as a basis for development, then we are talking about cooperation at all stages of the value chain. An example of this theoretical basis of the partnership approach is the insufficient involvement of companies in integration processes in the post-Soviet space (Libman, Kheifets, 2011).

The most problematic research field in the current conditions of global economic development is technological cooperation. We propose to interpret it as a joint process of technology development, exchange of scientific research, and mobility of scientific personnel between states to strengthen mutually beneficial innovative cooperation, which results in technological sovereignty in individual sectors or the national economy of the integration block member countries as a whole. It is precisely such cooperation that should become the basis for the development of countries in the RIEB.

Thus, we imagine the multilateral (multipolar) world as a system of countries with different levels of development, but which have achieved significant success in certain (one or more) sectors of the economy and are able to act as leaders in them, as well as interacting with participants in the reproductive industry process based on a fair redistribution of global income. Theoretically, members of the regional integration block can become industry leaders within the RIEB and thereby move away from the dominance of one country in the block. The countries of the block that do not have leading positions in at least one industry can enter the integration block, but they will be able to act as a pole of growth in the system of multilateral relations only as leadership matures.

Methodological aspect of the research

Within the framework of existing approaches, the RIEB analysis takes into account the place of the integration block in the world in terms of a variety of indicators (in world trade, including digital, in global industry, etc.). Despite the fact

[8] Kochetov E.G. (2006). Geo-economic (global) Explanatory Dictionary (Fundamentals of high geo-economic technologies of modern business): Collection of strategic concepts – short stories. Yekaterinburg: IPP "Ural'skii rabochii".

that many such calculations have been performed[9] (Glazyev, Tkachuk, 2023; Chupina, 2015), we consider them somewhat enlarged. In this article, the assessment is based on a set of indicators reflecting investment, innovation, production, trade and other cross-country relations, i.e. in the context of the GVC links. We have adopted the position of V.V. Perskaya (Perskaya, 2015) as a criterion for assessing integration cooperation, which believes that the volume of intra-block trade should outpace similar indicators in comparison with third countries (non-block trade).

Let us explain the choice of particular indicators. We analyze the "resources" link through the "trade in intermediate goods" indicator. According to the economic purpose, goods are divided into consumer, intermediate and investment. Investment goods are aimed at improving fixed assets, consumer goods are intended for personal consumption, intermediate goods are used for the subsequent production of goods and services. Thus, investment and consumer goods are final, and intermediate goods serve as resources, therefore, the growth rates of mutual and foreign trade in them are used in the methodology for calculating the "resources" link.

We will first determine the index of integration interaction (stage 1) to achieve the goals set in the study. Scientists traditionally evaluate the effectiveness of cooperation between countries within the integration block through the dynamics of foreign trade as a whole. We have attempted to carry out such an assessment in the context of the GVC links, in the context of which the integration interaction index (Formula 1) is proposed to determine the integration interaction of the RIEB countries. Considering that the types of interactions have different meanings (scientific, technological and investment cooperation are more important than simple export-import operations), the importance of the type of interactions α is introduced into the formula. We propose to evaluate it based on the level of added value created in the corresponding link of the reproduction process.

$$I = \frac{\sum_{i=1}^{n}(\alpha_i \, GR_{mi})}{\sum_{i=1}^{n}(\alpha_i \, GR_{fi})}, \quad (1)$$

where I – index of integration interaction;

GR_{mi} – growth (growth rate) (GR) of mutual economic flows of all member countries within the RIEB (m) along i-th link of the GVC;

GR_{fi} – growth (growth rate) (GR) of external economic flows with third countries of all RIEB member countries (f) according to i-th link of the GVC;

i – the GVC link (1 – R&D; 2 – investments; 3 – resources, etc.);

n – number of the GVC links;

α – significance of i-th link of the GVC according to the expert assessment method.

The significance of the links is determined in accordance with the value added distribution curve (the Stan Shih method), further refined by the

Table 1. Criteria for interpreting the calculated values of the integration interaction index

If the growth rates of mutual economic flows of all member countries within the RIEB		
<1, i.e. below the growth rate of external economic flows with third countries of all member countries	=1, i.e. equal to the growth rates of external economic flows with third countries of all member countries	>1, i.e. higher rates of external economic flows with third countries of all member countries
Insufficient integration interaction	Equivalent integration interaction	Sufficient integration interaction
Source: own compilation.		

[9] Shkvarya L.V. (2011). International economic integration in the global economy: Studied aid. Moscow: INFRA-M.

expert assessment method and normalized to the range from 0 to 1. Stan Shih's method is based on the "Smiling curve", which he obtained when analyzing his company Acer, and was also developed by other authors (Kaplinsky, 2013; Lundquist, 2007).

Table 1 gives the criteria for interpreting the integration interaction of the RIEB countries through the integration interaction index.

Questionnaires were prepared and sent to the experts to obtain the results of the expert assessments. The focus group of experts was made up of scientists specializing in this field. Their task was to quantify the importance of the link in accordance with the configuration of the value added distribution, that is, with the link's contribution to the global value chain. The following results were obtained: the importance of the "R&D" and "trade" links in the GVC was 0.93; the "investment" and "marketing" links – 0.86; the "resources" link – 0.76; the "production, assembly" link – 0.74; "logistics" link – 0.79; the "global income redistribution" link – 1.

Next, let us move on to identifying industry leaders (stage 2). Prerequisites for the formation of the RIEB model with industry leadership from different countries are the presence of activities with significant attraction of investments in fixed assets (step 2.1), pronounced product specialization within them (step 2.2), the presence of enterprises in the institutional framework of which the development of the reproductive process is possible (2.3), as well as innovative projects (2.4). The dominant industry of the RIEB member country is recognized as the industry that has a high share among other industries of the participating country in question or has the highest share in the country under consideration among the shares of other participating countries.

Research results and discussion (the EAEU case study)

Stage 1. Table 2 presents the result of calculating the complex index of integration interaction according to formula 1 using the example of individual indicators (within the framework of a simple value chain for the links "investments", "resources" and "trade"). The period 2016–2019 was considered intentionally, since in the specified time period the integration processes of the EAEU were implemented without taking into account global conditions, transformations, including the pandemic and sanctions pressure.

In accordance with the methodology for assessing the potential of integration interaction in the RIEB, the values obtained take into account the importance of each link of the Smiling curve according to the expert assessment. Formula 2 shows the calculations.

$$I = \frac{(0.86 \text{ x } 116.67) + (0.76 \text{ x } 113.13) + \left(0.93 \text{ x } \frac{(113.26 + 113.8)}{2}\right)}{(0.86 \text{ x } 164.38) + (0.76 \text{ x } 109.95) + \left(0.93 \text{ x } \frac{(115.41 + 111.3)}{2}\right)} = \frac{100.3 + 86.0 + 105.6}{141.4 + 83.56 + 105.42} = \frac{291.9}{330.38} = 0.88 \quad (2)$$

Table 2. Determination of the EAEU Integration Cooperation Index by links, 2016–2019 (fragment)

Link	Investment	Resources	Trading	
Using the example of one of the indicators	Mutual investments in the total volume of foreign direct investment, billion U.S. dollars	Trade in intermediate goods, million U.S. dollars	Exports, million U.S. dollars	Import, million U.S. dollars
GR_{mi}, %	116.67	113.13	113.26	113.8
GR_{fi}, %	164.38	109.95	115.41	111.3
According to: Eurasian Economic Commission. Available at: https://eec.eaeunion.org/ (accessed: 02.09.2025); OECD Data. Available at: https://data.oecd.org (accessed: 25.08.2025); World Bank Open Data from The World Bank: Data. Available at: https://data.worldbank.org (accessed: 11.09.2025).				

The index of integration interaction in the context of the main links of the internationalized reproductive process was 0.88, i.e. less than 1. In accordance with the accepted criterion of success of the RIEB, when the growth rate of mutual economic flows of all countries within the RIEB is lower than the growth rate of external economic flows with third countries of all member countries, we conclude that there is insufficient integration interaction in the EAEU and the need to strengthen cooperation ties and increase the economic power of the RIEB. On the one hand, there are many proposals to strengthen the EAEU, but most of them are focused on strengthening the management institutions of the integration block, including the creation of various support funds (institutional approach, redistributive approach). On the other hand, we can make suggestions for those stages of the GVC where, in our calculations, the private index of integration interaction is less than 1, for example, for the investment link. Some authors do so, suggesting that in order to raise the EAEU on the "wave" of the growth of a new technological order, either a way to upgrade fixed assets with the concentration of available resources on promising areas of modernization and economic development based on targeted credit issuance, or a way to increase the innovation activity of the private sector (Glazyev, Tkachuk, 2023).

All proposals deserve attention, but we see a development path toward the formation of specific industry leadership in each of the EAEU member states (distributed leadership).

At stage 2 (step 2.1), we will determine which industries in the EAEU countries attract the most investments in fixed assets and in which countries can take a leading position. To do this, we will calculate the share of each type of activity in the total investment volume for each category (*Tab. 3*). For example, the data show that Belarus can become a leader in the manufacturing industry, and Kazakhstan in the mining industry.

Moving from general industry data to specific product categories (stage 2, step 2.2), we analyze the shares of the commodity nomenclature of foreign economic activity (FEA) in the context of mutual trade between the RIEB member countries (*Tab. 4*). This analysis allows identifying the dominant types of products in each country, including in the context of leadership in its exports.

Table 4 shows that countries can become industry leaders, for example, Armenia and Belarus in the food group.

At stage 2 (steps 2.3 and 2.4), based on statistical data from the websites of companies in the EAEU countries and the statistical database of the EAEU, the leading international enterprises of the EAEU members were identified by priority industries that export their products to third countries, have foreign divisions or a foreign investor, and the largest innovative projects of the integration block were identified (*Tab. 5*).

Table 3. Types of economic activities with significant attraction of investments in the fixed assets of the EAEU within the member states for 2015–2021

Country	Type of economic activity
Armenia	Electricity, gas, steam and air conditioning (19%), accommodation and catering services (4%)
Belarus	Agriculture, forestry and fisheries (12%), manufacturing (23%)
Kazakhstan	Mining, quarrying (35%)
Kyrgyzstan	Provision of other services, including housing construction (32%)
Russia	Professional, scientific and technical activities (4%)
According to: Department of Statistics of the ECE. Investments in fixed assets. Available at: http://www.eurasiancommission.org/ru/act/integr_i_makroec/dep_stat/econstat/Pages/investments.aspx (accessed: 04.09.2025).	

Table 4. Types of commodity nomenclature of foreign economic activity with significant mutual trade turnover of the EAEU within the member states for 2015–2021

Country	Type of commodity nomenclature of foreign economic activity
Armenia	Vegetable and animal products (15%), prepared food products; alcoholic and non-alcoholic beverages and vinegar; tobacco and its substitutes (40%)
Belarus	Live animals; products of animal origin (21%); machinery, equipment and mechanisms; electrical equipment; parts thereof; sound recording and reproducing equipment, equipment for recording and reproducing television images and sound, their parts and accessories (14%)
Kazakhstan	Mineral products (37%), chemical and related industries (14%), base metals and products made from them (29%)
Kyrgyzstan	Textile materials and textile products (20%), stone, gypsum, cement, asbestos, mica or similar materials; ceramic products; glass and glass products (6%)
Russia	Mineral products (35%), machinery, equipment and mechanisms; electrical equipment and its parts; sound recording and reproducing equipment, equipment for recording and reproducing television images and sound, its parts and accessories (11%)
According to: Department of Statistics of the ECE. Mutual trade. Available at: https://eec.eaeunion.org/comission/department/dep_stat/tradestat/tables/intra/ (accessed: 04.03.2024).	

Table 5. Enterprises and the largest innovative projects of the EAEU (fragment on Kazakhstan and Russia)

Country	Priority industries		
	Industries	Enterprises	The largest innovative projects
Kazakhstan	Mineral products	TOO KAzRosGas, Karachaganak Petroleum Operating, North Caspian Operating Company	First integrated gas chemical complex
	Mining and metallurgical industry	AO TEMK, Company Stal Servis Kazakhstan, Eurasian Resources Group	Production of tin concentrates, etc.
	Chemical products	JSC Chimpharm, Abdi Ibrahim Global Pharm, JSC Nobel Pharmaceutical Almaty Factory	Production of soda ash, ammonia and carbamide
Russia	Mineral products	Lukoil, Gazprom, Rosneft	Construction of a gas chemical complex, etc.
	Mining and metallurgical industry	UGMK, RUSAL, RMK	Creation of a center of technological competence for aluminum and titanium casting, etc.
	Chemical products	Biocad, Group POLIPLASTIK	Construction of a factory of active pharmaceutical substances, etc.
According to: Open data from the websites of companies of the EAEU member states, the Report of the Eurasian Economic Commission "On the state of the business and investment climate in the Member States of the Eurasian Economic Union". Available at: https://eec.eaeunion.org/upload/medialibrary/ca0/Doklad-o-delovom-klimate-EAES-19-05-2023-g-docx.pdf?ysclid=lr3b2gwq8j658837336 (accessed: 29.08.2025); EAEU Industrialization Map. Available at: https://industry.eaeunion.org/industry/ru/registers/investments/map accessed: 02.09.2025); Decision of the Eurasian Intergovernmental Council 15, dated July 17, 2020 "On the Industrialization Map of the Eurasian Economic Union". Available at: https://docs.cntd.ru/document/565338911?ysclid=lr23p4g3m1485816835 (accessed: 15.07.2025).			

One of the indicators of strength in the context of the balance of power, considered as a criterion of multipolarity, is the ability of a country to attract and retain global (regional) industrial value chains (GVC) on its territory. At the next stage of the study, based on the results of previous stages, we will identify priority industries for the EAEU member states (*Tab. 6*).

According to the priority sectors of the EAEU countries outlined above, as well as the RF Government resolution on the areas of technological sovereignty projects, the following sub-sectors should be supported first of all as part of strengthening the technological development of the EAEU (*Tab. 7*).

Thus, within the framework of the polycentric structure of the EAEU, it is possible to single out the leadership of individual states in specific industries to redistribute the economic dominance of individual countries in the EAEU (the so-called "center–periphery" in the language of the world-system approach). However, as a rule, such leadership belongs to a group of countries.

Within the framework of the concept of distributed industry leadership, to strengthen the EAEU integration block, it is recommended that Russia and Kazakhstan become leaders in the following industries: mineral products, mining, metallurgy and chemical products with dominance in high-value-added sectors (R&D, trade, investment, marketing, redistribution of global income); Armenia, Belarus and Kyrgyzstan will become the leaders of the textile industry and agriculture, with dominance in high-value-added sectors.

Conclusion

We designate the following as a conclusion, within the framework of the stated aim:

– the essence of the multipolar world order is realized through the basic principle of interaction between countries – the principle of "equal and fair cooperation", the meaning of which is revealed through the totality of the components of this concept, including the spread of financial prosperity among all countries participating in the integration process;

Table 6. Priority industries of the EAEU member states for the development of industrial internationalized reproduction process

Country	Industry					
	Agriculture	Textiles and clothing	Mechanical engineering	Mineral products	Mining and metallurgy	Chemical
Armenia	+	+				
Belarus	+	+	+			
Kazakhstan				+	+	+
Kyrgyzstan	+	+		+		
Russia				+	+	+
According to: data of Tables 3–5.						

Table 7. Sub-sectors determining technological development

Countries	Kazakhstan, Russia	Belarus	Armenia, Belarus, Kyrgyzstan
Sub-industries	Medical industry, oil and gas engineering, pharmaceutical industry, chemical industry	Automotive industry, specialized mechanical engineering, machine tool industry and heavy machinery	Agricultural engineering
According to: Department of Statistics of the ECE. Mutual trade. Available at: https://eec.eaeunion.org/comission/department/dep_stat/tradestat/tables/intra/ (accessed: 04.09.2025).			

– the RIEB countries can act as leaders in individual industries, thereby eliminating the dominance of one country in the context of distributed leadership and GVC;

– the calculated value of the author's index of integration interaction of 0.88 indicates the insufficiency of integration interaction within the EAEU;

– despite Russia's continued dominance in the EAEU (Chupina, 2015), industry leaders are emerging. This indicates the beginning of the transition of the EAEU from the "center – periphery" model of a world-system approach (Ishukov, 2020) to a more polycentric structure, which in the future will strengthen its position as one of the poles in a multipolar world. For such development, in addition to redistributive funds (Chupina, 2015), it is necessary to create targeted incentive funds, for example, for technological integration within individual industry chains, using redistributed global income for specific reproductive processes.

The novelty of the conducted research lies, first, in substantiating the principle of equal and fair cooperation, the essence of which is to form partnerships between countries regardless of their level of development; second, in testing a methodological approach to assessing the strength of integration interaction, which is determined by the dominance of intra-block interaction over interaction with third countries; third, in assessing integration cooperation, taking into account the importance of the types of cooperation (investment, resource, trade) and the contribution to the configuration of the distribution of added value.

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Dynamics of the Structural Transformation of the Real Economy of the Republic of Armenia in the Context of Shifting Industrial Paradigms

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Abstract. This article examines the structural transformation of the Republic of Armenia's real economy within the context of shifting industrial paradigms. In small open economies, structural changes and digitalization intensify under the influence of external shocks, necessitating a quantitative assessment of their contribution to output dynamics. This study aims to determine the extent to which changes in the sectoral structure, employment, and labor productivity align with the logic of transitioning from Industry 3.0 to the emerging elements of Industry 4.0 and the prerequisites for Industry 5.0. The research introduces scientific novelty by integrating comparative and systemic-structural analysis with econometric verification using an ARDL model. This approach includes adjusting for atypical shock periods with a dummy variable and accounting for changes in the internal structure of the ICT indicator. The empirical analysis draws on data from national statistics and international sources covering 2008–2025. The methodology employs statistical and comparative analysis, stationarity tests, the ARDL bounds test, an error correction model, and diagnostic and stability tests. The findings reveal that the transformation has been predominantly adaptive in nature, with limited potential for deeper technological advancement due to low R&D investment and weak technology transfer mechanisms. A limitation of this study is its reliance on aggregated macro-indicators and proxy variables, which opens avenues for future research involving a more detailed sectoral assessment of the Armenian economy's alignment with the demands of Industry 5.0.

Key words: real sector, industrial revolution, Industry 3.0, Industry 4.0, Industry 5.0, ARDL model, labor productivity.

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Introduction

The history of human societies is characterized by an alternation of evolutionary and revolutionary changes. The evolutionary type of transformation involves gradual and slow shifts, whereas the revolutionary type is associated with drastic changes that form new foundations for socio-economic development. The most striking manifestations of the second type are industrial revolutions.

Over the previous 40,000 years, technological progress has demonstrated steady hyperbolic growth with periodic fluctuations. Within the framework of ultra-long cycles, the phases of accumulation and origin of innovations are replaced by phases of their rapid spread and improvement (Grinin et al., 2020). The pace of technological development has become exponential since the middle of the 20th century: several technological paradigms can change within one human generation (Dzyubenko, 2020).

In parallel with the acceleration of scientific and technological progress in recent decades, the frequency of crises of various origins has increased – economic, financial, social, and political. In times of crisis, innovation often serves as an anti-crisis mechanism, accelerating the adaptation of economies to new conditions and stimulating digitalization processes (Brem et al., 2023). Those countries that are able to quickly adapt to changes in the external economic environment not only reduce the negative impact of shocks, but also gain additional opportunities for accelerated growth.

After gaining independence in 1991, the Republic of Armenia faced the need to move from a centrally planned economy to a market system in the context of deep transformational crises. While personal computers, the Internet, and new software platforms were actively spreading in developed countries, Armenia had to face the challenges of institutional and structural transformation. This objectively led to temporary technological isolation and a decrease in the speed of integration into global processes. Currently, to compensate for the lag, the country is forced to rapidly implement digitalization, which will allow digital technologies and infrastructure to be introduced and disseminated in the domestic market.

The strength of the Armenian economy is the high level of human capital quality: a significant proportion of highly qualified specialists forms the basis for the development of sectors related to information technology and high-tech production. However, the continuing gap between global technological trends and domestic opportunities limits the country's technological competitiveness.

Understanding the logic of changing industrial revolutions and correlating them with the current state of the national economy is the key to an objective assessment of the level of development of countries, as well as to the formation of strategies for its modernization and integration into the global economy. In this regard, it was decided to conduct a study of the real Armenian economy in the context of industrial revolutions.

In the context of the accelerating digital transformation and the increasing frequency of exogenous shocks, the analysis of structural changes in the real economy of small open economies is of particular importance. For Armenia, which is in the late stage of Industry 3.0 and adapting to the elements of Industry 4.0, the key is not only the pace of economic growth, but also the nature of the redistribution of added value, employment and labor productivity between sectors of the economy.

The aim of our study is to analyze the structural transformation of the real economy of the Republic of Armenia in changing industrial paradigms and to assess the impact of digitalization, employment and labor productivity on the dynamics of output in the short and long term. To achieve this aim, the article uses a combination of structural analysis and econometric modeling based on the ARDL approach.

Materials and methods

The methodological basis of the research includes general scientific and special methods of economic analysis, including comparative, system-structural, statistical and econometric approaches. The research object is the real economy, determined in accordance with the methodology of the Statistical Committee of the Republic of Armenia. The time range of the study is 2008–2025, while some of the indicators are analyzed for the period 2012–2025 in connection with the transition to the methodology of the 2008 SNA. The empirical base of the study includes official statistical data from the Statistical Committee of the Republic of Armenia (Armstat), the Central Bank of the Republic of Armenia (CBA), the World Bank Group (WBG), the International Monetary Fund (IMF), the United Nations (UN), as well as the results of calculations and testing of the constructed models obtained by us during the study.

To quantify the impact of structural factors on the dynamics of the real Armenian economy, the method of the autoregressive distributed lag (ARDL) was used, which allows simultaneous analysis of short- and long-term effects in the presence of variables of different integration order.

Path of transformation from Industry 1.0 to Industry 6.0

In world economic history, there are several stages of technological transformation associated with industrial revolutions, each of which provided a transition to a new stage of socio-economic development.

The First Industrial Revolution (Industry 1.0, I.1) took place in the second half of the 18th – the middle of the 19th century. Its key result was the transition from an agrarian to an industrial society. Manual labor was replaced by mechanized production, machine tools, factories and manufactories appeared, and the use of waterwheel and steam engine energy became the basis for mass production (Gorodnichaya, 2024).

The Second Industrial Revolution (Industry 2.0, I.2) covers the period from 1870 to the outbreak of the First World War. Its specifics consisted in the improvement of production processes, the introduction of conveyor production, active electrification, as well as the rapid development of transport infrastructure – railway, sea and air transport (Nikolaev et al., 2021).

The Third Industrial Revolution (Industry 3.0, I.3) began in the middle of the 20th century and lasted until the beginning of the 21st century. Its defining characteristics were automation and computerization of production, which ensured an increase in productivity, accuracy and speed of production operations through the introduction of electronic control and data processing systems (Urinson, 2018).

The Fourth Industrial Revolution (Industry 4.0, I.4) started in the 2010s and continues in a number of countries at the present time. Its distinctive features are digitalization, robotization, the use of the Internet of Things (IoT) and artificial intelligence technologies. The I.4 concept is closely related to NBIC convergence (Nano-Bio-Info-Cognito), which unites nanotechnology, biotechnology, information technology and cognitive sciences, which opens up opportunities for the creation of new materials, processes and business models (Heilala, Singh, 2023; Babkin et al., 2023). While the development of the first three revolutions occurred with linear acceleration, the fourth is characterized by an exponential impact on the economy and society (Urinson, 2018).

The Fifth Industrial Revolution (Industry 5.0, I.5) began taking shape in 2020 in the context of deepening globalization. Its concept is related to the SCBIN convergence (Socio-Cognito-Bio-Info-Nano), which combines social, cognitive, biological, information and nanotechnology (Babkin et al., 2021). The main goal of I.5 is to integrate human creativity with the effectiveness of robotics for the personalization and flexibility of production processes, which ensures the transition to customized production (Gorodnichaya, 2024; Chourasia et al., 2022). This stage is expected to be completed by 2050.

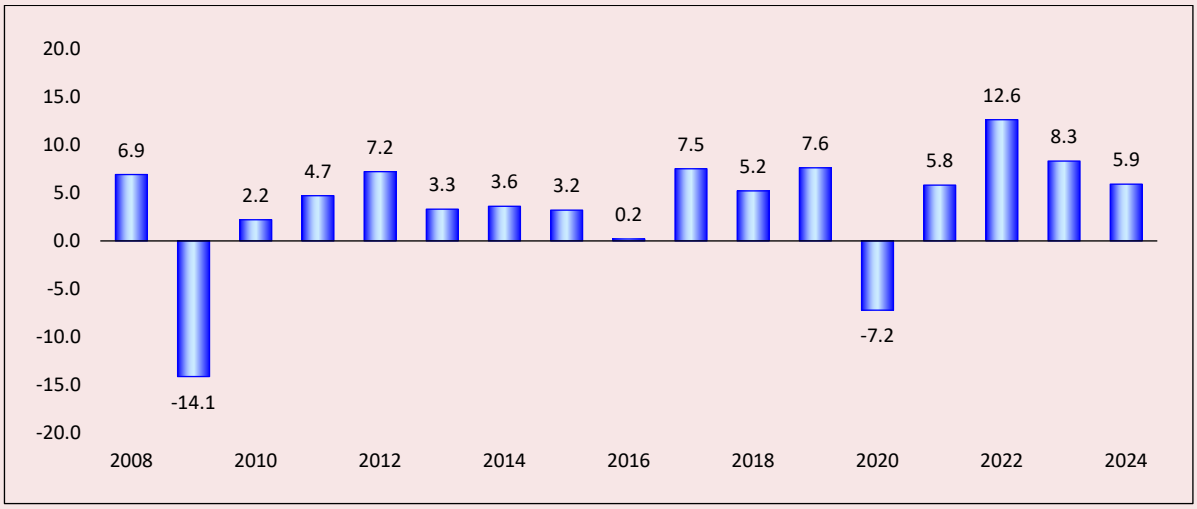
The Sixth Industrial Revolution (Industry 6.0, I.6) is projected to begin around 2050. Its main characteristics will be customer orientation, flexible and dynamic supply chains, automated systems with a high degree of adaptability, as well as integrated value creation networks operating both within national economies and internationally (Babkin et al., 2025; Chourasia et al., 2025). Since it is considered as a promising scenario, in this study it is used only as a context, not acting as an object of empirical verification.

Thus, consideration of the evolution of industrial revolutions makes it possible to identify key areas of transformation of production systems on a global scale. We analyzed the dynamics of the development of the real economy of the Republic of Armenia to assess the possibilities and limitations of adapting these trends in the national context.

Dynamics of development of the real Armenian economy

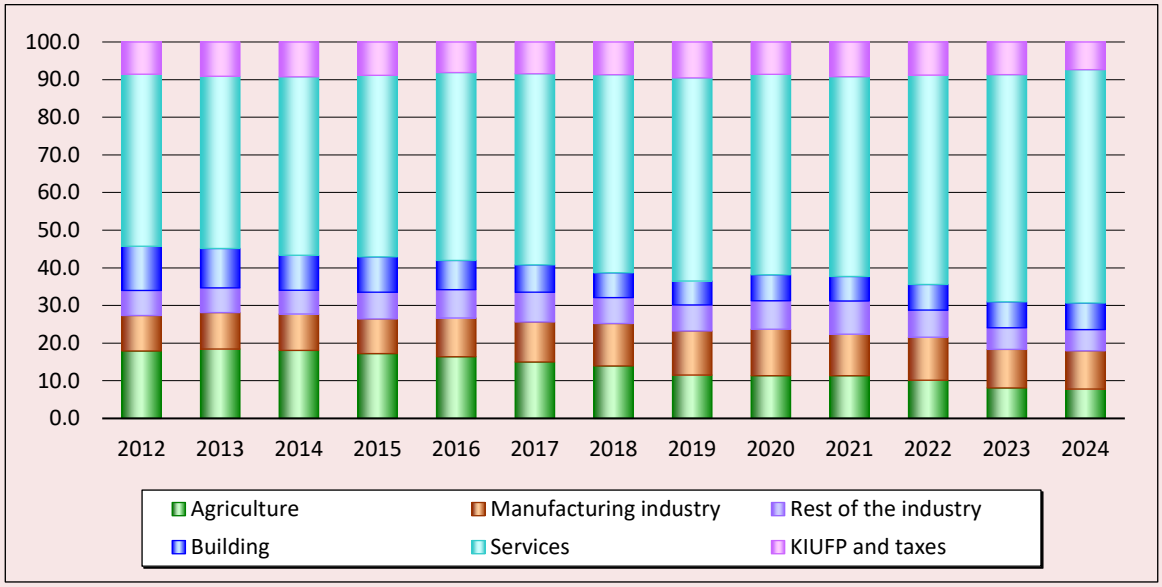
Figure 1 shows the dynamics of real GDP growth in the Republic of Armenia in 2008–2024. The deepest declines in total GDP were recorded in 2009 (-14.10 p.p. against the background of the global financial and economic crisis) and in 2020 (-7.20 p.p. due to the COVID-19 pandemic). In 2016, in the context of the regional currency crisis, the increase was only 0.20 p.p., which indicates the stagnation and preservation of the technological

Figure 1. Real GDP growth in 2008–2024, % compared to previous year



Sources: Armstat, databases, national accounts.

Figure 2. Structure of Armenia's GDP by economic sector in 2012–2024, % of GDP



Sources: Armstat, databases, national accounts.

base typical of Industry 3.0. Significant growth occurred in 2022 (+12.60 p.p. by 2021) due to capital inflows, the expansion of the ICT sector and accelerated digitalization, reflecting the transition to Industry 4.0. In 2024, the growth rate slowed to 5.90 p.p., indicating the need to move to a more sustainable and human-centered 5.0 Industry model.

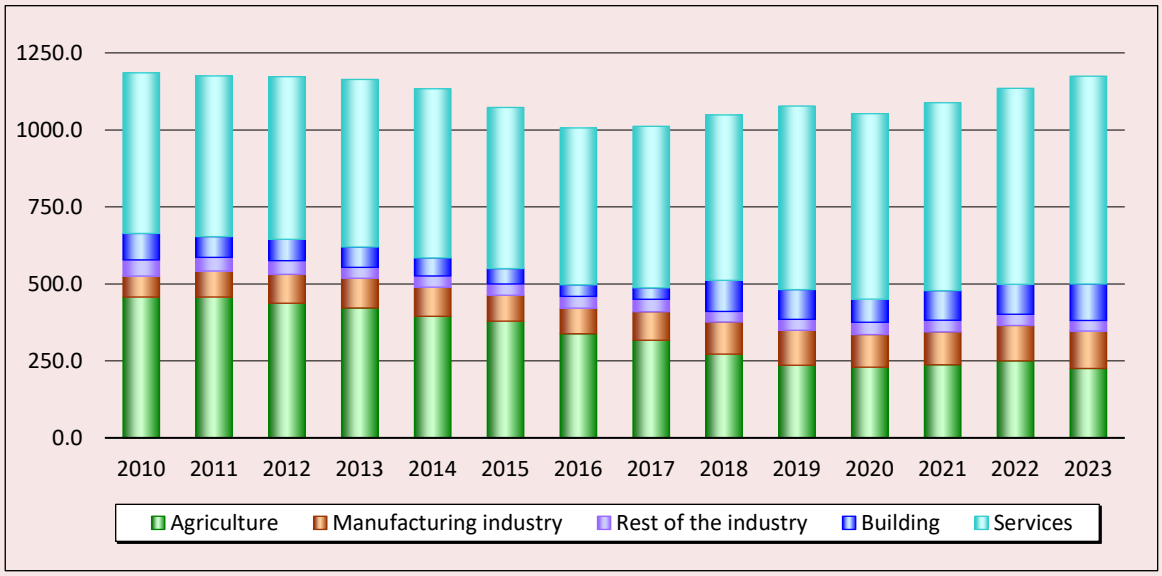
Significant changes were observed in the sectoral structure of Armenia's GDP during the period under review (*Fig. 2*), reflecting the redistribution of added value between key sectors of the economy. The share of agriculture decreased from 17.91 to 7.81% in 2012–2024, while the share of the service sector increased from 45.70 to 61.99%, consolidating its dominant position.

At the same time, the share of the manufacturing industry remained relatively stable (9–12%), amounting to 10.16% in 2024, which indicates the absence of large-scale shifts toward deepening production processes and technological renewal. The rest of the industry (mining, energy, water supply and waste processing) accounted for a total of 5.63% of GDP in 2024, maintaining a predominantly infrastructural and resource-oriented nature.

The growing role of services against the background of a shrinking agricultural sector generally corresponds to the transition to a post-industrial sectoral structure, but quantitative changes are not fully accompanied by comparable qualitative changes. A significant part of services is developing on the basis of limited implementation of modern technological and digital solutions, which constrains labor productivity growth and does not allow interpreting the observed shifts as a complete transition to a model consistent with the principles of Industry 4.0. As a result, the transformation is predominantly adaptive in nature and reflects a redistribution of economic activity without significantly increasing the technological depth of production and services.

Changes in the employment structure in 2010–2023 (*Fig. 3*) increased the trend of redistribution of labor resources between sectors of the economy, reflecting the processes of structural adaptation of the real economy. The number of people employed in agriculture decreased from 457.4 thousand to 225.4 thousand (-50.7%) and was redistributed to other sectors. At the same time, employment in the service sector increased from 521.4 thousand to 674.6 thousand people (+29.4%), which corresponds to an increase in the importance of the service sector in the structure of the economy. The highest relative increase in employment was observed in the manufacturing industry – from 68.0 thousand to 121.5 thousand people (+78.7%), however, it should be interpreted primarily as a result of the recovery and expansion of production and the redistribution of labor. Such dynamics may partially

Figure 3. Employment of the population by economic sector in 2010–2023, permanent population aged 15–74 years, 1,000 people, annual average



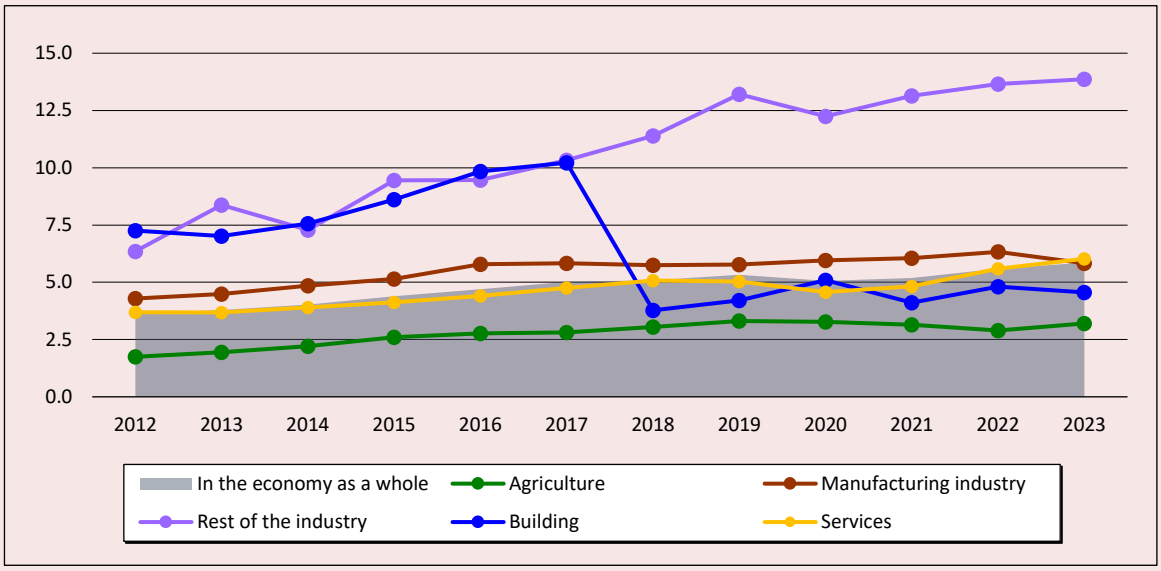
Sources: Armstat, databases, labor force survey.

reflect technological renewal, but the available grounds are insufficient to conclude that the industry is undergoing a large-scale modernization. Employment growth in construction (from 85.8 thousand to 118.4 thousand people (+38.0%)) was mainly cyclical and was driven by both the implementation of infrastructure projects and the expansion of demand in the real estate market. A significant role was played by an increase in wages, a change in the terms of the state target program "Affordable Housing for Young Families", as well as the introduction of an income tax refund mechanism in the amount of interest payments received on a mortgage loan when buying real estate on the primary market. The combined effect of these factors stimulated demand for mortgages and rising housing prices, which, in turn, supported an increase in supply in the real estate market and increased activity in the construction sector.

Taken together, the identified shifts indicate a departure from the agrarian-oriented model and the formation of a more diversified employment structure with the leading role of the service sector. At the same time, the qualitative characteristics of jobs and the level of technological equipment suggest a transitional phase of structural adaptation rather than an approach to the completed model of Industry 4.0: the redistribution of employment is not accompanied by a comparable increase in technological depth and industrial complexity, which limits the potential for sustained productivity gains in the long term.

Positive dynamics of labor productivity in 2012–2023 (*Fig. 4*) reflects an increase in the efficiency of the use of labor resources, but requires a differentiated interpretation by sector. In the economy as a whole, output per employee increased from 3.64 to 5.86 million drams at constant prices in 2012 (+61.0%). The highest increase was recorded in industry as a whole – from AMD 6.35 million to AMD 13.86 million per employee (+118.2%), however, the growth in the manufacturing industry was only 36%, which indicates the continued limited technological depth of processing industries

Figure 4. Output per employee by economic sector in 2012–2023, at constant 2012 prices, million Armenian drams



Sources: Armstat, databases, national accounts and labor force survey.

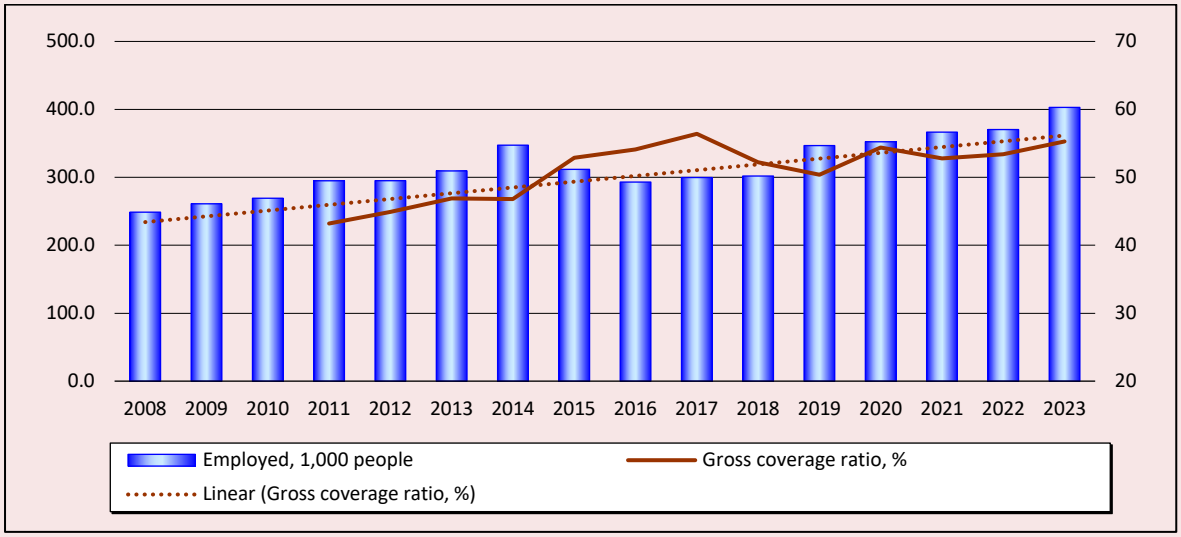
and the importance of extensive factors (changes in output structure, utilization of existing capacities). In agriculture, the 82.9% increase in productivity is largely due to reduced employment, resource redistribution, and technological progress.

In the service sector, output per employee increased by 63.4%, reflecting an increase in the efficiency of certain types of activities, including the use of digital tools and organizational changes, but the heterogeneity of the sector and differences in the technological equipment of its components limit the interpretation of such growth as a systemic effect of digitalization. In construction, productivity dynamics were unstable, due to the high cyclical investment activity, the industry's dependence on the macroeconomic environment, the development of construction technologies and the improvement of the quality of building materials.

In 2008–2023, the number of people employed with higher education in the Armenian economy increased by 62.0%, from 248.7 thousand to 402.9 thousand (*Fig. 5*), while the gross enrollment rate of higher education remained relatively stable (43.2–56.4%). The dynamics indicate an increase in the proportion of workers with a formally confirmed level of higher education, but this indicator alone is not a reliable indicator of the technological development of the economy. International comparisons show that high values of the proportion of people with higher education can be observed in countries with different levels of economic development and technological complexity, which limits the analytical applicability of the indicator without taking into account the quality of education and employment structure.

In this context, the increase in the number of people employed with higher education should be interpreted as the formation of a potential human resource for digital and technological adaptation associated with elements of Industry 4.0, but not as a direct confirmation of the corresponding transition. The realization of this potential is determined by

Figure 5. Number of employed people with higher education and the gross student enrollment rate at the first level of higher education in 2008–2023



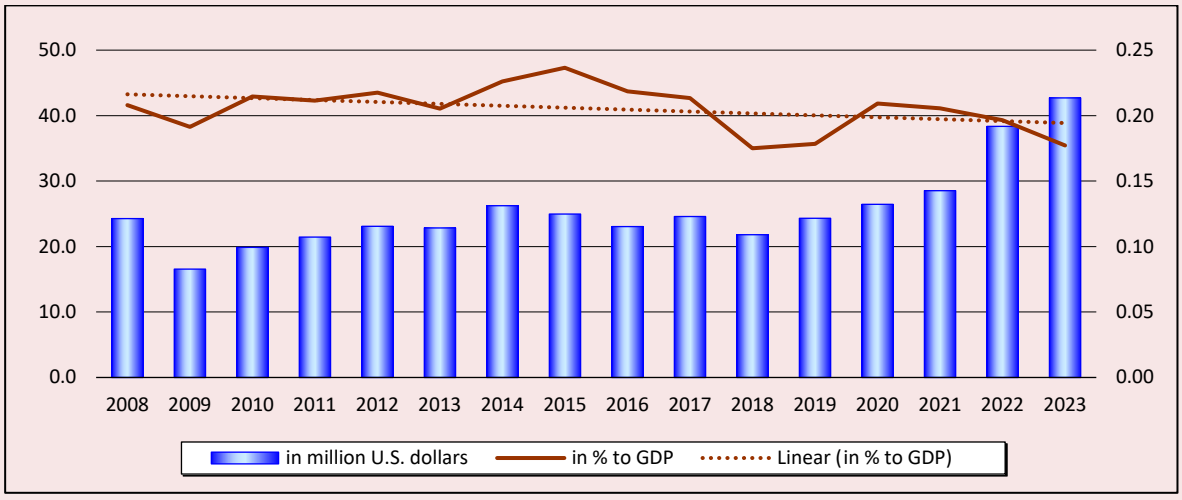
Sources: Armstat, databases, labor force survey, education.

the institutional environment, the technological equipment of workplaces and the ability of the real economy to transform human capital into productivity growth and innovation activity. In the absence of stable mechanisms of interaction between the education system, the labor market and business, underutilization of qualifications and a limited effect on structural modernization are possible.

Investments in science and innovation in the economy of the Republic of Armenia remain limited and do not fully meet the objectives of technological modernization of the real economy. Government spending on education ranged from 1.94 to 3.42% of GDP in 2008–2023, reflecting support for human capital accumulation, while the share of domestic R&D spending was only 0.18–0.24% of GDP (*Fig. 6*), noticeably below the values of both developed and a number of comparable developing economies. Accelerating the growth of R&D financing in 2022–2023. We can consider it as the formation of initial prerequisites for expanding the research base and strengthening the links between science and production, however, without a steady increase in resources and institutionalization of technology transfer mechanisms, these changes remain fragmented and limit the possibilities of a systemic transition to an innovation-oriented development model.

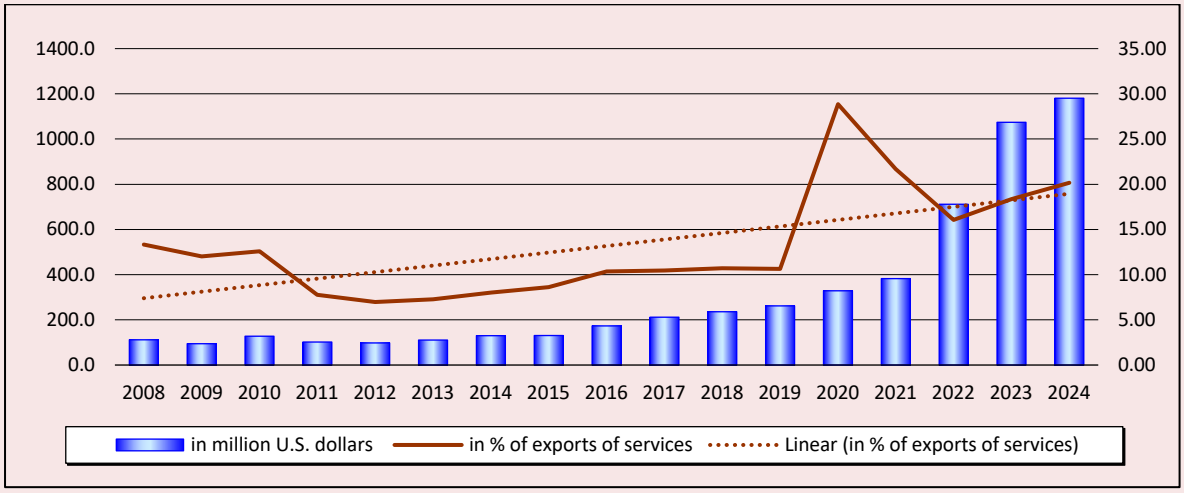
The development of information and communication technologies (hereinafter referred to as the ICT sector) in the Armenian economy reflects the expansion of digital economic activity and the strengthening of the external competitiveness of certain segments of the service sector. Exports of ICT services increased more than tenfold, from 111.61 to 1,180.57 million U.S. dollars in the period from 2008 to 2024 (*Fig. 7*). The share of ICT services in total exports of services reached 16.07% in 2022 and 20.16% in 2024, which indicates the increasing role of the sector of the country's foreign economic specializations. At the same time, the growing ICT share in the export of services is not a direct measure of the technological development of the economy as a whole: technological maturity is determined by the scale of implementation of digital solutions in a wide range of sectors of the real economy and their contribution to sustainable productivity growth. At the same time, the steady increase in exports of

Figure 6. Internal financing volume of research and development in 2008–2023



Sources: Armstat, databases, education and science.

Figure 7. Export volumes of ICT services in 2008–2023



Sources: Central Bank of the Republic of Armenia, databases, balance of payments.

ICT services indirectly indicates the accumulation of technological and human competencies, which, if there are diffusion channels, can support structural modernization outside the ICT sector itself.

The 2020 dynamics are particularly significant, when the share of ICT services in total exports of services increased 2.7 times compared to 2019. Against the background of the restrictions caused by the COVID-19 pandemic, a sharp reduction in the supply of services requiring direct interaction has increased the relative importance of remotely provided services, as a result of which the ICT sector has become a factor in the short-term sustainability and adaptability of the economy, partially compensating for the decline in traditional segments of the service sector.

Thus, the dynamics of the structure of output, employment, labor productivity, and digital activity indicate the transitional and heterogeneous nature of the structural transformation of the real economy of the Republic of Armenia: along with the formation of individual elements of Industry 4.0 and the appearance in certain segments of features correlated with Industry 5.0, lagging industries with characteristics of late Industry 3.0 persist. This leads to the fact that quantitative shifts are only partially accompanied by a comparable qualitative deepening of the technological base and do not ensure a complete transition of the economy from Industry 3.0 to Industry 4.0 at the system level. Econometric modeling is further applied to verify the stability of the identified relationships and assess the contribution of key factors to output dynamics.

ARDL model of the real economy

Since the transition between industrial paradigms at the macro-economic level is manifested not directly, but through a set of indicators, the analysis of the structural transformation of the real economy of the Republic of Armenia requires a quantitative assessment of the factors reflecting the adaptation of the economy to new technological and organizational conditions. Our research conducted a regression analysis using the autoregressive distributed lag (ARDL) to formalize the relationship between the identified structural shifts and the dynamics of output. This type of model is a linear time series model in which dependent and independent variables are taken into account not only in the current period, but also within their lag values.

The ARDL methodology was first proposed by Pesaran and Shin (Pesaran, Shin, 1998), and subsequently refined together with Smith (Pesaran et al., 2001). The general ARDL specification has the form:

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \sum_{i=0}^{k} \delta_i \Delta x_{t-i} + \varphi_1 y_{t-1} + \varphi_2 x_{t-1} + \varepsilon_t , \quad (1)$$

where y_t – dependent variable;
x_t – independent variable;
β_0 – free term;
β_i and δ_i – short-term coefficients;
φ_1 and φ_2 – long-term coefficients;
k – maximum lag level in the model;
ε_t – errors (white noise).

According to international research, ARDL models have been successfully applied for both developed and developing countries, as they allow taking into account both stationary and non-stationary variables without strict requirements for their integration order, as well as identifying short- and long-term effects. For instance, Jangid, Bal and Debata have established a positive long-term relationship between digitalization and economic growth in the G-20 countries and a negative short-term effect (Jangid et al., 2024). At the same time, the development of digital technologies has proved to be particularly significant in the banking and financial sectors, where it increases productivity and reduces information asymmetry, increasing the availability of financial services to the general population.

In contrast, a study by Ngepah, Saba, and Kajewole found a statistically significant negative long-term relationship between the adoption of Industry 4.0 technologies and the added value of the manufacturing industry in South Africa (Ngepah et al., 2024). The authors explain this effect by limited ICT capabilities, insufficient data protection, weak investment in medium- and high-tech industries, as well as institutional gaps in the regulatory system.

The econometric analysis for Armenia was conducted in the EViews 12 program. The quarterly figures of the Statistical Committee of the Republic of Armenia from the first quarter of 2014 to the first quarter of 2025 (45 observations) were used as the database. The choice of time interval is determined by the need to cover key exogenous shocks: the COVID-19 pandemic (2020–2021), the Second Artsakh War (2020), the special military operation (2022–2025), and the resettlement of residents from Artsakh (2023).

Taking into account the aims of the study, the specifics of the available statistical information and the results of a preliminary analysis of the scientific literature, cumulative indicators were used for econometric modeling in relation to the corresponding periods of the previous year (*Tab. 1*). This approach allows for comparability of time series and reduces the impact of seasonal fluctuations in the analysis of structural changes in the real economy.

The real economy includes 20 sections according to the classifier of economic activities of the Republic of Armenia HD-011-2013, dated

Table 1. Indicators for modeling and their designations

Designation	Variable
GDP	Real GDP (index)
ICT	Real growth of activity in the ICT sector (index)
EMP	Employment growth (index)
PROD	Real increase in output per employee (index)
DUMMY	Dummy variable that takes the values 0 and 1
Source: own compilation.	

September 19, 2013[1], therefore, the study uses the cumulative GDP indicator as a generalized indicator of economic activity and the main identifier of macro-economic effects for an aggregated assessment of the dynamics of structural transformation. Alternative aggregated indicators that allow for a comparable assessment of the cumulative impact of structural and digital factors on the economy as a whole are not available within the framework of available statistics or lead to a bias in estimates. The use of cumulative values is due to the features of publishing data on ICT and IT spheres, which in comparable prices are presented mainly in the form of indices for the corresponding periods of the previous year, which required bringing the remaining indicators to a single dynamics format.

When interpreting the ICT indicator, its internal structure is taken into account: until 2019, telecommunications activity prevailed, which limits the interpretation of ICT as a direct indicator of digitalization, but since 2020, the contribution of the IT segment has increased significantly and currently almost triples the share of telecommunications. At the same time, telecommunications retain their independent importance as the infrastructural basis of digital services and an important element of the modernization of the communication system in the post-Soviet period. Since the ICT sector is classified by NACE Rev.2 is part of GDP, and the statistically significant positive relationship between their dynamics is largely pro-cyclical in nature and reflects the co-directional movement of key components of economic activity. Given the limited number of comparable alternatives, the chosen approach makes it possible to assess the contribution of digital activities to the structural transformation of the real economy without distorting the overall macro-economic dynamics.

A dummy variable (*DUMMY*) was introduced into the model to account for periods characterized by sharp deviations of macro-economic dynamics from the trend due to the impact of exogenous factors of various nature. The variable assumed a value of 1 in the quarters 2020Q2–2020Q3 and 2022Q2–2023Q2 and a value of 0 in all other cases. The choice of the period 2020Q2–2020Q3 is due to the impact of the COVID-19 pandemic and restrictive measures, which led to a sharp decline in economic activity, disruption of production chains and supply reduction in a number of industries, which corresponds to the phase of the most severe pandemic shock for the real economy. The inclusion of the period 2022Q2–2023Q2 is associated with the combined influence of geopolitical and migration factors (the consequences of the relocation of the population from the Russian Federation, the forced resettlement of the population from Artsakh, the redistribution of foreign economic flows). Despite the high growth rates of GDP in this interval, the dynamics was characterized by asymmetry and structural heterogeneity, accompanied by jumps in individual indicators, a redistribution of supply and demand, as well as changes in the structure of employment and output, which could distort estimates of stable relationships without the introduction of a corrective indicator.

The stationarity of the time series was verified using the extended Dickey –Fuller test. According to the obtained values (*Tab. 2*), the variables *GPD* and *ICT* are stationary at the 10% significance level, while the variables *EMP* and *PROD* become stationary after the first difference. In accordance with the assumptions of the ARDL model, it is possible to use variables of different integration order, therefore, all indicators in the form of the first difference were included in the analysis.

[1] Classifier of economic activities. Statistical Committee of the Republic of Armenia. Available at: https://armstat.am/file/doc/99560228.docx

Table 2. Values of the extended Dickey – Fuller test

Variable	p-value I(0)	p-value I(1)
GDP	0.0513	0.0009
ICT	0.0534	0.0006
EMP	0.1024	0.0000
PROD	0.2008	0.0000
Source: own compilation.		

Table 3. ARDL model of Armenia's real economy

Variable	Coeff.	St. error.	t-statistics	p-value	
DGDP(–1)	0.218606	0.109895	1.989225	0.0539	*
DICT	0.091139	0.032526	2.801995	0.0079	***
DEMP	0.174139	0.045685	3.811690	0.0005	***
DPROD	0.520105	0.098592	5.275327	0.0000	***
DUMMY	-1.533546	0.737753	-2.078672	0.0445	**
Note: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10. Source: own compilation.					

The optimal specification was selected based on the Akaike criterion. *Table 3* presents the minimum value of the criterion corresponded to the model with the structure (1, 0, 0, 0, 0).

The resulting linear equation has the form:

$$\Delta GDP_t = 0.219 \cdot \Delta GDP_{t-1} + 0.091 \cdot \Delta ICT_t + \\ +0.174 \cdot \Delta EMP_t + 0.520 \cdot \Delta \mathrm{PROD}_t - \\ - 1.534 \cdot DUMMY. \quad (2)$$

The R-squared value of the model was 0.59, and the adjusted R-squared value was 0.55, which indicates the acceptable quality of the specification and explanatory ability of the model.

Since the ARDL/ECM specification is evaluated using the least squares method, the correctness of statistical conclusions (t- and F-criteria) depends on the properties of the residuals, primarily on the absence of auto-correlation and pronounced conditional hetero-scedasticity. In this regard, the Breusch – Godfrey LM test did not reveal a serial correlation of the residuals before the second lag (p-value according to F-statistics = 0.5435). The ARCH-effects test also did not show statistically significant conditional heteroscedasticity (p-value according to F-statistics = 0.660), which confirms the stability of the estimates of standard errors. To complete the diagnostic check, alternative tests for heteroscedasticity (Breusch – Pagan – Godfrey, Harvey, Glazer, and White) were additionally calculated; their p-values for F-statistics were 0.5842; 0.1159; 0.3647; 0.1610, respectively, which does not indicate the presence of persistent disorders that can significantly distort statistical conclusions. The multicollinearity estimate using variance inflation coefficients (VIF) showed values in the range from 1.1257 to 1.3187, indicating the absence of significant multicollinearity and the stability of parametric estimates. The normality of the residue distribution was confirmed by the Jarque – Bera test (p-value = 0.4221). The CUSUM and CUSUMQ tests show that the relevant statistics are found within the 5% confidence limits over the entire observation interval; the graphs do not demonstrate structural breaks or systematic deviations, which indicates the parametric stability of the model (Appendix).

To further verify the correctness of the functional form and the possible omission of significant explanatory variables, the Ramsey RESET test was performed with the inclusion of squares of the predicted (fitted) values in the model specification. The results obtained do not allow rejecting the null hypothesis of correct specification: the p-value for

t-statistics was 0.3763, the p-value for F-statistics was 0.3763, and the p-value of the Likelihood Ratio test was 0.3369). Consequently, there are no significant signs of a functional incorrect specification, missing non-linearities, or the systematic influence of unaccounted-for factors within the framework of the chosen model, which increases confidence in the obtained coefficient estimates and their interpretation.

Checking for a long-term relationship between variables using the ARDL bounds test gave an F-statistic value of 16.6589, which exceeds the critical values for I(0) and I(1) even at a 10% significance level (1.90 and 3.01, respectively). This allows concluding that there is a cointegration dependence and methodologically justifies the transition to evaluating an error correction model for interpreting short- and long-term effects.

Interpretation of the ARDL model results

In the short term, a statistically significant positive impact of digitalization, employment and labor productivity on the real Armenian economy has been revealed. *Table 4* shows that an increase in activity in the ICT sector (ΔICT) by 1% leads to an increase in real GDP of about 0.09%, which confirms the high sensitivity of the economy to the processes of digitalization. Similarly, a 1% increase in employment (ΔEMP) provides an expansion of output by 0.17%, while a 1% increase in labor productivity ($\Delta PROD$) leads to an acceleration of GDP by 0.52%. The results obtained allow concluding that it is the increase in labor efficiency that is the main driver of the short-term expansion of the real economy in the active digital transformation. At the same time, the negative short-term impact of crises was recorded, reflected by a dummy variable (*DUMMY*). During the periods of the COVID-19 pandemic, active migration flows and geopolitical instability, GDP declined by an average of 1.53%. This indicates the high vulnerability of the Armenian economy to exogenous shocks, which significantly limits the possibilities for an accelerated and sustainable transition to a new industrial stage of development.

In the long term, the influence of key factors on the dynamics of the real economy of the Republic of Armenia is increasing, reflecting the cumulative nature of structural and institutional changes. Long-term effects are obtained based on the estimated ARDL model by normalizing coefficients at the levels of explanatory variables in the error correction model (ECM), automatically calculated in the EViews environment, allowing the parameters to be interpreted as stable long-term relationships in the presence of cointegration.

According to the results in *Table 5*, a 1% increase in the ICT sector (ΔICT) is accompanied by an increase in GDP of about 0.12%, an increase in employment (ΔEMP) of 1% leads to an increase in GDP of 0.22%, and an increase in labor productivity ($\Delta PROD$) of 1% provides an increase in output of 0.67%. At the same time, productivity provides the greatest contribution to long-term dynamics, which emphasizes the key role of resource efficiency. Moreover, these estimates should not be interpreted as unambiguous evidence of a deep technological transformation, since productivity growth can be formed by a

Table 4. Short-term effects in the ARDL model

Variable	Coeff.	St. error.	t-statistics	p-value	
DGDP(–1)	-0.781394	0.109895	-7.110371	0.0000	***
DICT	0.091139	0.032526	2.801995	0.0079	***
DEMP	0.174139	0.045685	3.811690	0.0005	***
DPROD	0.520105	0.098592	5.275327	0.0000	***
DUMMY	-1.533546	0.737753	-2.078672	0.0445	**

Note: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10.
Source: own compilation.

Table 5. Long-term effects in the ARDL model

Variable	Coeff.	St. error.	t-statistics	p-value	
DGDP(–1)	-0.781394	0.109895	-7.110371	0.0000	***
DICT	0.091139	0.032526	2.801995	0.0079	***
DEMP	0.174139	0.045685	3.811690	0.0005	***
DPROD	0.520105	0.098592	5.275327	0.0000	***
DUMMY	-1.533546	0.737753	-2.078672	0.0445	**

Note: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10.
Source: own compilation.

combination of structural shifts, recovery processes, and the targeted implementation of organizational and digital solutions.

At the same time, the negative impact of exogenous shocks, reflected by the fictitious variable, persists in the long term: the decline in GDP by an average of 1.94% indicates the presence of sustained structural losses. They are manifested in a weakening of investment activity and modernization processes, limited expansion of R&D and digital infrastructure, as well as the risks of losing skilled labor, which together inhibits the implementation of industrial transformations and slows down the formation of a more technologically complex development trajectory.

Taking into account the presented long-term effects, the constructed ECM takes the form:

$$EC = \Delta GDP - (0.117 \cdot \Delta ICT + 0.223 \cdot \Delta EMP + \\ + 0.666 \cdot \Delta PROD - 1.963 \cdot DUMMY). \quad (3)$$

The coefficient in the equation is -0.781 with a significance level of p = 0.0000, which confirms the existence of a stable long-term relationship between the dynamics of GDP and the factors under consideration.

Discussion

The transformation of the real Armenian economy in 2008–2024 is characterized as a phase of structural adaptation in the context of a change in industrial paradigms, rather than as a "gradual completion" of Industry 4.0. The reduction in the share of agriculture, the growth of the service sector, changes in employment patterns and the expansion of digital activities, including increased exports of ICT services, are consistent with the formation of Industry 4.0 and the trend toward modernization. At the same time, these shifts do not ensure the automatic technological deepening of the real economy: there are still limitations associated with a low share of R&D expenditures, limited investments in innovation, and underdeveloped technology transfer mechanisms, which increases the risk of consolidating technological inertia and dependence on the external environment.

A comparison with international studies shows that such constraints are typical for developing economies and manifest themselves through institutional barriers to innovation, the procyclical nature of growth drivers, and vulnerability to exogenous shocks. In this regard, the priorities of industrial and innovation policy should be focused on the spread of digital solutions beyond the ICT sector, increasing the technological complexity of manufacturing industries and sustainable increase in labor productivity as a key channel of structural transformation. Practical directions include stimulating R&D, developing digital infrastructure and human capital, as well as supporting high-tech industries and building crisis resilience mechanisms, which creates prerequisites for the transition to more human-centered and sustainable development trajectories associated with the principles of Industry 5.0.

Conclusion

The study revealed that the formation of the real economy of the Republic of Armenia traces a

trajectory from the catching-up development of the early 2000s, focused on bridging the technological gap and integrating into foreign economic relations, to the stage of accelerated structural adaptation in the 2020s, accompanied by the expansion of digital activities and the formation of Industry 4.0 infrastructure. These processes have contributed to increased productivity and opportunities for diversification, including through the IT sector and higher-value-added services, but have not eliminated the institutional and investment constraints of the technological expansion of the real economy.

The analysis shows that the observed structural changes – namely the reallocation of value added toward services, shifts in employment patterns, and productivity growth – reflect a transitional phase of transformation in the context of shifting industrial paradigms. The econometric results confirm a statistically significant positive impact of digital activity, employment, and productivity on output dynamics, with labor efficiency making the dominant contribution, while exogenous shocks create long-term constraints by weakening investment activity and slowing modernization processes. Accordingly, advancing toward more sustainable and human-centered development trajectories – associated with the principles of Industry 5.0 – requires a comprehensive industrial and innovation policy: expanding R&D investment, strengthening digital infrastructure, stimulating technological upgrading in manufacturing sectors, and establishing institutions that ensure technology transfer and diffusion, coordination among science, business, and the state, and the resilience of the real economy to external shocks.

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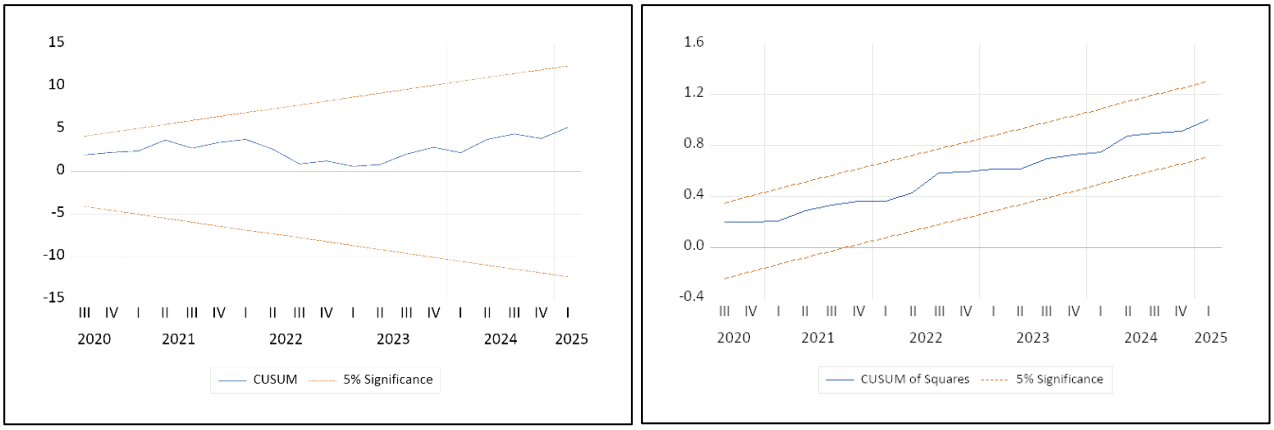
Appendix

Results of CUSUM and CUSUMQ tests



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Public Opinion Monitoring of the State of the Russian Society

Continuing the established tradition of our publication, we present the findings of public opinion monitoring assessments of the state of the Russian society conducted by the Vologda Research Center of the Russian Academy of Sciences (VolRC RAS) in the Vologda Region[1].

The following tables and figures show the dynamics of a number of parameters capturing the social well-being and socio-political attitudes of the region's population, based on the latest monitoring wave (April 2026) and covering the period from April 2025 through April 2026 (the last seven surveys, i.e., one year of measurements).

The findings are compared with annual average data for 2000 (the first year of Vladimir Putin's first presidential term), 2007 (the final year of his second presidential term, when the highest ratings of presidential performance were recorded), 2012 (the first year of his third presidential term), 2018 (the first year of his fourth term), and 2023 (the last full year of his fourth term).

Year-on-year dynamics are presented for 2007–2025[2].

In February–April 2026, the approval rating of the Russian President remained unchanged, standing at 62–64%. The share of negative assessments also remains stable (20–21%)[3].

Over the past twelve months, the share of positive assessments of the head of state's performance declined from 64 to 61%[4].

[1] Surveys are conducted six times a year in the cities of Vologda and Cherepovets, and in Babaevsky, Velikoustyugsky, Vozhegodsky, Gryazovetsky, Tarnogsky, Kirillovsky, Nikolsky, and Sheksninsky municipal okrugs of the region. The survey method is a face-to-face questionnaire administered at respondents' places of residence. The sample size is 1,500 people aged 18 and older. The sample is purposive and quota-based. Representativeness is ensured by maintaining appropriate proportions between urban and rural populations, between residents of different types of settlements (rural localities, small and medium-sized towns), and by matching the gender and age structure of the region's adult population. The sampling error does not exceed 3%.

More detailed information on the results of the surveys conducted by VolRC RAS can be found at http://www.vscc.ac.ru.

[2] In 2020, four monitoring waves were conducted. The surveys scheduled for April and June 2020 were cancelled due to the quarantine restrictions imposed during the COVID-19 pandemic.

[3] Here and throughout all tables, figures, and in the text, green shading indicates positive changes, red shading indicates negative changes, and blue shading indicates no change. Since variations of ±3 percentage points fall within the margin of sampling error, they are treated as statistically insignificant and are marked in blue.

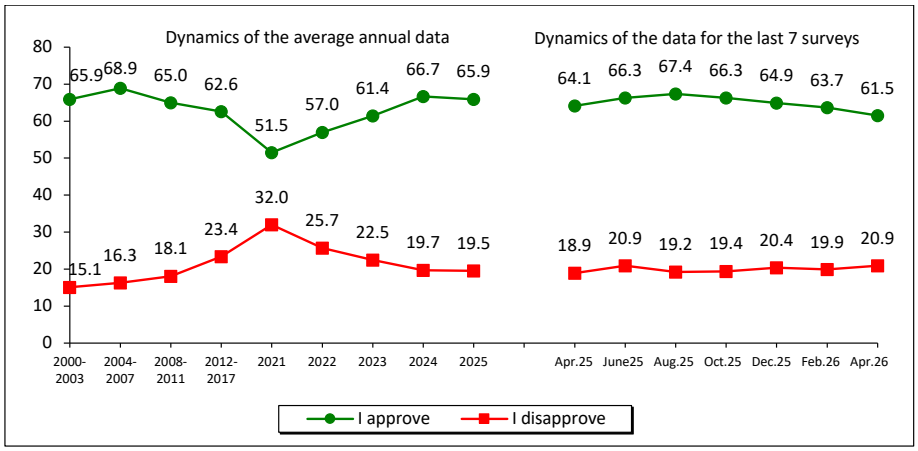
[4] Here and throughout the text, the boxed section presents the results of a comparative analysis of the survey conducted in April 2026 against the findings of the monitoring wave carried out in April 2025.

How would you assess the current work of…? (% of respondents)

Response	Dynamics of the average annual data									Dynamics of the data for the last 7 surveys							Dynamics (+/-), Apr. 2026 to	
	2000	2007	2012	2018	2021	2022	2023	2024	2025	Apr. 2025	June 2025	Aug. 2025	Oct. 2025	Dec. 2025	Feb. 2026	Apr. 2026	Apr. 2025	Feb. 2026
RF President																		
I approve	66.0	75.3	51.7	66.4	51.5	57.0	61.4	66.7	65.9	64.1	66.3	67.4	66.3	64.9	63.7	61.5	-3	-2
I disapprove	14.8	11.5	32.6	21.7	32.0	25.7	22.5	19.7	19.5	18.9	20.9	19.2	19.4	20.4	19.9	20.9	+2	+1
Chairman of the RF Government																		
I approve	–	–	49.6	48.0	39.9	45.4	50.1	54.1	54.4	53.9	53.0	55.1	55.7	54.0	51.1	48.9	-5	-2
I disapprove	–	–	33.3	31.6	37.6	32.0	27.6	24.8	22.5	22.3	22.9	20.6	23.1	22.2	21.3	22.8	+1	+2
Vologda Region Governor*																		
I approve	56.1	55.8	41.9	38.4	36.7	40.9	48.1	51.7	42.5	42.9	39.9	41.0	41.8	42.8	40.2	38.2	-5	-2
I disapprove	19.3	22.2	33.3	37.6	40.5	35.8	30.9	28.4	37.2	34.6	37.2	39.1	41.3	39.3	39.0	41.2	+7	+2

Green shading indicates positive changes, red shading indicates negative changes, and blue shading indicates no change. Since variations of ±3 percentage points fall within the margin of sampling error, they are treated as statistically insignificant and are marked in blue.
The question wording was: "How do you currently assess the performance of...?" Respondents were then offered a list of government bodies at various levels to evaluate, with the answer options: "fully approve", "mostly approve", "mostly disapprove", "fully disapprove", "not familiar with the activities", and "difficult to answer".
* On October 31, 2023, by Decree of the President of the Russian Federation, Georgy Yu. Filimonov was appointed Acting Governor of the Vologda Region. In the regional elections held on September 6–8, 2024, G.Yu. Filimonov received 62.3% of the vote and was elected Governor of the Vologda Region.

How would you assess the way that the RF President is handling his job?
(% of respondents, VolRC RAS data)*



Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
I approve	-3	-2
I disapprove	+2	+1

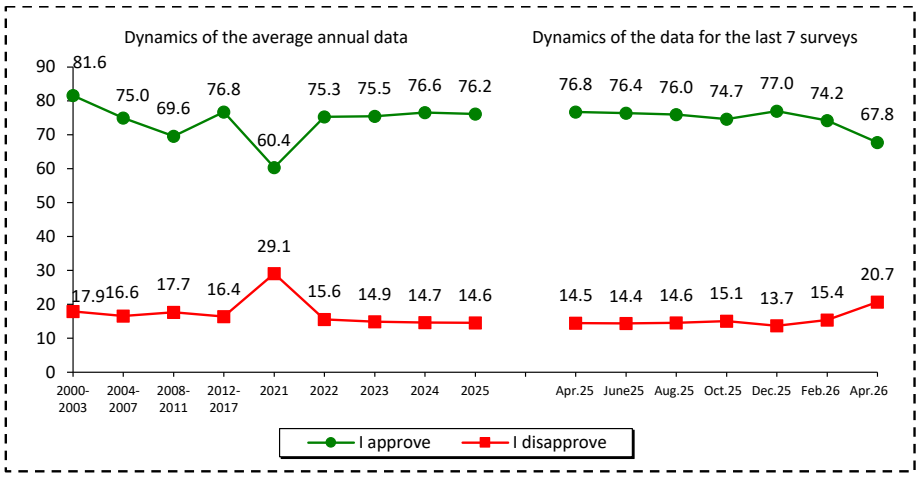
* Here and throughout all figures, annual average data are presented for 2020, 2021, 2022, 2023, 2024, and 2025, as well as annual average data for the periods 2000–2003, 2004–2007, 2008–2011, and 2012–2017, which correspond to the periods of the presidential terms.

For reference:

According to VCIOM data, the approval rating of the Russian President declined from 74 to 68% (by 6 p.p.) over February–April 2026. The share of negative assessments increased from 15 to 21%.

The level of support for the Russian President's performance declined from 77 to 68% (by 9 p.p.) between April 2025 and April 2026.

Do you approve or disapprove of the way that the RF President is handling his job?
(% of respondents; VCIOM data)



Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
I approve	-9	-6
I disapprove	+6	+5

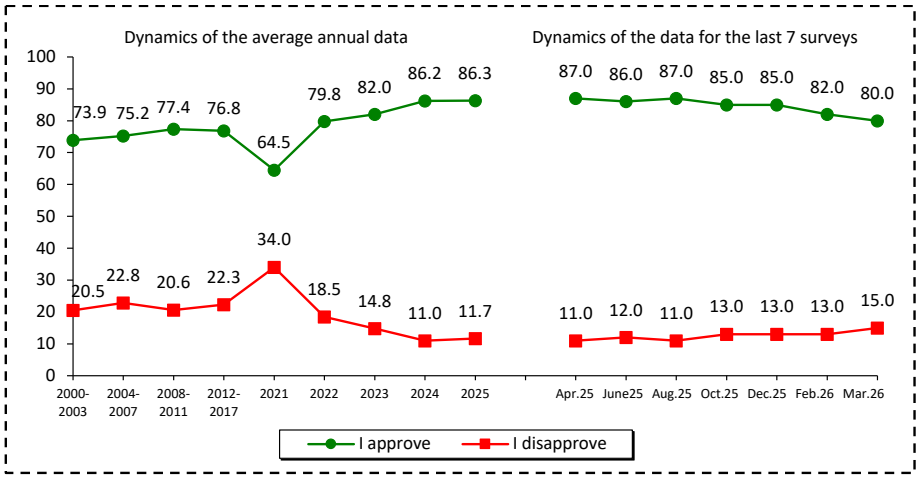
Wording of the question: "In general, do you approve or disapprove of the way that the Russian President is handling his job?"
Data for April – for one survey: as of April 5, 2026.

Source: VCIOM. Available at: https://wciom.ru/

According to nationwide surveys by Levada-Center*, over the past two months (February–March 2026), positive assessments of the Russian President's performance stand at 80–82%, while negative assessments amount to 13–15%.

The approval rating of the head of state fell from 87 to 80% (by 7 p.p.) between April 2025 and March 2026. The share of negative assessments rose by 4 p.p.

In general, do you approve or disapprove of the way that Vladimir Putin is handling his job as President of Russia? (% of respondents; Levada-Center* data)



Response	Dynamics (+/-), March 2026 to	
	Apr. 2025	Feb. 2026
I approve	-7	-2
I disapprove	+4	+2

Wording of the question: "In general, do you approve or disapprove of the way that Vladimir Putin is handling his job as President of Russia?"

Source: Levada-Center*. Available at: https://www.levada.ru/

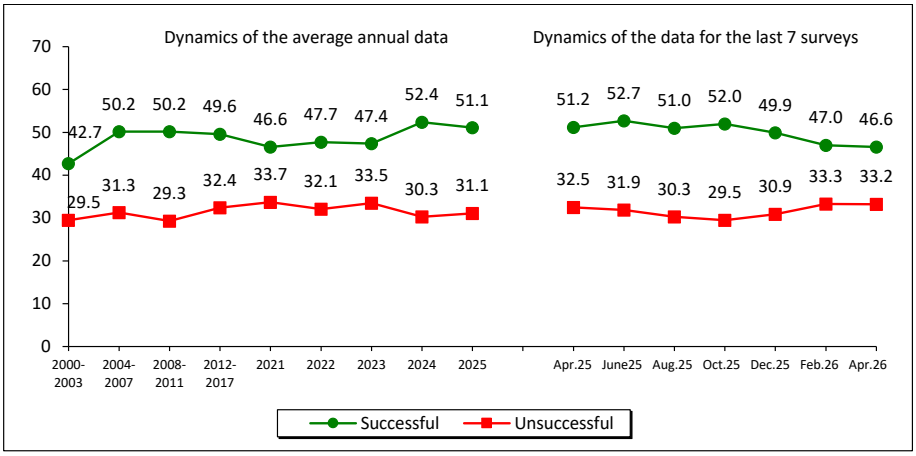
* Included in the register of foreign agents.

In your opinion, how successful is the RF President in handling challenging issues? (% of respondents; VolRC RAS data)

The share of the region's residents who view the head of state's actions to strengthen Russia's international standing as successful remained at the same level over the past two months – 47%. The proportion of people holding the opposite view also remained unchanged (33%).

In April 2026, compared with April 2025, the share of positive assessments of the head of state's performance in strengthening the country's international position decreased from 51 to 46% (by 5 p.p.).

Strengthening Russia's international standing

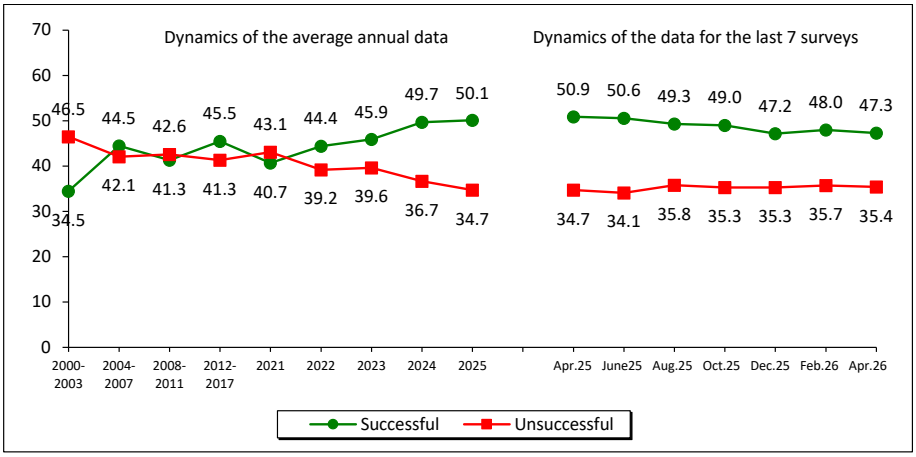


Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Successful	-5	0
Unsuccessful	+1	0

Between February and April 2026, the share of positive assessments by the region's residents of the Russian President's efforts to maintain order in the country remained unchanged at 47–48%. The share of negative assessments also stayed at the previous level (35%).

Over the past twelve months, the proportion of positive assessments declined from 51% to 47% (by 4 p.p.).

Maintaining order in the country

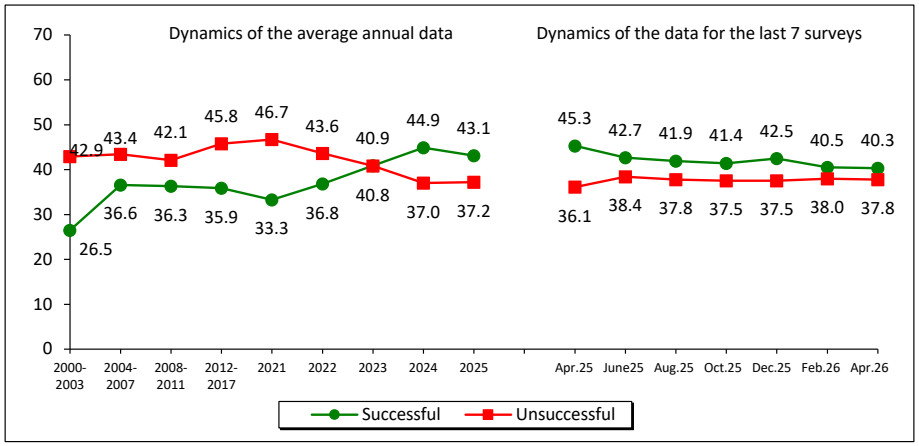


Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Successful	-4	-1
Unsuccessful	+1	0

In April 2026, compared with February 2026, the share of the region's residents who positively assess the Russian President's performance in protecting democracy and strengthening citizens' freedoms did not change, nor did the share of negative assessments.

Over the year of measurements, the share of those approving of the head of state's work in protecting democracy and strengthening citizens' freedoms decreased from 45 to 40%.

Protecting democracy and strengthening citizens' freedoms

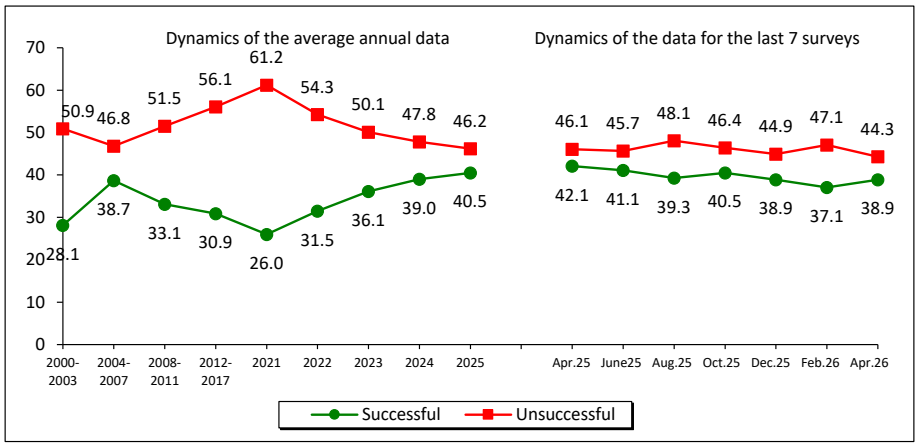


Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Successful	-5	0
Unsuccessful	+2	0

The share of positive assessments of the Russian President's success in addressing the problems of economic recovery and improving citizens' well-being did not change significantly between February and April 2026.

From April 2025 to April 2026, the proportion of positive assessments of the head of state's performance in tackling economic issues declined slightly – by 3 p.p., from 42 to 39%.

Economic recovery and improving citizens' well-being



Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Successful	-3	+2
Unsuccessful	-2	-3

The structure of residents' party-political preferences remains stable. The share of people whose interests are represented by the United Russia party stood at 36%, the Communist Party of the Russian Federation (CPRF) and the Liberal Democratic Party of Russia (LDPR) each at 8–9%, the Just Russia party at 3–4%, and New People at 2%.

Over the past twelve months, the level of support for United Russia decreased from 41% to 36%. At the same time, the share of respondents who believe that none of the parties represents their interests rose by 4 p.p. – from 28 to 32%.

Which party expresses your interests?
(% of respondents; VolRC RAS data)

Party	Dynamics of the average annual data													Dynamics of the data for the last 7 surveys							Dynamics (+/-), Apr. 2026 to	
	2011	Election to the RF State Duma 2011, fact	2012	2016	Election to the RF State Duma 2016, fact	2018	2020	Election to the RF State Duma 2020, fact	2021	2022	2023	2024	2025	Apr. 2025	June 2025	Aug. 2025	Oct. 2025	Dec. 2025	Reb. 2026	Apr. 2026	Apr. 2025	Feb. 2026
United Russia	31.1	33.4	29.1	35.4	38.0	37.9	31.5	49.8	31.7	35.2	39.5	42.9	40.3	40.5	41.6	41.2	40.5	38.1	36.1	35.7	-5	0
CPRF	10.3	16.8	10.6	8.3	14.2	9.2	8.4	18.9	9.3	10.1	9.6	8.9	9.6	8.0	9.1	11.5	10.5	9.7	9.2	8.1	0	-1
LDPR	7.8	15.4	7.8	10.4	21.9	9.6	9.5	7.6	9.9	7.3	7.0	7.1	8.2	7.1	9.4	8.7	7.8	8.6	8.9	7.9	+1	-1
Just Russia – Patriots for the Truth	5.6	27.2	6.6	4.2	10.8	2.9	4.7	7.5	4.7	4.9	4.4	3.5	3.5	2.9	3.9	4.2	3.4	4.1	3.1	4.3	+1	+1
New People*	–	–	–	–	–	–	–	5.3	2.3	1.5	1.9	2.0	2.5	3.0	2.5	1.8	2.2	2.5	2.4	2.3	-1	0
Other	1.9	–	2.1	0.3	–	0.7	0.5	–	0.2	0.3	0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0	0
None	29.4	–	31.3	29.4	–	28.5	34.2	–	33.9	30.6	26.5	25.2	25.8	27.7	24.9	23.3	24.3	26.1	29.1	31.5	+4	+2
Difficult to answer	13.2	–	11.7	12.0	–	11.2	11.1	–	10.0	10.1	11.1	10.3	10.0	10.8	8.5	9.2	11.3	10.7	11.0	9.8	-1	-1

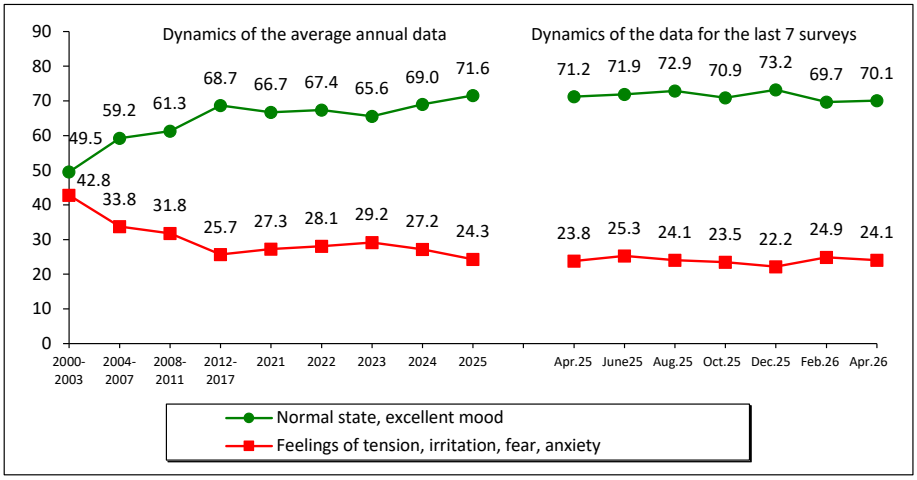
* The New People party first won a seat in the State Duma of the Russian Federation following the elections held on September 17–19, 2021.

Estimation of social condition
(% of respondents; VolRC RAS data)

In February–April 2026, the share of positive assessments of social mood stood at 70%; the share of negative assessments was 24–25%.

Between April 2025 and April 2026, the share of people experiencing positive and neutral feelings ("normal state, excellent mood") remained virtually unchanged at 71–70%. The share of those experiencing negative emotions ("tension, irritation, fear, anxiety") remained at the level of 24%.

Social mood

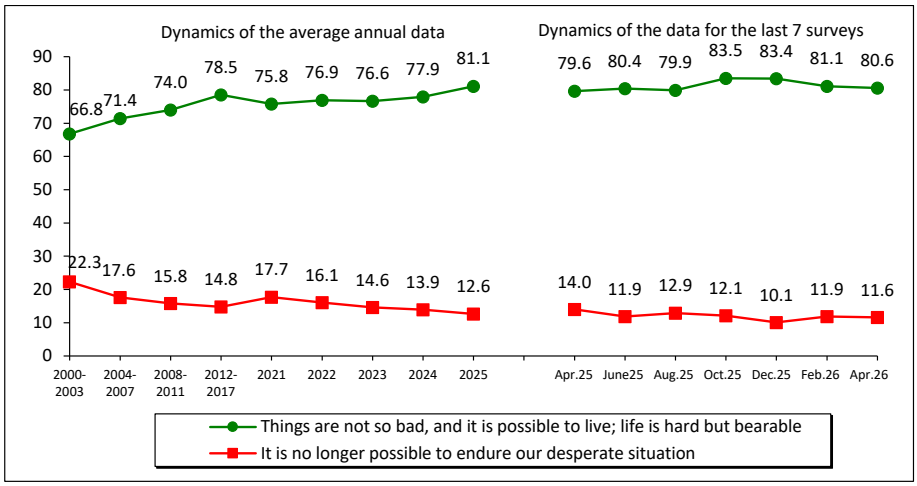


Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Normal state, excellent mood	-1	0
Feelings of tension, irritation, fear, anxiety	0	-1

The reserve of patience remains at a consistently high level: 81% of the region's residents stated in February–April 2026 that "things are not so bad and it is possible to live". The share of those who believe that "it is no longer possible to endure" their desperate situation stood at 12%.

In April 2026, compared with April 2025, no significant changes are observed in the reserve of patience indicator.

Reserve of patience

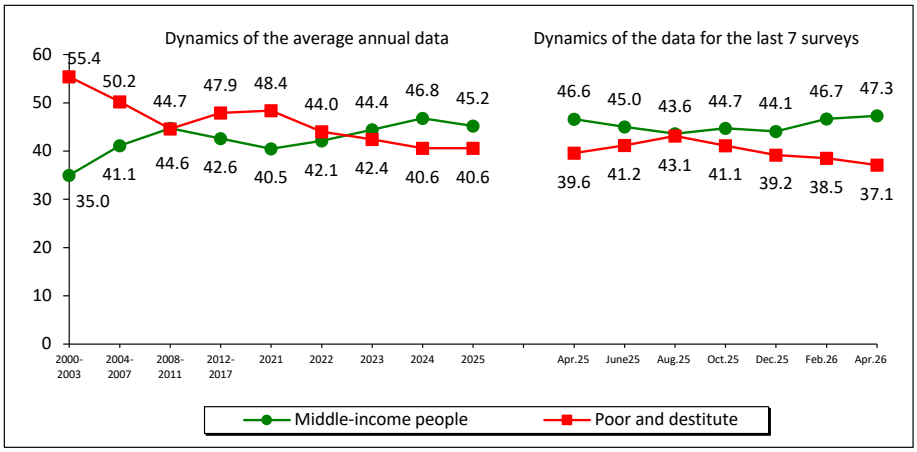


Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Things are not so bad, and it is possible to live; life is hard but bearable	+1	-1
It is no longer possible to endure our desperate situation	-2	0

As in February, in April 2026 the share of the region's residents who subjectively identify themselves as belonging to the "middle-income" category stood at 47%. The share of those identifying as "poor and destitute" also remained unchanged (37–38%).

In April 2026, compared with April 2025, the share of those considering themselves "poor and destitute" decreased by 3 p.p. (from 40 to 37%).

Social self-identification



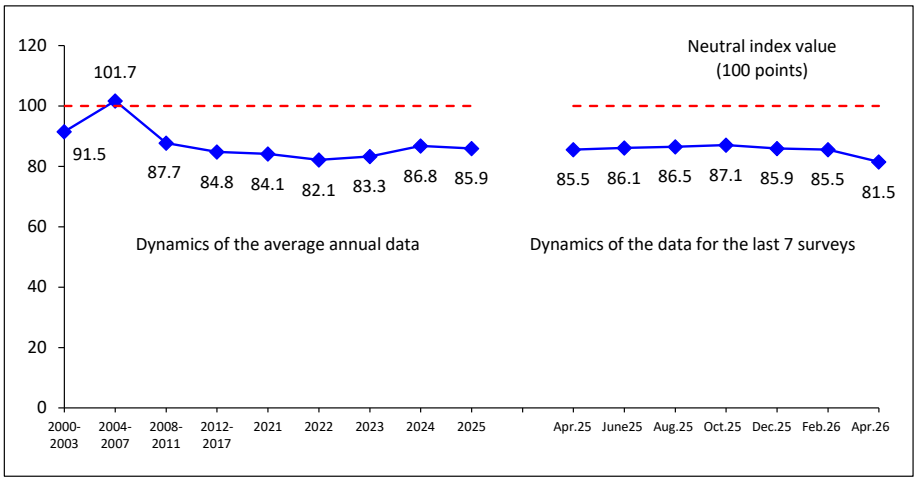
Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Share of those considering themselves middle-income	+1	+1
Share of those considering themselves poor and destitute	-3	-1

Question wording: "Which category do you belong to, in your opinion?"

Between February and April 2026, the value of the Consumer Sentiment Index (CSI) decreased from 86 to 82 points.

The year-on-year dynamics also show a deterioration: the CSI indicator fell from 86 to 82 points.

Consumer Sentiment Index (CSI, points; VolRC RAS data for the Vologda Region)



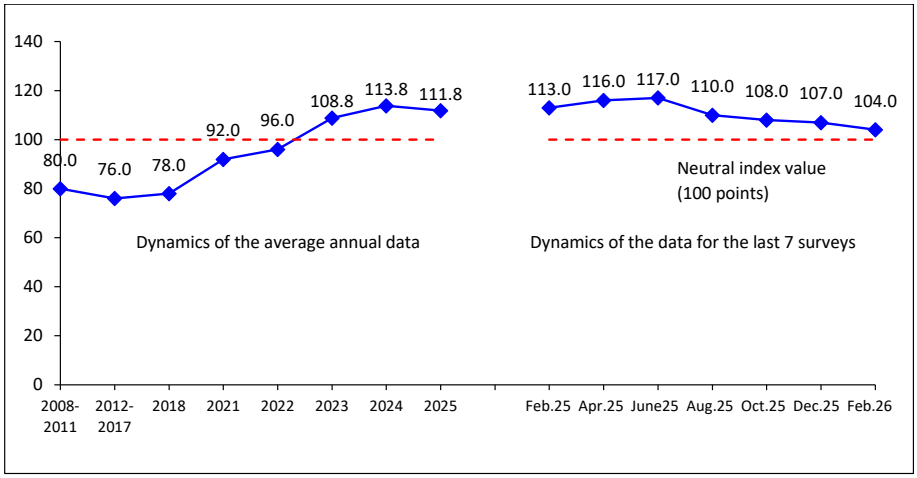
Response	Dynamics (+/-), Apr. 2026 to	
	Apr. 2025	Feb. 2026
Index value, points	-4	-4

For reference:

According to the latest data from nationwide surveys by Levada-Center (for the period December 2025–February 2026), the Consumer Sentiment Index declined by 3 points, from 107 to 104 points.*

Year-on-year (February 2026 compared to February 2025), the CSI fell by 9 points, from 113 to 104 points.

Consumer Sentiment Index (CSI, points; Levada-Center* data for Russia[5])



Response	Dynamics (+/-), Feb. 2026 to	
	Feb. 2025	Dec. 2025
Index value, points	-9	-3

The index has been calculated since 2008.
The latest data are for February 2026.
Source: Levada Center* data. Available at: https://www.levada.ru/indikatory/sotsialno-ekonomicheskie-indikatory/

Between February and April 2026, no significant changes in the dynamics of the share of positive social mood assessments are observed in the majority of socio-demographic population groups, with the exception of the top 20% income group, where the share of positive assessments declined by 4 p.p.

Over the year (from April 2025 to April 2026), the share of positive social mood assessments decreased in 5 of the 14 socio-demographic groups. The greatest decline is observed among young people under 30 (by 9 p.p.), the bottom 20% income group (by 6 p.p.), as well as people with secondary and incomplete secondary education (by 5 p.p.). At the same time, in the majority of groups (9 out of 14), the share of positive assessments remained unchanged.

[5] **Since March 2025, Levada-Center* has updated its CSI data.** The CSI in Russia has been calculated since 1993 based on five questions, similar to the index developed in the 1940s by the Institute for Social Research at the University of Michigan. Individual indices for each question are calculated as the difference between the shares of positive and negative responses plus 100. The aggregate CSI is the arithmetic mean of the individual indices (range 0–200, where >100 indicates a predominance of positive assessments). In 2009, the CSI was pegged to the March 2008 values (base 100%), which was associated with a change in the survey methodology and the economic crisis. However, this led to the index reflecting changes only relative to 2008. From March 2025, a decision was made to revert to the original CSI calculation methodology, abandoning the peg to 2008, since in 2023 many indicators exceeded the 2008 maxima and the old version of the index ceased to adequately reflect the current situation. The return to the original methodology is intended to resolve this problem. Source: Updated Consumer Sentiment Index: February 2025 indicators. Available at: https://www.levada.ru/2025/03/26/obnovlennyj-indeks-potrebitelskihnastroenij-pokazateli-fevralya-2025-goda/

* Included in the register of foreign agents.

Social mood in various social groups (response option "Excellent mood, normal, steady state", % of respondents; VoIRC RAS data)

Population group	Dynamics of the average annual data								Dynamics of the data for the last 7 surveys							Dynamics (+/-), Apr. 2026 to	
	2007	2012	2018	2021	2022	2023	2024	2025	Apr. 2025	June 2025	Aug. 2025	Oct. 2025	Dec. 2025	Feb. 2026	Apr. 2026	Apr. 2025	Feb. 2026
Gender																	
Men	65.9	69.1	72.8	65.7	66.8	65.5	66.5	70.7	68.8	71.6	72.1	68.2	73.3	69.1	71.9	+3	+3
Women	61.7	65.8	69.8	67.4	67.9	65.7	70.9	72.3	73.1	72.2	73.5	73.1	73.1	70.1	68.7	-4	-1
Age																	
Under 30	71.3	72.3	79.9	73.5	77.6	75.0	76.6	76.8	76.7	76.7	78.1	75.2	74.3	69.5	67.6	-9	-2
30–55	64.8	67.9	72.6	69.5	69.4	68.8	71.3	74.3	74.1	74.1	74.9	73.9	78.4	73.6	73.1	-1	-1
Over 55	54.8	62.1	65.2	60.5	61.1	58.2	63.3	66.5	65.8	67.6	68.6	65.9	66.6	64.9	67.5	+2	+3
Education																	
Secondary and incomplete secondary	58.4	57.2	64.8	62.1	64.6	62.0	64.6	67.2	65.6	68.4	70.3	68.4	66.1	60.6	60.4	-5	0
Secondary vocational	64.6	66.7	72.1	66.7	68.3	66.1	70.3	73.6	74.8	74.1	73.6	71.4	75.6	71.6	74.7	0	+3
Higher and incomplete higher	68.6	77.0	76.7	71.5	69.5	68.8	72.3	73.9	73.4	73.0	74.7	73.1	77.6	74.7	74.0	+1	-1
Income group																	
Bottom 20%	51.6	51.5	57.2	54.6	57.0	50.1	53.5	55.2	56.9	56.1	58.3	53.3	50.7	48.2	51.3	-6	+3
Middle 60%	62.9	68.7	72.1	67.3	68.1	67.4	70.7	73.2	72.6	74.4	73.1	73.1	75.2	72.2	72.7	0	+1
Top 20%	74.9	81.1	82.4	79.9	78.3	73.9	77.6	83.6	81.3	84.1	83.8	84.8	89.4	87.7	83.4	+2	-4
Territory																	
Vologda	63.1	73.6	71.0	60.3	59.8	59.6	66.0	70.2	68.6	69.5	72.9	71.4	71.9	68.1	68.8	0	+1
Cherepovets	68.1	76.2	75.7	71.0	71.2	68.1	69.8	73.1	71.5	72.5	75.0	73.2	76.3	73.0	73.5	+2	+1
Districts	61.6	59.8	68.6	67.8	69.5	67.7	70.2	71.6	72.7	73.1	71.6	69.3	72.2	68.7	69.0	-4	0
Region	63.6	67.3	71.2	66.6	67.4	65.6	69.0	71.6	71.2	71.9	72.9	70.9	73.2	69.7	70.1	-1	0
Total number of groups: positive changes / no changes / negative changes																14: 0 / 9 / 5	14: 0 / 13 / 1

SUMMARY

The latest wave of public opinion monitoring was conducted between February and April 2026. On the whole, no significant changes are observed in most indicators over these two months. However, when compared with data from a year earlier (April 2025 vs. April 2026), a buildup of moderately negative dynamics is recorded across a number of key indicators of the region's population's social well-being and sociopolitical attitudes.

Over the year (from April 2025 to April 2026), the approval rating of the Russian President declined slightly, from 64 to 61%. At the same time, the deterioration in assessments affected all key areas of his performance: strengthening Russia's international standing (a decline of 5 p.p.), maintaining order in the country (by 4 p.p.), protecting democracy and citizens' freedoms (by 5 p.p.), and addressing economic issues and improving the population's well-being (by 3 p.p.).

That said, it should be emphasized that the dynamics of Vologda Region residents' attitudes toward the head of state's performance reflect nationwide trends. According to VCIOM data, approval of the head of state fell from 77 to 68% over the year, and according to Levada-Center* data, from 87 to 80%. In this sense, the dynamics of public opinion in the region appear relatively more favorable compared to national trends.

The structure of residents' party sympathies in the region also underwent changes over the year. The level of support for the United Russia party decreased from 41 to 36%. At the same time, the share of respondents stating that none of the parties represents their interests rose by 4 p.p. (from 28 to 32%).

Across the region as a whole, the share of positive and neutral mood assessments ("normal, excellent") remained virtually unchanged over the year, at 71–70%. However, the averaged figures conceal divergent dynamics across socio-demographic groups. The greatest decline in the share of positive assessments was recorded among young people under 30 (-9 p.p.), the bottom 20% of the population by income (-6 p.p.), and people with secondary and incomplete secondary education (-5 p.p.).

Self-assessments of living standards exhibit contradictory dynamics. The share of those considering themselves "middle-income" remained at 47%, while the share of those identifying as "poor and destitute" fell by 3 p.p. over the year (from 40 to 37%). However, the most alarming signal comes from the dynamics of the Consumer Sentiment Index (CSI). Over the year of measurements, the indicator dropped from 86 to 82 points, and over the past two months (February–April 2026) the decline amounted to 4 points. This trend is corroborated by nationwide data (Levada-Center*: an annual decline in the CSI from 113 to 104 points). The deterioration of consumer expectations against a backdrop of stable or slightly declining assessments of current social well-being may indicate the formation of a deferred negative backdrop in the perception of the future – the population is increasingly skeptical about the prospects for improving its prosperity.

Thus, April 2026 marks a transition from a phase of consistently high indicators (characteristic of 2023–2024 and the first half of 2025) to a phase of accumulating negative changes. This suggests that while the external backdrop of social stability is being maintained (high reserve of patience, predominance of positive and neutral mood), there is a growing public demand for changes in the dynamics of living standards and quality of life – a development that is entirely natural against the backdrop of fatigue and the population's habituation to living under the conditions of the special military operation, something experts have been speaking about since late 2025[6].

Prepared by K.E. Kosygina and I.M. Bakhvalova

* Included in the register of foreign agents.

[6] See, for example: Obukhov S.P., Mikhalchuk A.M., Bogachev A.M., Strelkov D.A., Khamadieva T.V., Chervontsev A.V. Results of 2025 from V.V. Putin. Express analysis of the message to Russian society and foreign opponents. Available at: https://kprf.ru/politindx/239901.html?ysclid=mlhmrkgapk916136109

Alfimov V. From salary to victory: How Russian society changed over the year (interview with VCIOM Director V. Fedorov). Available at: https://www.kp.ru/daily/27763.3/5191948/?ysclid=mkgituc55z530676123

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1. The following materials are submitted to the editorial office in electronic form:
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