PROBLEMS OF TERRITORY'S DEVELOPMENT

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Peer-reviewed scientific and practical journal covering a wide range of issues on the socio-economic development of territories.

The journal's primary aim is to provide broad scientific communities and practitioners with the opportunity to familiarize themselves with scientific research findings in the field of scientific support for territorial economies and to participate in discussions on these issues. Key topics include territorial development problems, regional and sectoral economics, socio-economic development of territories, issues of regional budget revenue formation and expenditure rationalization, innovation economics, and current issues in the development of the agro-industrial complex.

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FROM THE EDITOR

ABOUT THE JOURNAL'S DEVELOPMENT CONCEPT: SEARCHING FOR A RESPONSE TO MODERN CHALLENGES

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The development of the global community in the second half of the 20th century was characterized by the expansion and deepening of *globalization* processes. This era saw economic agents (individuals, businesses, and entire states) become integral participants in global economic, socio-cultural, environmental, and other processes, facilitated by the liberalization of economic activity and the rapid development of information, communication, financial, and other technologies.

However, the specific nature of the current stage of geopolitical transformations, which has intensified particularly after 2022, lies in the escalation of *regionalization* processes. This involves major states and their blocs (the European Union, NATO, BRICS+, etc.) protecting their strategic interests. Such tectonic shifts have an objective basis and are linked to the formation and strengthening of new centers of power in recent decades. For instance, in 1992, the G7's[1] share of global GDP at purchasing power parity (PPP) was 45.7%, while that of BRICS[2] (even before its expansion) was 16.5%. By 2022, the G7's share had fallen to 30.3%, whereas BRICS's share had risen to 31.5% *(see Figure)*. Estimates suggest that by 2028, BRICS will account for 36.6%, while the G7's share will decline to 27.8%[3].

According to expert assessments[4], the outcome of this confrontation will be a new *multipolar world* consisting of major macro-zones. In this context, Russia, as a historically

formed Civilization-State (as it was during the times of the Russian Empire and the USSR), can and should aspire to become the organizing center of one such macro-zone – that is, a spatial complex of production and exchange with a population of no less than 250–300 million people.

In addition to geopolitical transformations, the world is currently facing a number of other economic, technological, social, and environmental trends that are rapidly gaining momentum. Foremost among these is the transition of the global economy to the Sixth Technological Paradigm, which entails the accelerated development of new economic sectors (artificial intelligence, platform technologies, the Internet of Things, nanotechnology, biotechnology, genetic engineering, etc.). These sectors drive productivity growth in traditional industries, raise the requirements for the quality of human capital, and form a
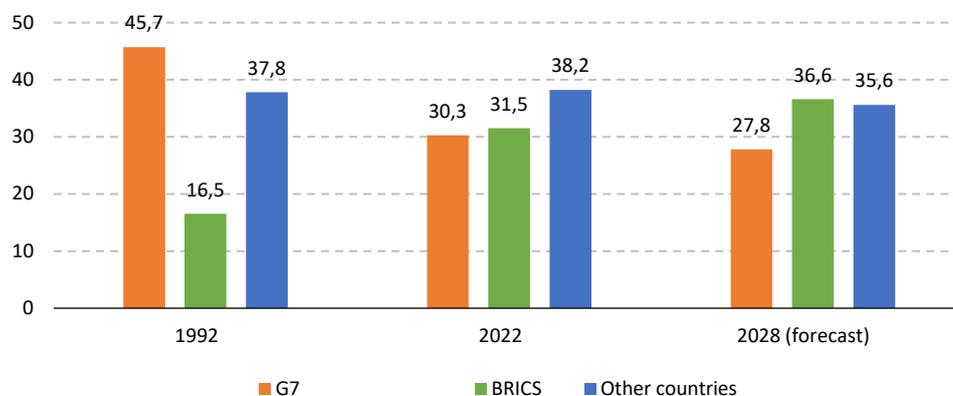
Fig. Share of the G7 and BRICS Countries in Global GDP (at PPP), %
Source: own compilation.

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[1] The Group of Seven (G7) comprises the United States, the United Kingdom, Germany, Italy, Canada, France, and Japan.

[2] The BRICS composition has continually expanded: 2009 – Brazil, Russia, India, China; 2011 – Brazil, Russia, India, China, South Africa; 2024 – Brazil, Russia, India, China, South Africa, Egypt, Iran, the United Arab Emirates, Ethiopia; since 2025 – Brazil, Russia, India, China, South Africa, Egypt, Iran, the United Arab Emirates, Ethiopia, Indonesia.

[3] Address by the President of the Russian Federation to the Federal Assembly of the Russian Federation. 29.02.2024. URL: http://www.kremlin.ru/acts/bank/50431 (accessed: 27.01.2026).

[4] On the Contours of the Long-Term Forecast... and What It Means for the Arctic. CMASF. March 2025; Dugin A. The Civilization-State. Izborsk Club. 31.02.2022. URL: https://izborsk-club.ru/22879 (accessed: 27.01.2026); Fursov A., Titov I. At the Turning Point of Eras: On the Special Operation, the European Union, and the Influence of the Anglo-Saxons. Zavtra. 28.04.2022. URL: https://zavtra.ru/blogs/na_perelome_epoh_fursov (accessed: 27.01.2026).

new system for the spatial organization of the economy. Simultaneously, there is an objective risk of labor displacement, including in low-skilled occupations. In our view, these processes lead to a further intensification of urbanization and a growth in territorial disparities in socio-economic development along the center-periphery divide, necessitating the development of a scientifically grounded approach to finding answers to these challenges.

Environmental challenges are also intensifying, manifesting in global climate change and its increasing impact not only on economic activity but also on human health. In turn, the depletion of natural resources leads to stagnation in a number of cities and other settlements specializing in raw material extraction, as well as the expansion of industrial periphery areas. This underscores the urgency of finding ways to diversify the economies of these territories.

In this context, a multifaceted and dialectical examination of the development features of territorial systems at various hierarchical levels (global, international integration associations, countries, macro-regions, regions, municipalities, urban and rural agglomerations, etc.) amidst escalating global, national, regional, and sectoral challenges holds not only high scientific value but is also particularly crucial for the practice of strategic territorial development management. The ultimate goal of such management should be enhancing the quality of human life and ensuring comprehensive human development.

Furthermore, Russia, as the world's largest country by area, is characterized by significant differentiation among its territories across key socio-economic, socio-cultural, geographic, climatic, and other indicators. This constitutes not only a competitive advantage but also a challenge, highlighting the necessity for increased attention to the spatial aspects of national development. The primary strategic task – finding and securing Russia's geopolitical status as one of the centers in the emerging multipolar world – also requires a spatial dimension. This entails the need to address deep-seated, accumulated problems related to the effectiveness of state governance in territorial development and the clear definition of a sovereign national development course. In our view, these issues should be studied in close connection with the necessity of forging a new social contract within the country—an agreement between the state and major societal groups in line with the pursued course of strengthening Russia's political, economic, and cultural sovereignty[5].

The search for answers to these questions necessitates the scientific substantiation of strategic priorities for the development of the country and its regions. These priorities should be aimed at unlocking endogenous potential and creating conditions for the development of all types of territories, not just the largest cities and major urban agglomerations.

Furthermore, the results of a study conducted by the Vologda Research Center of the Russian Academy of Sciences in May–June 2025[6] indicate that residents of municipal

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[5]   The Constitution of the Russian Federation (adopted by popular vote on 12.12.1993, with amendments approved during the all-Russian vote on 01.07.2020; with amendments as of 04.10.2022), Presidential Decree 809 dated 09.11.2022 "On Approving the Foundations of State Policy for the Preservation and Strengthening of Traditional Russian Spiritual and Moral Values", Presidential Decree 229 dated 31.03.2023 "On Approving the Concept of the Foreign Policy of the Russian Federation", among others.

[6]   The results of a survey of residents of the Vologda Region are presented, broken down by major cities (Vologda, Cherepovets) and a number of municipal okrugs (Babayevsky, Velikoustyugsky, Vozhegodsky, Gryazovetsky, Kirillovsky, Nikolsky, Tarnogsky, Sheksninsky). The sample is quota-based by gender, age, and territory and includes 1500 individuals aged 18 and over. The sampling error for the survey does not exceed 3% with a confidence interval of 4–5%.

okrugs, which are predominantly rural areas, currently give lower ratings for the current state of their locality on almost all key indicators compared to the population of the region's major cities. They are most concerned about the condition of roads (rated only 2.9 points on a five-point scale), street lighting (3.1 points), and the cleanliness of streets and courtyards (3.1 points; *Table 1*).

According to residents of municipal okrugs, the lowest ratings were also given to the availability of healthcare services (hospitals, outpatient clinics, paramedic stations: 3.2 points) and banking/ATM/postal services (3.4 points, *Table 2*). A high demand is observed for auto repair services and the creation of green recreational areas. In general, the situation is more favorable regarding the availability of educational services and sports facilities.

Table 1. Respondents' assessment of the condition of their locality
(2025, average score on a five-point scale: 5 – highest, ..., 1 – lowest)

Assessment criterion	Vologda	Cherepovets	Municipal okrugs*	Region on the whole
Air quality	3.3	2.5	**3.4**	3.1
Landscaping of territories (green spaces)	3.4	3.5	**3.2**	3.3
General condition	3.4	4.0	**3.1**	3.4
Cleanliness of streets and courtyards	3.2	3.8	**3.1**	3.3
Street lighting	3.2	3.7	**3.1**	3.3
Road conditions	3.0	3.5	**2.9**	3.1
* Sorted in descending order of ratings given by residents of municipal okrugs. Source: own compilation.				

Table 2. Assessment of the availability of key social services for locality residents
(2025, average score on a five-point scale: 5 – highest, ..., 1 – lowest)

Assessment criterion	Vologda	Cherepovets	Municipal okrugs*	Region on the whole
Education (pre-school)	3.7	4.1	**3.7**	3.8
Education (school)	3.6	4.1	**3.7**	3.8
Education (additional)	3.6	4.1	**3.7**	3.8
Sports facilities	3.5	3.9	**3.7**	3.7
Food trade enterprises	3.8	4.3	**3.7**	3.9
Culture, leisure (for adults)	3.5	3.9	**3.6**	3.6
Culture, leisure (for children)	3.6	4.0	**3.6**	3.7
Pharmacies	3.8	4.4	**3.6**	3.9
Industrial goods trading enterprises	3.7	4.3	**3.6**	3.8
Catering establishments (cafes, restaurants)	3.7	4.2	**3.6**	3.8
Car service	3.7	4.1	**3.5**	3.7
Parks, green areas, recreation areas	3.7	3.7	**3.5**	3.6
Mail	3.6	4.0	**3.4**	3.6
Banks and ATMs	3.7	4.3	**3.4**	3.7
Healthcare (hospitals, outpatient clinics, medical centers)	3.6	3.5	**3.2**	3.4
* Sorted in descending order of ratings given by residents of municipal okrugs. Source: own compilation.				

Municipal okrugs in the region are characterized not only by low service availability but also by the *low quality of the provided social services*. In particular, the quality of healthcare services received a rating of 3.2 points. The quality of financial and credit infrastructure services (banks, ATMs) is also low (3.3 points, *Table 3*).

An unfavorable living environment and dissatisfaction with one's life are among the factors that shape the migration intentions of the population.

The quality of life in a territory largely depends on the effectiveness of the state's regional development policy.

In July 2020, Decree of the President of the Russian Federation V.V. Putin established Russia's National Development Goals until 2030, which aim to create conditions for comprehensive human development. To achieve these goals, 14 national projects were developed and implemented from 2020 to 2024, focusing on human capital development, ensuring economic growth, and forming a comfortable living environment.

Overall, the region's population notes that the implementation of national projects has a positive impact on improving the comfort of the living environment in the territory. Residents of municipal okrugs see the most noticeable changes in the modernization of social infrastructure facilities (schools, hospitals, kindergartens, etc.): 36% of respondents indicated this; about 30% noted improvements in the amenities of squares and public spaces, and the development of road transport infrastructure *(Table 4)*. Residents of the region's major cities give similar assessments.

The presented data indicates that under modern conditions, the role of the state in solving national development tasks must be decisive, and the implemented state policy should be built upon scientifically grounded methodological approaches. Consequently, scientific research should focus not only on deepening fundamental knowledge but also on ensuring its orientation toward solving practical problems of state and municipal governance.

Table 3. Quality of social services provided to the population
(average score on a five-point scale: 5 – highest quality, ..., 1 – lowest quality)

Assessment criterion	Vologda	Cherepovets	Municipal okrugs*	Region on the whole
Education (school)	3.4	4.0	**3.8**	3.7
Food trade enterprises	3.7	4.1	**3.7**	3.8
Education (pre-school)	3.4	4.0	**3.7**	3.7
Education (additional)	3.5	4.1	**3.6**	3.7
Culture, leisure (for adults)	3.4	3.9	**3.6**	3.6
Culture, leisure (for children)	3.4	4.0	**3.6**	3.6
Pharmacies	3.6	4.1	**3.6**	3.7
Sports facilities	3.4	4.0	**3.6**	3.6
Industrial goods trading enterprises	3.5	4.2	**3.6**	3.7
Parks, green areas, recreation areas	3.5	3.7	**3.6**	3.6
Car service	3.5	4.0	**3.5**	3.6
Catering establishments (cafes, restaurants)	3.4	4.1	**3.5**	3.7
Mail	3.5	3.9	**3.4**	3.5
Banks and ATMs	3.6	4.3	**3.3**	3.7
Healthcare (hospitals, outpatient clinics, medical centers)	3.2	3.1	**3.2**	3.2
* Sorted in descending order of ratings given by residents of municipal okrugs. Source: own compilation.				

Table 4. Population's assessment of the most noticeable positive changes
from the implementation of national projects over the past year, % of respondents

Assessment criterion	Vologda	Cherepovets	Municipal okrugs*	Region
Modernization of social infrastructure facilities (schools, hospitals, kindergartens, etc.)	16.0	33.3	**36.1**	29.7
Improvement of squares and public spaces	34.5	36.9	**29.4**	32.8
Development of road transport infrastructure (repair of roads, bridges, public transport stops)	16.9	34.8	**28.2**	26.8
Landscaping of courtyards	18.1	36.1	**27.5**	27.1
An increase in housing construction	13.1	18.4	**16.8**	16.2
Reconstruction of old buildings and structures	15.5	23.5	**14.8**	17.3
Increasing the number of sports facilities (stadiums, gyms, fitness halls, etc.)	10.7	27.5	**13.0**	16.2
Improving the environmental situation	9.8	1.0	**10.7**	7.9
Increasing the number of cultural and entertainment facilities	12.6	17.4	**9.5**	12.5
An increase in the number of cultural events for all socio-demographic groups	11.4	12.4	**6.9**	9.6
I find it difficult to answer	41.7	28.0	**31.9**	33.6
* Sorted in descending order of ratings given by residents of municipal okrugs. Source: own compilation.				

The aforementioned circumstances underscore the need to revise the core conceptual foundations of the journal "Problems of Territory Development" as one of the country's leading platforms for discussion among scientists, experts, and management practitioners on issues of territorial system development. In this context, we deem it appropriate to outline several ***conceptual theses aimed at clarifying the journal's subject field and its positioning*** among other leading Russian periodicals in regional and spatial economics.

First. The journal is focused on publishing scientific works aimed at the comprehensive study of development problems in territorial systems at various hierarchical levels amidst ongoing geopolitical and other global transformations. Territories can be examined both in a highly general and even abstract sense (i.e., from the standpoint of developing the fundamental foundations of regional and spatial economics) and in relation to the development problems of specific territories in Russia and foreign countries.

Second. Currently, research by domestic and foreign scholars often directs attention exclusively "inward" into the territory, thereby failing to account for global, national, regional, and sectoral challenges and trends that determine and will determine the specific features, problems, and strategic opportunities for territorial development. Considering this, the journal's scientific and discussion platform advocates for a spatial approach to studying territories within the context of ongoing global and national processes and their integration into global and national socio-economic space.

Third. Within the journal's pages, territorial systems are examined as economic, socio-cultural, financial, innovative, institutional, and other spaces where key actors of national development operate: the state (authorities at all levels, political elites), society (socio-

demographic groups and strata), businesses, civil society actors, etc. However, the primary focus of research is on the individual, who, in close connection with their living environment and economic activity, forms a territorial community.

Fourth. Research of high fundamental and practical significance for Russia and its regions is encouraged. Such research should be oriented toward scientific frontiers in both theoretical and instrumental terms and be based on rich empirical data.

The outlined principles of *multi-scalarity* and *interdisciplinarity* shape the journal's research and discussion field, establishing a broad and comprehensive direction for the development of regional and spatial science in a rapidly changing world.

The first issue of the journal this year features articles addressing development problems of territories at various levels: municipality, region, country. The authors' works cover theoretical aspects of spatial and territorial economic processes and relations *(V.N. Lazhentsev)*; a methodological approach to assessing the financial stability of territorial systems at regional and municipal management levels *(I.V. Naumov, N.L. Nikulina)*; a methodology for assessing

regional and sectoral differentiation in corporate social responsibility *(L.V. Babich, S.L. Ivanov)*; a methodological approach to identifying sectoral reserves for labor productivity growth at the regional level *(I.R. Cheplinskite, E.V. Lukin, D.M. Lisenkov)*; key problems of digital transformation in Russian regions and an assessment of its potential as a tool for reducing economic space differentiation *(A.D. Lavrik)*; an assessment of the impact of improved housing conditions on the convergence of urban and rural fertility rates in post-Soviet Russia *(E.L. Domnich)*; regional specifics and an assessment of the impact of population aging on the quality of life and human potential of territories *(A.A. Kolesov)*; spatial-econometric modeling of factors affecting regional labor productivity in China, accounting for population aging *(Jiang Ling)*; and the economic situation in Russia's Northwest in January-November 2025 *(M.A. Sidorov, E.V. Lukin)*.

We invite to collaborate all those interested in expanding scientific knowledge on the problems of territorial system development and its implementation into the practice of state governance at the federal, macro-, and regional levels to achieve the country's national development goals.

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TERRITORIAL ORGANIZATION AND MANAGEMENT

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TERRITORIAL-ECONOMIC PROCESSES AND RELATIONS (THEORY AND ITS PRACTICAL APPLICATION)

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Territorial-economic processes are considered within the framework of the theory of regional organization of the productive forces of society and the formation of territorial-production complexes. The importance of socio-economic structures, which are represented differently in different parts of the country and taken into account in regional policy, is demonstrated. Economic relations are a mechanism for territorial development, regulated by laws and other regulations. Various circumstances play a significant role, sometimes dramatically altering the concept of the spatial configuration of the national economy. The parties to economic relations regarding territorial development are federal and regional government bodies, local governments, and enterprises. The four lines of interaction are revealed: center–region, region–municipality, region–region, and region–enterprise. The primary instrument for regulating these relationships is contracts, including subcontracts and subcontracting. The contractual form of cooperation corresponds to the need for mutual coordination between large, medium and small businesses, as well as the need to "adapt" the location of production to the population settlement system.

Territorial processes, economic relations, lines of communication, economic federalism, local government, interregional cooperation, enterprise, contracts.

Introduction

An earlier work by the author (Lazhentsev, 2024) examined specific relations concerning territory as a resource for the economic activities of households, enterprises, and local and regional governance systems. It was assumed that this sufficed for a scholarly explication of the essence of territorial issues. However, a comprehensive examination of spatial development problems undertaken by the editorial board of the journal "Problems of Territory's Development"[1] revealed new, broader aspects of the territorial organization of the Russian state and its national economy. The issues addressed included federalism, spatial heterogeneity of population well-being, interregional cooperation, the formation of regional governance institutions, the impact of technology on urban development, and others. This served as an impetus to continue the work cited above, now incorporating not only its economic-geographical but also its political-economic and legal dimensions.

Another precondition for writing this article is connected to a fundamental publication by RAS Academician A.G. Aganbegyan, titled "Three Main Socio-Economic Challenges Facing Russia and 15 Response Steps"[2]. Among the strategic problems he examined, the issue of consolidating regions and transitioning them to a system of self-sufficiency, self-financing, and self-governance was identified – a matter that requires broad scholarly discussion.

This article attempts to systematize and critically analyze spatial and territorial economic processes and relations with the aim of improving regional governance.

The conceptual content of spatial and territorial processes

The theory of economic geography rests on three fundamental postulates:

– natural-historical processes of interaction between nature and society give rise to territorial integrated systems of "nature – population – economy" of varying geographical scale;

– the geographical division of labor is accompanied by the economic specialization of countries and regions, the territorial concentration of specific types of production and their combination, as well as intra- and interregional cooperation;

– the spatial structure of the global and national economy is dynamic, albeit with varying degrees of dynamism depending on the level and pace of development of productive forces and social relations.

These postulates warrant reiteration only because their very fundamentality is being transformed at an accelerating pace, giving rise to problems – including the search for new forms of spatial organization of production and of society as a whole. The problematic nature is determined by the simultaneous operation of two groups of factors acting in the direction of both contraction and expansion of socio-economic space.

The first direction is predetermined by the dynamics of the forms and content of the social organization of production. For instance, the concentration of production within a techno-economic paradigm dominated by microelectronic systems and information technologies exhibits entirely different spatial characteristics compared to the "coal and steel" paradigm, with its concentration of industry in gigantic integrated plants, cartels, and trusts. Reductions in unit consumption of energy, raw materials, and supplies, along with positive shifts in consumption patterns, lead to a contraction of economic space and, consequently, to a densification of production and population in regions with favorable climatic conditions.

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[1] Problems of Territory's Development. 2025. Vol. 29. Issue 5.
[2] Economic Strategies. 2022. Issue 6; 2023. Issue 1.

The second direction is associated with the growth in absolute consumption of food, fuel and energy, mineral resources, timber, and other biological resources; with the increasing significance of environmental protection, recreation and tourism, ethno-culture and traditional forms of economic activity; and with the development of transit infrastructure. The expansion of economic space becomes inevitable. Production and population move into new territories, often under unfavorable natural and climatic conditions. Yet even this type of spatial dynamics is undergoing substantial change. Scientific and technological progress makes it possible to minimize social costs associated with the development of new territories through low-labor technologies, high labor productivity in primary, auxiliary, and service sectors, as well as through sustained cooperation between enterprises, regions, and countries.

At present, Russia's main objectives are to preserve territorial sovereignty, ensure the rational allocation of productive forces, manage population settlement and migration, develop backbone transport corridors, utilize space monitoring, and equalize levels of social welfare across its diverse regions. These objectives also encompass issues of ethno-cultural development, geopolitics, and national security. At the regional level, primary attention is devoted to the balanced use of shared resources, the formation of hub-and-spoke networks, and the coordination of economic agents' activities. The local (municipal) economy is closely intertwined with the formation and development of territorial communities and their aspiration to live in prosperity and a favorable environment. In the economy of plants, factories, and other enterprise forms, territory and its resources are regarded as an asset (a fixed asset), whose reproduction is carried out through depreciation of natural capital and private investment in social and environmental infrastructure.

The conceptual content of spatial and territorial relations

The content of these relations is largely predetermined by the geographical location of natural and intellectual resources, historical legacies, technological "transitions", and economic feasibility.

The principal driving force of territorial development is commodity-money relations, which are objective in nature. At the same time, the economy is subject-driven and, to a certain extent, subjective – shaped by the needs and interests of various actors: households, enterprises, the state, and local self-government bodies.

Within the activities of these actors, commodity-money relations assume concrete forms concerning property rights, natural resource management, pricing and tariff policy, monetary circulation, and cross-sectoral and interregional cooperation. Particular attention should be drawn to the regulatory function of the municipal economy, which is oriented not toward profit but toward the growth of collective-use resources and the provision of high-quality social services. It acts as a shock absorber against price and tariff increases by organizing unitary enterprises for the production of socially significant goods.

The totality of such relations constitutes a system, as their counterparties are interconnected as parts of a single process.

Territorially integrated economic entities without formal administrative status – such as nodes, agglomerations, complexes, economic regions, special economic zones, and territories of advanced development (TOR) – typically lack legal personality. Their development depends on the norms and rules of economic governance established at

the national level, as well as on the quality of planning and project organization. Here, the primary benchmark for improving norms and rules is the alignment of economic regulators with the natural-historical process of forming territorial economic complexes as specialized components of the national economy.

The relevance of regulating spatial and territorial economic processes and relations at the present stage

The author concurs with Professor A.N. Shvetsov that the unsystematic, haphazardly formed practice of regional (spatial) policy development has led to arbitrariness, backroom decision-making, and an absence of procedurally regulated justifications (Shvetsov, 2025). For our part, we note that the relevance of a systemic approach increases as territorial complexes themselves become more complex due to:

– the commercialization of structural divisions within state-owned and private corporations – divisions that are fundamental to the entire national economy and system-forming in most industrially developed regions of the Russian Federation;

– the growing number of economic agents connected to flagship, city-forming enterprises, which economically densifies the territory;

– the organizational formalization of environmental protection, social communication environments, and public safety as specialized economic activities;

– the refinement of methods for the economic valuation of space as a factor influencing economic activity.

Each decision-making center makes its own choices regarding its participation in territorial economic processes and relations. However, such decisions become more rational when a comprehensive territorial development plan is in place.

The regulation of territorial processes and relations is grounded in the hierarchical triad: "regularity – law – legal norm". Yet the significance of rules operating beyond statutory law is gradually increasing. This is evident, for instance, in the near-ubiquitous adoption of corporate ethics codes and agreements between regional governments and business entities that explicitly address territorial relations. Documents of this kind substantially supplement the written norms of commercial (entrepreneurial) law.

At the same time, various circumstantial factors play a significant role in current affairs. The configuration of the country's economic framework and its territorial economic systems – shaped by regularities, laws, and rules – can sometimes be drastically altered by circumstances. For example, under the influence of external causes, the Spatial Development Strategy of the Russian Federation for the Period up to 2030 has incorporated the category of "geostrategic territories". These include (in whole or in part) 32 constituent entities of the Russian Federation (out of 89) – border regions of substantial importance for national security (19 in the European part and 13 in the Asian part). As a result, the Eurasian paradigm of Russia's development has acquired a predominantly geopolitical meaning. The economic dimension of the shift to the East is receding into the background.

The significance of natural circumstances is increasing, as global climate warming and rising seismic activity pose threats to the safe livelihoods of millions of people. A natural factor such as the threat of drought in the steppe and forest-steppe zones may, paradoxically, have a positive impact on taiga territories, strengthening the economic positions of regions located there. The challenge of food security will, by necessity, be addressed through the reclamation of northern and eastern agricultural lands.

Both the positive and negative impacts of climate change necessitate preventive measures, substantial financial outlays, the development of a specialized insurance system, and the planning of population adaptation (Porfiriev, 2024). Under the influence of natural processes, the need to strengthen administrative and economic centralism becomes clearly discernible—notwithstanding the long-declared course toward decentralization of state governance and the growing role of local self-government.

The areal organization of the national economy

The propositions set forth above become a kind of guide to action when they are linked to the specific developmental characteristics of particular territories. These characteristics manifest themselves primarily in the multi-structured nature of the economy and its regional diversity.

It is worth recalling that more than a century ago (following the October Revolution of 1917), the tasks of economic development – based on scientific and technological achievements – were addressed with due regard for the actual socio-economic structures in existence: the natural peasant economy; small-scale commodity production; private economic capitalism; state capitalism; and socialism (Lenin, 1921). Areal differences in this multi-structured composition played a crucial role in the implementation of such political undertakings as the development and execution of the GOELRO Plan, the temporary transition to the New Economic Policy (NEP), industrialization and collectivization, the elimination of illiteracy, and others.

Economic relations from an areal perspective were first examined comprehensively and from a scientific standpoint by V.I. Lenin in his work "The Development of Capitalism in Russia" (Lenin, 1899). This study demonstrated the objective necessity of economic regionalization for individual types of economic activity and their territorial combinations, and, most importantly, for the organization of a unified domestic Russian market. Analyzing this work, Professor V.M. Chetyrkin formulated two propositions of fundamental importance for economic geography: (1) the areal organization of society's productive forces is a regularity; and (2) what is regionalized is not things, but the economic relations concerning the creation and use of things (Chetyrkin, 1957).

At the present time, when Russia's economy is justifiably regarded as predominantly capitalist, it would be prudent to reassess the significance of this cited scientific monograph by V.I. Lenin. This is particularly relevant with respect to the theory of surplus value realization within the framework of the domestic market.

The realization of surplus value within a capitalist Russia – historically a subject of debate between Social Democrats and Populists (Narodniks) – is entirely possible provided there exists a ramified production structure, its rational spatial distribution, scientific and technological endowment, the organization of interlinkages between socio-economic structures, and growth in household incomes and purchasing power. Moreover, it is possible under the condition that vertical and horizontal technological linkages are equal in significance, which elevates the role of the territorial factor (Kryukov, Kryukov, 2024). Under such circumstances, the factor of international trade ceases to be the primary means of realizing surplus value generated by the Russian economy.

Russia has undergone and continues to undergo fundamental transformations in its socio-economic development, yet the diversity of economic activity forms across its vast territory has persisted. Thus, the natural economy and small-scale commodity production remain present as enclaves within the overall economic structure – manifesting as individual entrepreneurship, handicrafts, subsistence hunting and fishing, auxiliary household plots, and dacha farming. Alongside historically acquired artisanal skills, a significant role is played by the psychology of survival during the hardships of perestroika,

revolutionary reforms, and the confluence of various adverse circumstances. In this connection, it should be noted that many territories of the North, Siberia, and the Far East lack large-scale industrial production. Their populations subsist primarily on natural economy, traditional trades, and pensions. Yet precisely this state of the economy is often interpreted as post-industrial – a phenomenon justly recorded as a geographical paradox (Treyvish, 2025).

Every country experiences a period during which the leading socio-economic structures shift. In Russia, the state sector of the economy has once again acquired primary importance, its share in GDP over the past decade amounting to 48–56%. According to World Bank estimates, enterprises and organizations subordinate to the state currently produce 71% of Russia's GDP. By the logic of a functioning market economy, however, this share should not exceed 40%. For comparison, according to International Monetary Fund data for 2022, total government expenditures as a share of GDP in the United States are estimated at 37%. Against this backdrop, the general direction is defined as "the transformation of Russia's socio-economic system into a developed system of a market-based private-property economy within the framework of a social state" (Aganbegyan, 2023, p. 9).

The locomotive of the Russian economy at present is constituted by state corporations and public-private companies – the pillars of major cities and agglomerations, and the foundation for the formation of program-targeted territorial production complexes (TPCs). This fact is consistent with contemporary trends in territorial development, but only partially. Beyond the purview of large capital – especially of the state-oligarchic variety – remain many spheres of the economy and peripheral territories with their traditional agricultural, subsistence, and artisanal economies, as well as small and medium-sized businesses. It is precisely into these domains that private capitalist enterprise penetrates, thereby

contributing to the integrated development of districts. This fact, however, does not resolve the difficulty of reconciling a capitalist economy with social justice.

The territorial dimension and regional organization of the economy

All types and forms of socio-economic activity can be examined in a territorial dimension – that is, disaggregated by the country's districts. However, only a certain portion of these activities constitutes a function of the regions themselves.

The territorial dimension of strategic planning is the prerogative of the central government and corporate structures, implemented through the framework of the major economic regions – now superseded by federal districts. This substitution is not equivalent, but it is a reality that must be reckoned with.

The central node of territorial development has become the constituent entities of the Russian Federation: republics, krais, oblasts, the autonomous oblast, and four autonomous okrugs. These have acquired the designation "region", although their essential districtological (raionological) nature remains unchanged: they are districts of oblast-level rank, subdistricts of the major economic regions.

Intra-oblast economic regionalization, once mandatory for the development of district planning projects, has now given way to administrative-territorial transformations of urban okrugs and municipal districts. Nevertheless, it has retained its significance as a method of inter-municipal integration.

At the regional level, territorial development is considerably more detailed than the territorial dimension of the national economy. It is at the regional level that the coordination of individual economic entities takes place with respect to labor and natural resources, energy, water consumption, the construction industry, transport, education and healthcare, culture, and so forth. Land cadastres are compiled, indicating the functional designation of land plots, identifying promising industrial

sites, zones for the disposal of industrial and municipal waste, as well as recreational and specially protected areas. All this information is incorporated into geographic information systems (GIS) and constitutes a crucial object of regional governance.

In addition to regional governments, the aforementioned range of functions involves municipalities and Territorial Public Self-Government (TPSG). However, these bodies also have a "personal" mission of their own. For municipalities, it is the infrastructural provision of the daily livelihoods of the population and the local economy; for TPSGs, it encompasses the formation of homeowners' associations, the planning and improvement of residential areas, landscape architecture, community clean-up days (subbotniks), and other activities characteristic of territorial communities.

Theoretically, it can be argued that the district of oblast-level rank constitutes the basic unit of the territorial organization of Russian society. It is therefore regarded in this study as a kind of starting point for the organization of economic relations along the lines of interaction between the regional government and central authorities, local self-government, other regions, and enterprises.

Center – region: The relations of economic federalism

These relations are enshrined in the Constitution of the Russian Federation in the form of powers and competencies; consequently, their actual implementation is typically assessed against constitutional provisions[3] (Leksin, Shvetsov, 2012; Bukhvald, 2025). From the perspective of our research focus, such a comparison is predicated on an assessment of the ability of the constituent entities of the Russian Federation to ensure their own integrated and balanced development. Scholars and practitioners of regional governance note that this capacity is at a low level and continues to decline. There are specific reasons for this.

Contemporary Russian federalism is characterized by excessive centralization of state power, the saturation of regions with federal agencies, the endowment of constituent entities and municipalities with powers on a residual basis, and the ambiguous position of local self-government in relation to state governance. Constituent entities of the Russian Federation and municipalities are "short-changed" in terms of property ownership, particularly with regard to land, natural resources, and financial resources[4]. This phenomenon is not unique to the Russian Federation. "Young federations, developing countries, and transition economies exhibit a relatively high level of budget revenue centralization and make more active use of vertical transfers" (Kolmak, Sumskaya, 2020, p. 91).

Regional governments seek to increase the volume of federal financing for their regions through "shuttle diplomacy" aimed at securing participation in the formulation and implementation of national programs and projects. Municipalities strive to structure their relations with state authorities so as to obtain as many grants, subventions, and subsidies as possible. In both cases, heads of regions and municipalities approach higher authorities "cap in hand". What was once considered unbecoming has become the norm of economic behavior. The professional competence of managers is assessed by their ability to "muscle out" funding and "cut backroom deals".

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[3] Russian Federalism: Economic and Legal Problems (2008). Institute of Economics, Russian Academy of Sciences; Center for the Economics of Federal Relations; Executive Editor S.D. Valentey. Saint Petersburg: Aletheia. 320 p.

[4] In 2023, the share of gratuitous transfers in the revenues of the budgets of constituent entities of the Russian Federation was: on average – 19.8%; for the city of Moscow – 1.8%; in the Komi Republic – 12.0%; in the Vologda Region – 14.2%; in the Republic of Crimea – 68.0%; in the Chechen Republic – 82.0%. Source: Regions of Russia. Socio-Economic Indicators. 2024: Statistical Compendium. Rosstat. Moscow, 2024. P. 953.

In the revenues of municipal budgets, grants are the primary source. Consequently, municipalities are advised to optimize not the budgets themselves, but rather the financing of local budget deficits and the servicing of debt obligations. It is assumed that municipalities should increase their activity in managing municipal property and in the credit sphere (Kachanova, 2024).

In "classical" federations, disagreements and conflicts between the central government and regions (states, Länder, etc.) are resolved through judicial proceedings. In the Russian Federation, such a procedure, while not excluded, is effectively not applied. The latter is a sign of dysfunction in the system of federal relations, where subordination prevails over coordination.

Academician A.G. Aganbegyan writes: "The essence of radically reforming regional governance lies in transitioning regions to a system of self-sufficiency, self-financing, and self-government. To achieve this, a significant portion of the revenues of enterprises and organizations must be retained in the region, with the share of financial resources remitted to the center greatly reduced. Enterprises and organizations in approximately two-thirds of the constituent entities of the Federation remit to the center taxes and levies substantially exceeding the subsidies and other payments received from the center... Over time, it would be possible to consolidate many regions, forming 20–30 large gubernias and autonomous republics in Russia – three to four times fewer than at present. Without a genuine commitment on the part of each region to boosting its economy and social sphere, and to increasing investment in its fixed and human capital, we will not achieve any significant economic growth" (Aganbegyan, 2023, p. 14).

As can be seen, the areal organization of society, the economy, and governance is a matter of serious consequence. The general direction would seem clear, yet its examination through the prism of current circumstances entails the search for answers to a number of complex questions. Among them are the following:

– Will the federal government be able to fulfill its powers if its budget receives fewer taxes and levies than those retained by the regions?

Presumably, it could –provided the efficiency of the economy itself is substantially increased, thereby expanding the overall tax base.

– Will regional governments and municipalities be able to materialize the revenues of their increased budgets in accordance with the nationwide proportions and trends of socio-economic development? Theoretically, this is possible, provided there is a redistribution of powers increasing the competencies of regions and municipalities, but, above all, on condition that the forms and methods of regional and local governance are fundamentally transformed.

– How should the concepts of "self-sufficiency" and "self-financing" be interpreted when applied to regions? If these concepts are considered within the framework of regional accounting that encompasses the entire economic turnover of a given region, it would appear that the region as a whole constitutes a subject of economic activity. This is a characteristic error – the reification (personification) of the region – whereby the region is credited with achievements or blamed for shortcomings in the process of social reproduction. The region (represented by its government) is, indeed, an economic actor, but only with respect to regional (sub-federal and municipal) property and the powers vested in it.

– What measures are necessary to expand the capacity of the regional government as an economic actor? First and foremost – to increase the volume of regional property and intensify its use on a commercial basis[5]. It is also desirable to systematically organize engagement with monetary and financial institutions – banks, investment funds, stock exchanges, and others. This would enable regional governance to participate in addressing the issue of inter-sectoral and interregional capital flows, without

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[5] For example, sub-federal and municipal ownership of land constitutes only 3.8% of total land ownership in the Russian Federation. Source: State (National) Report on the Condition and Use of Lands in the Russian Federation in 2023. Available at: https://base.garant.ru/410503214/ (accessed: 31.05.2025).

which a capitalist economy itself is considered incomplete[6].

– What changes in the territorial-political structure of the country would be required to introduce gubernias as constituent entities of the Federation into its framework? The author of this article has no substantiated answer to this question and therefore leaves it open. Let us merely record our concern regarding the current circumstance, in which a retreat from the policy of developing the federal form of national statehood in favor of its unitary form is discernible, despite the fact that the economic potential of federal relations has not yet been exhausted (Valentei, 2025). In this regard, the reference by historians to the persistence of the imperial idea among the state and the peoples of Russia serves as a kind of warning (Yachin et al., 2023). However, there is also an authoritative opinion that "the preservation of the existing structure of Russian statehood in its current form is probable, at least in the medium term" (Kolesnikov, Uglanova, 2023, p. 136).

Region – municipality: Relations between state authority and local self-government

Municipal formations are regarded as problematic objects of regional policy (Chistobaev, 2022). One of the problems is the search for an optimal balance between social (civic) and state principles in the organization of territorial economic management at the local level.

In Russia, district and okrug-level municipalities exhibit predominantly state governance characteristics by virtue of their de facto direct subordination to regional authorities. The predominance of civic (social) governance principles has largely remained at the level of rural and settlement administrations, as well as Territorial Public Self-Government (TPSG)

bodies. It follows from this that economic relations between the regional and municipal levels of governance are, in essence, structured as intra-state relations. In such a case, the consolidated budget of a constituent entity of the Russian Federation becomes unitary and must be distributed across the region, its urban okrugs, and municipal districts in accordance with the taxes and levies assigned to them, as well as the normative deductions from the regional budget.

Regional governance is also responsible for organizing inter-municipal cooperation, taking into account the principles, methods, and directions proposed by academic research (Voroshilov, 2021).

Region – region: Interregional cooperation

Under the influence of the entrenched spatial disparities in Russia's national economy and driven by the tendency of constituent entities toward economic autarky, scholarship has come to frame interregional cooperation as any movement toward the unity of the domestic market, including the vast northern territories (Kozhevnikov, 2025). This approach is reasonable; consequently, the unity of Russia's market space should serve as the primary benchmark for organizing interaction between regions.

At the tactical level, the subject matter of interregional cooperation is defined as specific actions in the following areas:

– formation of balanced rural settlement systems;

– natural resource management and environmental protection within the boundaries of large geosystems (physiographic provinces or regions);

– solid waste disposal;

– hydraulic engineering construction on rivers of the first and second order;

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[6] The following fact serves as an illustration. In 2024, Moscow's share was: in the population of the Russian Federation – 9%; in the volume of shipped goods (including works and services) – 11%; in GDP – 20%; in deposits held by credit institutions – 45%, including 66% of legal entity deposits and 32% of individual deposits. Per 1 million residents, deposits in Moscow are 8.6 times higher than the Russian average, including 14.2 times higher for legal entities and 5.6 times higher for individuals. Source: Regions of Russia. Socio-Economic Indicators. 2024: Statistical Compendium. Rosstat. Moscow, 2024. Pp. 45, 465, 574, 995.

Of the 354 head offices of commercial banks in the Russian Federation, 187 (53%) are registered in Moscow; 26 regions have no bank head offices at all (Domashchenko, 2023, p. 139).

– development of interregional power distribution systems;

– construction and repair of "junction" sections of roads;

– fiber-optic communications;

– organization of tourism, sports, and cultural events;

– development of balances of production and consumption of construction materials and locally produced foodstuffs.

The institutional frameworks for managing interregional cooperation include agreements between regional governments and various kinds of alliances. Among the initiatives known to the author, particular significance should be attributed to such examples as the "Komi-Nenets Reindeer Herding Agreement", the "Yenisei Siberia" program, the "Tomsk-Kemerovo Project", and "Northeast Asian Russia". From a scholarly perspective, the Asian Northeast has been examined with particular thoroughness, including a detailed analysis of the mechanisms of organizational and managerial coordination (Krasnopolsky, 2023).

Region – enterprise: Relations between regional authorities and enterprises

In socio-economic development, the foundational relations between regions and enterprises are labor relations (employment and job quality) and fiscal (tax) relations. However, in both the theory and practice of regional governance, direct and indirect regulation is also exercised through regional normative legal acts, monitoring compliance with norms and standards, licensing, economic incentives to attract private investment in the construction and management of educational, healthcare, transport, and energy facilities.

The projection of such relations onto the problematic of territorial development "illuminates" a number of key issues related to the economic behavior of entrepreneurs, the expansion of the operational sphere of small and medium businesses, and the alignment of production siting with population settlement patterns.

Large corporations, as a rule, establish themselves on a territory thoroughly, actively participating in the construction of social and environmental infrastructure. Over time, however, their activity declines, as problems of internal capital reproduction arise. RAS Academician V.I. Maevsky has framed this problematic as a "switching mode of reproduction", wherein the renewal of fixed assets and other capital stock occurs incrementally, reflecting their non-simultaneous aging (Maevsky, 2025).

The "switching" phase requires particular attention from regional authorities, who must understand the specific nature of the moment and refrain from compelling enterprises to engage in excessive territorial development activity. It is also important to ascertain whether the economic behavior of the enterprise itself is aligned with the objectives of technological modernization. One frequently observes instances where an enterprise's depreciation fund is used for purposes other than its intended one – figuratively speaking, "eaten away" – thereby infringing upon the interests of the region. Examples of such corporate misconduct demonstrate how critical the response of regional governments is in defending their regions' interests (Ilyin et al., 2021).

The issue of economic behavior also has an opposite variant, wherein enterprises undertake no territorial development whatsoever. This is frequently observed in the organization of logging operations. "Fly-in" brigades harvest up to 10,000–15,000 cubic meters of timber per year, transporting it outside the region (for instance, to the Moscow suburbs for dacha construction), while contributing nothing to the construction of logging roads or social infrastructure. The region, in turn, receives a paltry share of the revenue from the sale of "stumpage", yet enhances its rating as an "organizer" of small business.

The use of "small business" as a performance indicator for regional governments and municipalities leads to formalism – mere "box-ticking" – but, more importantly, it diverts attention from the actual foundations of organizing this form of production. The classics

of political economy long ago demonstrated the significant role played in the development of large-scale industry by the process of isolating individual production operations within the framework of general cooperation. At present, this occurs by virtue of the economic feasibility of organizing miniature enterprises operating under subcontracting arrangements with a parent firm. Small business is also possible without rigid technological determinism, based instead on subcontracting for the performance of specific types of work not intrinsic to the customer's specialization.

The interrelation of large, medium, and small business is of interest to regional governance with regard to the regulation of the distribution of production across settlement hierarchy levels. In regions where manufacturing industry is concentrated, it is necessary to align head production facilities located in large cities with ancillary and service operations, which it is rational to site in small urban settlements. In the conditions of the Arctic and the North, the scheme of interrelation between enterprises and settlements presupposes the creation of large processing centers for minerals extracted at mines, pits, and fishing grounds within a radius of up to 100–150 km.

Diversification of the production-technological structure of enterprises and the formation of an appropriate topology for the siting of large, medium, and small businesses constitute a critical task for both regional and corporate governance.

Conclusion

The theory of territorial development is a subject of socio-economic geography. It is in this capacity that it continues to evolve, incorporating new characteristics of spatial socio-economic systems. At the same time, the theory derives significant increments from the assimilation of knowledge from adjacent disciplines – knowledge necessary for elucidating the essence of the economic and legal mechanisms governing the siting of society's productive forces.

The transition from theory to practice is effectuated through the concretization of territorial processes and the corresponding economic relations. This can be achieved by various methods, including the method of systematizing relations along four lines of interconnection between the counterparties of regional government: federal authority, local self-government, the leadership of neighboring regions, and corporate governance.

Each of these lines captures a problematic situation in the regulation of economic relations. Federal line: the "short-changing" of regions and municipalities with respect to property and budgetary resources. Municipal line: the ambiguity in the correlation between state governance and self-governance. Interregional line: the lack of awareness of the significance of horizontal cooperation as a social form of economic activity. Corporate (firm-level) line: the multidirectional nature of the economic behavior of enterprises of various organizational forms, and the low level of formalization of their relations with regional governing bodies.

Contracts and agreements play a pivotal role in territorial economic relations. The near-total absence of agreements between federal and regional governments, between regional governments and municipalities, and between neighboring regions for the resolution of specific problems impedes their solution or renders it impossible. There is a need to render more concrete the existing system of contractual relations between regional governments and business structures. Within the framework of corporate governance, the use of subcontracting and sub-supply arrangements should be expanded. This would enable the systematic organization of interconnections between large, medium, and small businesses and would accelerate the process of forming territorial production complexes within the boundaries of existing population settlement systems.

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TERRITORIAL FINANCE

THEORETICAL AND METHODOLOGICAL APPROACH TO ASSESSING THE FINANCIAL STABILITY OF THE SOCIO-ECONOMIC DEVELOPMENT OF TERRITORIAL SYSTEM

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In modern conditions of turbulence of socio-economic development, the study of the financial stability of territorial systems at various levels of government and the search for effective tools for its regulation are becoming relevant. The aim of the study is to develop a methodological approach to assessing the financial stability of the development of territorial systems at the regional and municipal levels of government. To achieve this goal, the following tasks were defined: to identify the features, advantages and disadvantages of applying statistical and economic-mathematical approaches to assessing the financial stability of territorial development at the regional and municipal levels; to develop our own methodological approach. The methodological approach presented in the study involves the systematic use of various methods: statistical indicators (coefficient of variation and standard deviations), reflecting the variability of the dynamics of financial development of the elements of the territorial

socio-economic system (financial institutions, enterprises of all types of economic activity, households and the public administration sector), maps. According to W. Shewhart charts of financial development indicators, to search for control boundaries beyond which indicates a violation of the financial stability of the system's development, regression modeling to assess influencing factors, ARIMA modeling to predict the most likely and alternative scenarios for the deployment of the dynamics of financial stability of territorial systems in the future. Our methodological approach makes it possible to assess the financial stability of the development of all elements of the territorial socio-economic system, as well as to identify its most vulnerable elements, the stability of which is under threat, and in the future to choose more effective mechanisms for stabilizing the financial development of territorial systems at the regional and municipal levels.

Financial stability, financial sustainability, territorial socio-economic systems, statistical analysis, Shewhart charts, economic and mathematical modeling.

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Introduction

Under conditions of sanctions restrictions and geopolitical tensions, the intensification of pro-inflationary factors, and the growing deficit of investment, labor, and other resources, the assessment of the sustainability and financial stability of the development of territorial socio-economic systems, as well as the modeling of factors driving their dynamics, are becoming increasingly relevant. A detailed assessment of the financial stability of these systems at the national, regional, and municipal levels, together with the identification of key risks to its decline, is essential for developing optimal regulatory mechanisms and achieving balanced financial development of territories.

In the scholarly literature, financial sustainability and financial stability in the development of socio-economic systems are often treated by many authors as synonymous concepts characterizing the ability of systems to maintain resilience under the impact of various adverse factors. This approach has been adopted by N.D. Shimshirt (Shimshirt, 2011), M.V. Avdeeva (Avdeeva, 2017), I.N. Gravshina, and N.I. Denisova (Gravshina, Denisova, 2023). Specifically, V.K. Burlachkov considered financial stability as the stability of financial markets and financial institutions, as well as the sufficiency of liquidity and capital of financial institutions to cover potential losses (Burlachkov, 2011). This approach is also shared by the Central Bank of Russia, which defines financial stability as "the resilience of the financial system to shocks and its uninterrupted and efficient functioning"[1]. However, the vast majority of indicators used by the Central Bank to assess the financial stability of territorial systems are better suited for assessing their financial sustainability. These include, for example, the share of household savings held in foreign instruments, the share of unsold housing in multi-apartment buildings under construction, the volume of mortgage and unsecured consumer loans extended to individuals with a debt-to-income ratio exceeding 80%, the household debt service

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[1]   Financial stability of financial markets. Central Bank of the Russian Federation. Available at: https://cbr.ru/finstab/

ratio, and others. This approach complicates the assessment of the financial stability of territorial systems' development.

Nevertheless, the concepts of "sustainability" and "stability" of a socio-economic system are distinct: sustainability characterizes a system's ability to maintain its current, equilibrium state over time under the influence of external factors (shocks); stability characterizes a system's ability to preserve its structure and maintain uninterrupted and efficient functioning despite external impacts. While stable systems are static and unchanging over time, sustainable systems may be dynamic, with their parameters potentially changing over time while preserving the overall sustainability of the system. A stable, time-invariant socio-economic (territorial) system may develop unsustainably. Such a situation is currently observable in the Russian economy: external shocks – caused by sanctions pressure, restrictions on goods exports and technology and equipment imports, rising inflation, and the tight monetary policy of the Central Bank of Russia – have led to a deficit of investment and human resources in the productive sector, the inaccessibility of credit resources, and a decline in the solvency of enterprises and households. That is, they have led to a decline in the financial sustainability of territorial systems. At the same time, their financial stability persists: the financial system – comprising the banking sector, the insurance sector, pension funds, investment companies, and the system of public finance – continues to function in its regular mode.

It is for this reason that the assessment of the financial stability of territorial socio-economic systems requires methodological approaches distinct from those proposed for assessing the financial sustainability of these systems. The present study is devoted to the development of such a methodological approach.

According to our hypothesis, the proposed methodological approach will enable a more systematic assessment of the financial stability of a

territory's socio-economic development by examining all its elements in their totality, revealing factors that exert a negative influence on the financial stability of socio-economic systems' development, and formulating the most probable forecast scenarios of their future dynamics. We assume that the approbation of this approach will make it possible to identify trends of declining financial stability at the regional and municipal levels – trends that have not been detected within the framework of currently applied methodological approaches.

Theoretical and methodological approaches to assessing the financial stability of territorial systems' development

A theoretical review of scholarly works on this topic reveals that the assessment of the financial stability of the development of territorial socio-economic systems predominantly employs two approaches: statistical and economic-mathematical. Statistical analysis involves the assessment of variation in the dynamics of financial development across different elements of the system using indices and indicators, as well as their graphical analysis by means of control charts. Mathematical modeling, in turn, comprises factor analysis of the impact of external shocks on the dynamics of financial development. Let us examine the specific features of the application of these approaches to the assessment of the financial stability of territorial development by Russian and foreign researchers.

The index/indicative approach to assessing financial stability of development has been employed by O.V. Makashina, L.M. Borshch, D.D. Burkaltseva, D.N. Mikhailova, E.A. Zakharchuk, A.F. Pasynkov, M.V. Korotich, P.V. Trunin, M.V. Kamenskikh, and other scholars. For instance, in assessing the financial condition of territories, O.V. Makashina applied a model for assessing the financial sustainability of the budget through a system of indicators characterizing the dynamics of budget revenues and expenditures, tax and

non-tax revenues, intergovernmental transfers, and others (Makashina, 2010). The methodological approach presented in that work assesses the financial stability of the development of only one element of the territorial system – namely, public administration – while ignoring the assessment of the financial stability of economic entities, households, and financial institutions.

The financial stability of regional development, assessed through their financial sustainability, was examined by L.M. Borshch, D.D. Burkaltseva, and D.N. Mikhailova. Their methodological approach, aimed at assessing the budgetary and investment capacity of the regions of the Southern Federal District, likewise presumes the examination of only one element of the system (Borshch et al., 2021).

The indicative methodological approach was employed by P.V. Stroev and other researchers in assessing the socio-economic development and budgetary-financial sustainability of the constituent entities of the Russian Federation (Stroev et al., 2023). However, a significant proportion of the indicators used by the authors characterize not financial, but rather socio-economic development of the regions. The financial sustainability of territories is assessed exclusively from the perspective of budgetary capacity. The same approach to assessing the financial sustainability of regions was employed in the works of T.A. Naidenova and I.N. Shvetsova (who presented a methodological toolkit for the comprehensive assessment of the financial sustainability of budgets of the constituent entities of the Russian Federation) (Naidenova, Shvetsova, 2017); T.A. Zhuravleva, E.M. Semenova, and O.M. Goltsova (who proposed a system of indicators assessing the performance of the regional budget, its financial sustainability, and the balance of its revenue and expenditure components) (Zhuravleva et al., 2021); E.A. Chumakova, O.V. Darelina, and L.V. Shamray-Kurbatova (who proposed an approach to assessing the financial sustainability of a municipal formation through the prism of

criteria depending on the degree of their influence on the economic security of the territory: budget expenditure coverage; decent standard of living; budget balance; limitations on the volume of municipal debt; level of external financing; endowment with investment resources; profitability of organizations) (Chumakova et al., 2022); and A.V. Minakov and T.N. Agapova (who employed indicators of the financial sustainability of budgets of the constituent entities of the Russian Federation) (Minakov, Agapova, 2022).

An integral indicator – the financial sustainability index of small towns, employed by M.V. Korotich – also characterized the budgetary capacity of territories. In its calculation, the author applied such indicators as: the capitalization ratio (sufficiency of the town's own budgetary funds); the maneuverability (mobility) ratio of own revenues, characterizing the volume of tax and non-tax revenues; the financing ratio (the town's dependence on transfers); the ratio of gratuitous receipts; and the budget expenditure efficiency ratio (Korotich, 2014). The integral indicator of financial sustainability itself was assessed by the author using a simple arithmetic mean, without the application of weighting coefficients. A similar methodological approach to assessing the financial sustainability of territories from the perspective of their budgetary capacity – albeit exclusively at the regional level – was proposed by O.B. Ivanova and S.S. Vergun, who developed a rating system for the rapid assessment of the level of financial sustainability of territories, combining quantitative and qualitative evaluative criteria (Ivanova, Vergun, 2014).

The financial sustainability of municipal formations, assessed from the perspective of their budgetary capacity and the unprofitability of enterprises, was also examined by Kh.S. Pak, E.V. Ushakova, and R.V. Bolshakov (Pak et al., 2018). They proposed an integral coefficient of financial sustainability that takes into account: own

revenues and expenditures of the local budget; the level of overdue accounts payable and receivable of enterprises; and the share of unprofitable organizations in the region. The approach they presented does not provide for the assessment of the financial stability of the development of households and financial institutions.

I.N. Gravshina and N.I. Denisova presented a methodological approach to assessing the financial sustainability of a region that considers not only its budgetary capacity but also the dynamics of socio-economic development. The authors proposed evaluating the financial sustainability of a territory using indicators of: gross regional product (GRP) dynamics; per capita money income of the population; unemployment rate; share of unprofitable enterprises; accounts payable of enterprises; volume of their fixed capital investment; and expenditures on innovation activity (Gravshina, Denisova, 2023). However, not all of the proposed indicators characterize the financial sustainability of the territorial system; they are more oriented toward assessing its economic security and do not reflect the financial sustainability of the public administration sector or financial institutions (the banking sector of the economy).

P.V. Trunin and M.V. Kamenskikh, drawing upon a "signal" approach to the selection of indicators as precursors of crisis, compiled a list of indicators capable of providing early warning of impending financial instability. The authors constructed a composite financial stability index, enabling a quantitative assessment of the onset of financial instability. It was found that the probability of financial instability increases nonlinearly as the number of signals generated by the working indicator-precursors grows: if only a small number of indicators signal, the probability of financial instability remains low; however, as alarming symptoms accumulate, the probability of instability in the financial market increases sharply (Trunin, Kamenskikh,

2007). The indicators proposed by the authors assessed, first and foremost, the financial stability of the development of the financial (banking) sector of the economy and of public administration (e.g., current account balance of payments; real interest rate on the interbank lending market; ratio of money supply to gold and foreign exchange reserves; real effective exchange rate of the ruble; GDP growth rate; volume of goods exports; volume of gold and foreign exchange reserves; etc.). The presented methodological approach can be used exclusively for assessing the financial stability of territorial system development at the national level.

A more systemic approach to assessing the financial stability and sustainability of the development of territorial systems was proposed by O.V. Goncharuk and Yu.E. Putikhin. Within their approach, the financial system of a region is conceptualized as an aggregate of interacting and interconnected sectors: the sector of state and municipal finance; the financial sector; and the regional sector of corporate and personal finance (Goncharuk, Putikhin, 2021). However, the indicators presented by the authors characterize the ratio of financial resources of the considered economic sectors to the volume of gross regional product and to the total capital of these sectors – that is, they assess exclusively the financial sustainability of territorial development. Such an approach lacks universality and is applicable solely to the assessment of the financial sustainability of regional systems.

For the assessment of the financial sustainability of territorial systems at the regional level and the development of mechanisms for its stabilization, I.V. Naumov developed a monitoring system comprising: a block of indicators warning of the threat of loss of financial sustainability of a territory at the macroeconomic level; financial and credit indicators of territorial development at the regional

level; and a block of indicators for analyzing the consequences of changes in financial sustainability – a block of indicators characterizing socio-economic sustainability (Naumov, 2013). During the approbation of this system, it was revealed that the methodological approach can be used to assess the financial stability of the development of territorial systems, but exclusively at the regional level, and does not provide for the assessment of the financial stability of the development of the public administration sector (budgetary capacity) of territories.

An Aggregate Financial Stability Index *(AFSI)* was proposed in the work of F. Ahamed and A.R. Chowdhury to assess the "systemic health" and resilience of the financial system of Bangladesh over the period from 2016 to 2024. The index consolidated 19 macro-financial indicators across the real, monetary-financial, fiscal, and external sectors of the economy. Employing a normalized approach to indicator valuation and equal weighting coefficients, the authors aggregated sub-indices to form a composite indicator of financial stability (Ahamed, Chowdhury, 2025). This approach is also not universal, as it does not account for the household sector in assessing the financial stability of territorial development and relies on indicators characterizing the dynamics of financial development of territories exclusively at the macroeconomic level.

E.A. Zakharchuk and A.F. Pasynkov developed methodological provisions for assessing the financial sustainability of local territories based on the construction of a System of National Accounts (SNA). The authors proposed an algorithm for determining indicators of the financial sustainability of a territory using a multidimensional model for identifying its financial flows (Zakharchuk, Pasynkov, 2018). The approach employed by these au-

thors is fundamentally different from those previously considered, as it does not rely on a system of indicators characterizing the financial development of individual elements of the territorial system (enterprises, financial institutions, the public administration sector, and households), but rather presents an entire system of financial flows between them. This system can be used to assess both the financial sustainability and the financial stability of their development.

Based on an analysis of financial stability metrics employed by the world's leading central banks and recommended by international financial organizations, Yu.A. Danilov, D.A. Pivovarov, and I.S. Davydov formulated proposals for the modernization of the system of financial stability indicators used by the Bank of Russia. The authors proposed the introduction of new indicators, such as: yield spreads between two-year and ten-year government bonds in the USA, Germany, Great Britain, Japan, and China; financial conditions indices calculated by international financial organizations, rating agencies, and US Federal Reserve Banks; the stock market volatility index – VIX; the ratio of commercial real estate prices to annual commercial property rent; an indicator of excessive credit growth in the real sector (according to the methodology developed by the World Bank); the ratio of residential real estate prices to annual residential rent; the share of individuals in the total volume of open positions on the exchange market for derivative financial instruments; and others (Danilov et al., 2021). The approach proposed by the authors develops the methodological toolkit for assessing the financial stability of territorial development at the macroeconomic level currently employed by the Central Bank of Russia and, unfortunately, cannot be used at the regional and municipal levels of governance.

The development of a systemic methodological approach to assessing the financial stability of territorial development at the macroeconomic level was also addressed by S.V. Kadomtseva and M.A. Israelyan. They proposed a system of indicators assessing the development dynamics of the corporate and financial sectors of the economy, households, financial markets, and the external sector, and also calculated an early warning index of the potential for financial instability in Russia (Kadomtseva, Israelyan, 2016). The methodological approach developed by these authors is also applicable only at the macroeconomic level.

In addition to the indicative method, other statistical research methods have been employed in assessing the financial stability of territorial development – namely, W. Shewhart's and H. Hotelling's control charts, which graphically reflect the dynamics of the development of the object under study over an extended period of time. By means of horizontal lines plotted on the chart, reflecting the boundaries of the stable state of the assessed process, points at which the system exits its stable, controlled state are identified, and the causes of the disruption of the stability of its development are established. The construction of such control charts is governed by GOST R ISO 7870-2–2015, which establishes the fundamental provisions for the application and interpretation of Shewhart's control charts and corresponding methods of statistical process control[2]. According to V.L. Shper and other researchers, W. Shewhart's control charts are, on the one hand, a powerful, and on the other hand, a technically simple tool for analyzing process variability (Shper et al., 2024). As noted by E.M. Grigorieva, they are intended for monitoring dynamic processes with the aim of their analysis, regulation, and control (Grigorieva, 2023).

The study by V.N. Klyachkin and I.N. Karpunina demonstrated that methods of statistical/graphical analysis of processes are actively employed for assessing the stability of the functioning of technical systems, the efficiency of the organization of production processes, and the quality control of manufactured products. The authors concluded that, when investigating the dynamics of independent indicators, it is optimal to use traditional Shewhart's control charts, while for correlated indicators, methods and algorithms based on H. Hotelling's multivariate statistics and generalized variance are preferable (Klyachkin, Karpunina, 2018). In that work, the authors presented a methodology for constructing such charts, which involves: assessing the operating conditions of analogous systems and identifying possible disruptions in the stability of their functioning; calculating the main statistical characteristics of the process; selecting statistical tools for subsequent control depending on the anticipated disruptions and the level of correlation of parameters; and conducting continuous monitoring of the system's functioning for the purpose of diagnosing stability disruptions.

The principal advantage of control charts lies in the simplicity of their construction and use for diagnosing the controllability and stability of the process under study, as well as for visualizing the points at which the system exits its stable state. The juxtaposition of such charts with the dynamics of changes in the factors influencing the processes under study, and the plotting of key events on the charts that lead to significant changes in the dynamics of these processes, forms a powerful toolkit for identifying the main triggers of system destabilization and for developing and adopting effective management decisions. At the same time, there exist limitations in the use of this method that reduce its

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[2] GOST R ISO 7870-2-2015. Statistical methods. Control charts. Part 2. Shewhart's control charts. Moscow: Standartinform, 2016. 42 p.

effectiveness: the laboriousness of forming time series for assessment (problems of stationarity, comparability of data series, representativeness of the samples used); problems of selecting the method for estimating mean values for constructing the central line on a Shewhart's chart (methods for calculating the arithmetic mean, median, weighted averages, etc., are employed); as well as the problem of selecting the method for calculating control limits displayed on the chart (standard deviations, range of variation, and other methods for estimating the variation of indicator values are used). These methodological issues in the construction of control charts increase the subjectivity of the use of this toolkit in assessing the stability of the financial development of territories.

Researchers have also employed economic-mathematical modeling of the financial stability of territorial development. A methodological approach to the construction of mathematical models in the form of both discriminant and regression equations for assessing financial sustainability was developed by G.V. Polygalov and O.A. Mishchenko. They performed calculations to determine the risk of loss of financial sustainability by municipalities on the basis of discriminant, regression, and neural network analysis (Polygalov, Mishchenko, 2020).

A.G. Vasilyeva and V.M. Gafurova proposed a systemic approach to assessing the effectiveness of managing the financial sustainability of regional systems, based on an economic-statistical method of scientific inquiry – the method of analyzing correlation dependencies between an "integral indicator of financial sustainability" and the "growth rates of indicators of socio-economic well-being" of territorial systems (Vasilyeva, Gafurova, 2016).

To assess the factors promoting financial stability in Nigeria over the period from 2002 to 2021, P.K. Ozili employed two-stage least squares regression and modified ordinary least squares (OLS) methods (Ozili, 2025). In constructing this model, the factors considered included: the volume of assets of the banking sector of the economy; the return on assets of lending institutions; the bank cost-to-income ratio; the number of bank accounts per 1,000 adult clients; as well as GDP growth rates, the unemployment rate, and the inflation rate as control variables. Thus, in this study of the financial stability of territorial development, the author assessed the influence of only one factor – the banking sector of the economy.

Regression analysis and other methods of economic-mathematical modeling have been applied primarily to assess the financial sustainability of territories at the macroeconomic and regional levels. This toolkit is used predominantly by the Central Bank of Russia at the macroeconomic level to identify the most effective instruments of macroprudential policy aimed at preventing the formation of bubbles in the economy and financial sphere and mitigating the consequences of shocks for the economy. Such a toolkit, in combination with W. Shewhart's control charts, opens up broad opportunities not only for assessing the financial stability of the development of territorial systems, but also for forecasting alternative scenarios for the unfolding of their dynamics in the future.

A methodological approach to assessing the financial stability of the development of a territorial socio-economic system

The theoretical review of the literature has demonstrated that the financial stability of the development of territorial socio-economic systems is assessed fragmentarily, with only individual elements of this system being addressed. Most frequently, studies examine the financial stability of the development of individual enterprises and economic sectors, or of credit institutions and the banking sector as a whole, as well as the stability of changes in the

budgetary capacity of territories at the regional and national levels. At the same time, the assessment of the financial stability of the development of households is entirely ignored. Such an approach does not permit an assessment of the financial stability of the development of the territorial socio-economic system as a whole. In this connection, there is a need for the development of a systemic methodological approach that would make it possible to assess the financial stability of the development of all its elements: financial institutions, enterprises of all types of economic activity, households, and the public administration sector. This approach will help to identify the most vulnerable elements of the system – those whose stability of development is under threat – and, subsequently, to select more effective mechanisms for stabilizing the financial development of the territory.

To obtain objective results at the initial stage of assessing the financial stability of the development of these elements, it is proposed to employ an entire system of methodological tools, including in particular: the coefficient of variation, which reflects the variability of the dynamics of the assessed indicators relative to their mean level; and the construction of a W. Shewhart's control chart to identify control limits, exceeding which indicates a disruption of the financial stability of the system's development.

It is proposed to assess the financial stability of the development of each element of the territorial system according to the variation of indicators characterizing their development, with the calculation of an integral indicator aggregating their values. Variation exceeding 33.3% (one standard deviation from the mean) will indicate variability in the dynamics of the assessed indicators over time, while a value exceeding 99.9% will indicate a disruption of stability in the development of the assessed element of the socio-economic system. To calculate the integral indicator of the financial stability of the devel-

opment of an element of the territorial socio-economic system ($\overline{Vl}$), it is proposed to use the geometric mean of their variation (1):

$$\overline{Vl} = \sqrt[n]{V_{i1} * V_{i2} * V_{i3} * \ldots * V_n}, \qquad (1)$$

where

$$V_i = \frac{\sqrt{\frac{\sum (X_i - \bar{X})^2}{n}}}{\bar{X}} * 100\% \quad ;$$

$\overline{Vl}$ – integral indicator of variation of the financial development of an element of the territorial socio-economic system, %;

V_i – variation of an indicator characterizing the financial stability of the development of an element of the system over the considered time period, %;

X_i – indicators used to assess the financial stability of the development of the system's elements;

n – considered period of assessment of the indicators.

Since the variation indicators characterizing the financial stability of the development of a given element of the system are measured in percentages, the geometric mean is the optimal type of integral indicator to be calculated. In its calculation, we do not apply weighting coefficients to the assessed elements, as we consider them to be equally significant characteristics of the financial stability of the socio-economic development of the territorial system.

When assessing the financial stability of the development of enterprises of different economic sectors at the regional and municipal levels, we propose to use the following indicators: absolute liquidity ratio and quick (acid-test) liquidity ratio, reflecting the ability of enterprises to cover short-term liabilities; equity ratio (financial independence ratio), determining the share of equity capital in the total volume of funds from all sources; financial leverage ratio, characterizing the ratio of debt to equity capital of enterprises; equity maneu-

verability ratio, reflecting the share of capital in circulation and not invested in non-current assets; share of short-term liabilities in their total volume; ratio of gross profit of enterprises to the volume of their assets; profitability level of the use of current and non-current assets; provision of enterprises with material and technical inventories and operating capital. These indicators reflect the specific features of the financial development of enterprises in various sectors of the economy and are typically employed by researchers to assess their financial sustainability; the assessment of the stability of their dynamics will make it possible to draw conclusions about the financial stability of the development of this element of the territorial system.

The calculation of the indicators presupposes the preliminary aggregation of data from primary accounting records of enterprises, disaggregated by sector and territory, in dynamics over the last 20 years. For the correct calculation and assessment of the dynamics of the indicators (2), and to take into account the sectoral specificities of enterprises within the territorial system, it is proposed to employ corrective weighting coefficients characterizing the contribution of sectors to the output of products in the territorial system (the share of shipped products of enterprises of each sector in their total volume):

$$V_i = \frac{k_1 * X_1 + k_2 * X_2 + \cdots k_n * X_n}{n}, \quad (2)$$

where

V_i – variation of an indicator characterizing the financial stability of the development of enterprises of all economic sectors in the territorial system, %;

X_i – indicator used to assess the financial stability of the development of enterprises;

K_i – corrective coefficient from 0 to 1, characterizing the share of the sector in the volume of shipped products in the territorial system;

n – number of economic sectors under study in the territorial system.

The list of assessed indicators, should a more detailed study of the stability and sustainability of the development of enterprises be required, can be significantly expanded by including indicators of turnover of current and non-current assets, production inventories, accounts receivable and accounts payable, and the profitability of their use. The aggregation of primary data from enterprises' financial statements makes it possible to conduct a more detailed assessment of the financial stability of their development at both the regional and municipal levels of governance – an undertaking that is difficult when using officially published statistical data.

When assessing the financial stability of the development of the public administration sector at the municipal level, it is proposed to employ the following indicators: share of tax and non-tax budget revenues in the total volume of own budget revenues, %; surplus and deficit of the actually executed local budget, million rubles; share of own revenues in the total volume of budget revenues, %; volume of fixed assets at the end of the year at full book value for organizations of municipal ownership, million rubles; volume of fixed capital investment financed from the local budget, million rubles; share of unprofitable organizations in the housing and communal services sector, %; collection rate of payments for housing and communal services rendered, %; share of repaired local public roads with hard surface for which major repairs have been carried out, %; length of repaired street gas network during the reporting year, m; length of replaced heating and steam networks in double-pipe terms during the reporting year, m; length of replaced water supply networks during the reporting year, m; length of replaced sewerage networks during the reporting year, m.

These indicators are calculated by the Federal State Statistics Service and are presented in the Database of Municipal Formations[3]. They reflect the financial capacity of the territory, the sustainability of its financial development, as well as the dynamics of attracted investments in the development of the engineering infrastructure of territories, and should therefore be used to assess the financial stability of the development of the public administration sector at the municipal level. The list of indicators employed may be expanded, subject to the availability of statistical data. To calculate the integral indicator characterizing the financial stability of the development of this sector of the economy, it is proposed to employ Formula (1) without the application of weighting coefficients.

When assessing the financial stability of the development of the public administration sector at the regional level, the following indicators should be employed: ratio of revenues to expenditures of the budget of a constituent entity of the Russian Federation; share of taxes, fees, and other mandatory payments received in the total volume of budget revenues of a constituent entity of the Russian Federation, %; share of receipts from the Pension Fund of the Russian Federation and the Social Insurance Fund in the total volume of budget revenues of a constituent entity of the Russian Federation, %; ratio of public debt to the volume of budget revenues received by a constituent entity of the Russian Federation; volume of debt securities issued by a constituent entity of the Russian Federation, million rubles; volume of loans received by a constituent entity of the Russian Federation from credit institutions, foreign banks, and international financial organizations, million rubles; volume of budget loans received by a constituent entity of the Russian Federation from other budgets of the budgetary system of the Russian Federation, million rubles; volume of state guarantees issued and other debt securities, million rubles.

Their use will make it possible to assess not only the financial stability of the dynamics of the budgetary capacity of Russia's regions, but also the level of their budget security. A value of the integral indicator exceeding triple the standard deviation from the mean will indicate a destabilization of the financial development of a constituent entity of the Russian Federation, reflecting a significant increase in its budgetary capacity driven by a rise in public debt.

To calculate the integral indicator characterizing the financial stability of the development of financial institutions at the regional level, it is proposed to employ the following indicators: number of credit institutions and their internal structural subdivisions (branches) in a constituent entity of the Russian Federation, units; share of unprofitable credit institutions in a constituent entity of the Russian Federation, %; volume of funds attracted by credit institutions from organizations, and bank deposits of legal entities and individuals, million rubles; volume of issue of equity securities of Russian issuers (shares and bonds), including those of credit institutions, million rubles; volume of loans granted to legal entities – residents and individual entrepreneurs, million rubles; volume of loans granted to individuals – residents, million rubles; volume of debt on loans granted to legal entities – residents and individual entrepreneurs, million rubles; volume of debt on loans granted to individuals – residents, million rubles.

The statistical data necessary for the assessment of these indicators are published by the Central Bank of Russia disaggregated by region, taking into account the presence of internal structural subdivisions (branches) of federal banks in the constituent entities of the Russian Federation. At the municipal level, the assessment of the financial stability of the development of financial institutions is complicated, since statistical data and annual financial reports are submitted by these institutions in a consolidated form, without disaggregation of data by territorial subdivisions.

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[3] Database of Municipal Formations. Available at: https://rosstat.gov.ru/dbscripts/munst/munst65/ DBInet.cgi#1

In assessing the financial stability of the development of territorial socio-economic systems, a crucial aspect is the study of the stability of the development of households. It is households that are the final consumers of goods produced and services rendered in territorial systems, and they shape the budgetary capacity of these systems. A disruption of the financial stability of their development may create threats of a decline in the financial sustainability of enterprises, the banking sector of the economy, and the public administration sector.

When assessing the financial stability of the development of households at the municipal level, the indicators presented in the Rosstat Database of Municipal Formations may be employed, including in particular: average number of employees of organizations; average monthly wage of employees of organizations; volume of overdue wage arrears of employees of organizations; number of families receiving subsidies for the payment of housing and utilities during the reporting period; volume of social payments to the population; share of the population residing in apartment buildings recognized as unfit for habitation in accordance with established procedure; and others.

When assessing the financial stability of the development of households at the municipal and regional levels, a broader range of indicators may be applied, characterizing not only the level of their money income, but also their indebtedness (credit burden). In particular, it is proposed to employ the following indicators: volume of deposits of individuals attracted by credit institutions, million rubles; volume of loans granted by credit institutions to individuals, million rubles; volume of housing loans granted by credit institutions to individuals, million rubles; volume of debt of individuals on loans in rubles and foreign currency, million rubles; median per capita money income of the population, thousand rubles; population with money incomes below the poverty line/subsistence minimum, persons; volume of subsidies granted to citizens for the payment of housing and utilities, million rubles.

The coefficients of variation calculated for the above indicators, and the integral indicators aggregating their values for enterprises, financial institutions, the public administration sector, and households, will make it possible to assess the level of financial stability of their development that has been observed over the entire time period under consideration.

It should be noted that a significant proportion of the presented indicators for assessing the financial stability of a territorial system (indicators expressed in monetary terms) exhibit a wide range of variation, and the longer the time series used to calculate the coefficients of variation, the higher the calculated values of the coefficients. This complicates the assessment of the financial stability of the elements of the territorial system. Therefore, for the correct calculation of the coefficients of variation, a preliminary adjustment of monetary indicators for inflation is presupposed, as well as the use of the geometric mean in calculating the integral indicator of financial stability, which mitigates the negative consequences of significant volatility of indicators.

To assess the dynamics of changes in indicators of their financial development over time and to identify turning points indicating a disruption of the stability of the assessed processes, the next stage of the study proposes the construction of W. Shewhart's control charts *(Figure)*. The central line of this chart characterizes the mean (median) value of the assessed indicator over time, while the upper and lower limits, located at a distance of three standard deviations ($\pm3\sigma$) from it, constitute the control limits, exceeding which signals a disruption of the stability of the process.
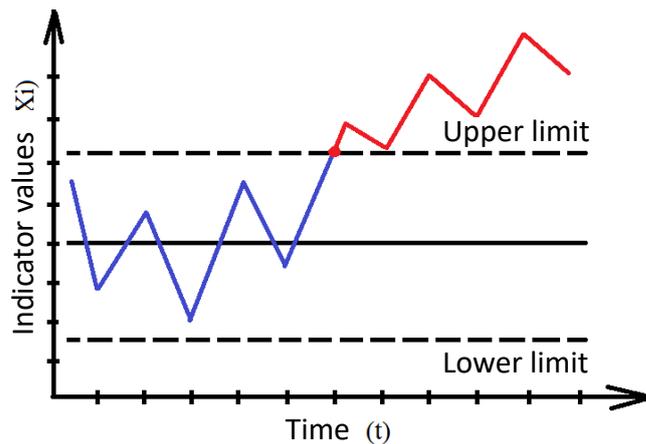
Fig. W. Shewhart's control chart
Note: own compilation.

According to such a chart, stable financial development of elements of the socio-economic system is observed within the specified control limits, and the closer the values of the assessed indicators approach the central line, the more stable their dynamics. A disruption of the stability of the dynamics of the assessed processes is signaled not only by exceeding the control limits, but also by the formation of a sustained (prolonged) upward or downward trend in its dynamics.

In practice, various modifications of this chart are applied: with intermediate warning lines between the central and control lines (at a distance of one or two standard deviations); using the range of variation or individual values of moving ranges instead of standard deviations; and also using the median level instead of the arithmetic mean when determining the central line. To simplify the process of assessing the financial stability of the development of enterprises, financial institutions, the public administration sector, and households, it is proposed to construct standard Shewhart control charts for all assessed indicators — with the calculation of the mean value for plotting the central line on the chart and three standard deviations for determining the control limits (see Figure):

Values of the assessed indicators falling within the range presented in equation (3) will indicate moderate variability of their dynamics and the financial stability of the development of the assessed element of the territorial system:

$$\bar{X} - 3 * \sqrt{\frac{\sum(X_i - \bar{X})^2}{n}} < X_i < \bar{X} + 3 * \sqrt{\frac{\sum(X_i - \bar{X})^2}{n}}. \quad (3)$$

Values falling outside this range (the control limits) signal a disruption of the financial stability of the development of the assessed element of the system.

Since an important aspect in assessing the stability of the development of any socio-economic system is the study of the risks (external shocks) that destabilize its development, the next stage proposes to assess the influence of factors on the dynamics of key indicators characterizing the financial development of the considered elements of the territorial socio-economic system. A list of such indicators is presented in the *Table*.

In constructing such models, it is proposed to employ two types of indicators as dependent variables (*Y*), characterizing, on the one hand, the financial performance of the development of elements of the territorial socio-economic system, and on the other hand, their financial sustainability.

Table. List of variables for regression modeling of the dynamics of financial development of enterprises, households, financial institutions, and the public administration sector in the territorial system

Dependent variables (Y)		Factors assessed in the regression model (X)
Enterprises	Absolute or quick (acid-test) liquidity ratio	Level of financial independence (equity ratio) of enterprises Turnover of current assets of enterprises Provision of enterprises with inventories and operating capital Profitability (unprofitability) of sales, % Profitability of the use of current assets, % Interest rate on bank loans for legal entities in Russian rubles, %
	Profitability of core activities of enterprises, %	Inflation rate in the region, % Foreign exchange rate (US dollar), RUB Labor productivity at enterprises, RUB/person Volume of fixed capital investment, RUB Depreciation of fixed production assets, % Number of advanced production technologies developed, units Volume of exports of technologies and technical services, RUB
Public administration	Surplus / deficit of the actually executed budget of the municipal formation	Inflation rate in the region, % Foreign exchange rate (US dollar), RUB Weighted average interest rate on bank loans for legal entities and individuals, % Number of economically active population in the region, persons Volume of fixed capital investment by enterprises, RUB Volume of fixed capital investment carried out by organizations located in the municipal formation, million RUB Volume of expenditures on innovation activities of organizations, million RUB
	Share of own revenues in the total volume of budget revenues of the municipal formation, %	Share of profitable organizations in the municipal formation, % Volume of shipped goods of own production, works and services performed in-house, million RUB Number of economically active population in the region, persons Volume of non-current assets of enterprises, million RUB Volume of residential buildings commissioned, sq. m Number of municipal unitary enterprises in the municipal formation, units
Households	Average monthly wage of employees of organizations, thousand RUB	Inflation rate in the region, % Average number of employees of organizations, persons Migration increase in the municipal formation, persons Volume of shipped goods of own production, works and services performed in-house, million RUB Profitability of core activities of enterprises, % Labor productivity at enterprises, RUB/person Volume of accounts receivable of enterprises, million RUB
	Volume of debt of individuals on loans in rubles and foreign currency, million RUB	Weighted average interest rate on bank loans for individuals, % Level of wage arrears of enterprises, million RUB Share of unprofitable organizations in the municipal formation, % Volume of accounts receivable of enterprises, million RUB Level of financial independence (equity ratio) of enterprises
Financial institutions	Volume of funds attracted by credit institutions, bank deposits, million RUB	Weighted average interest rate on bank deposits for legal entities and individuals, % Average monthly wage of employees of organizations, thousand RUB Profitability of core activities of enterprises, % Share of profitable organizations in the municipal formation, % Provision of enterprises with inventories and operating capital
	Volume of debt on loans granted to legal entities and individuals, million RUB	Inflation rate in the region, % Turnover of current assets of enterprises Level of financial independence (equity ratio) of enterprises Absolute liquidity ratio of enterprises Volume of accounts receivable of enterprises, million RUB Volume of administrative and commercial expenses of enterprises, million RUB

Source: own compilation.

Thus, for the construction of a regression model assessing the influence of internal and external factors on the dynamics of the financial development of enterprises of all economic sectors within the territorial system, it is proposed to employ as dependent variables: the indicator of profitability of core business activities and the absolute or quick (acid-test) liquidity ratio, which characterizes the sufficiency of liquid assets to cover short-term liabilities – that is, the level of their solvency. At this stage, it is also planned to construct regression models assessing the influence of both external and internal factors on: the dynamics of the volume of surplus/deficit of the actually executed budget of municipal formations and the share of own revenues in their total volume – reflecting the level of budgetary capacity of territories and the risks of its decline; the influence of factors on the dynamics of the average monthly wage of employees of organizations and the debt of individuals on loans in rubles and foreign currency; and on the dynamics of the volume of funds attracted by credit institutions, bank deposits, and the debt on loans granted to legal entities and individuals.

Thus, Table 1 presents indicators that may generate risks of a decline in the financial stability of the development of the considered elements of the territorial system, and which are available in statistical databases. Their list may be substantially expanded when constructing regression models.

The constructed regression models will make it possible to identify the main factors driving changes in the financial stability of the development of enterprises, public institutions, households, and credit institutions, as well as to formulate, as a result of applying stress-testing of model parameters, forecast scenarios of

changes in their financial stability. For the formulation of such scenarios, it is proposed to employ autoregressive moving average modeling – *ARMA/ARIMA* (depending on the stationarity or non-stationarity of the time series). The forecast bounds of the factors established as a result of modeling, with a 95% confidence interval, may be used to formulate the most pessimistic and most optimistic scenarios of changes in the dynamics of the financial development of the assessed elements of the territorial socio-economic system. In the course of stress-testing the model parameters, it is proposed to combine the forecast values for all factors within the established ranges to formulate alternative forecast scenarios of changes in the dynamics of the financial development of the system's elements.

Thus, the presented methodological approach, in contrast to those currently applied, presupposes a systemic assessment of the financial stability of the development of all elements of the territorial socio-economic system: enterprises of all economic sectors, financial institutions, the public administration sector, and households, employing various research methods and forecasting of their development dynamics. The distinguishing features of this methodological approach are: the use of coefficients of variation to assess the financial stability of both individual elements of the territorial system and their entire aggregate – for the calculation of an integral indicator of the financial stability of the territory; the application of Shewhart's control charts to assess the stability of the dynamics of the considered indicators of the financial development of elements of the territorial system; the use of regression analysis, in contrast to other methodological approaches, not only to assess the influence of factors on the dynamics of the financial

stability of elements of the territorial system, but also to construct forecast scenarios of its future changes; for the implementation of this task, the use of autoregressive moving average modeling of the dynamics of financial stability indicators (ARMA/ARIMA modeling) was proposed. Such an approach will permit a more objective assessment of the financial stability of territories, the identification of factors destabilizing their development, and the selection of more effective mechanisms for enhancing their financial stability.

The presented approach will be approbated in the course of a study of the financial stability of the regions and their municipal formations comprising the Ural Federal District over the period from 2010 to 2023. As a result of the approbation of the methodological approach, it is expected to identify: territories with a significant disruption of the financial stability of socio-economic development; territories where a decline in financial stability is observed, which has not yet reached a critical level; as well as financially stable regions. This will make it possible, in the future, to determine spatial priorities for state financial support and to develop mechanisms for stabilizing their financial position.

Conclusion

The theoretical review of the literature has demonstrated that currently existing methodological approaches are aimed at assessing the financial stability of the development of individual elements of territorial socio-economic systems (financial institutions, enterprises of various types of economic activity, households, and the public administration sector), while approaches presupposing their systemic assessment can be used only at the macroeconomic level. The methodological approach presented in this paper conceptualizes the territory as a socio-economic system and presupposes the

assessment of the financial stability of the development of all its elements using a suite of statistical and econometric methods.

The proposed methodological approach forms a system of indicators for assessing the financial stability of all elements of the territorial system: enterprises of various economic sectors, financial institutions, the public administration sector, and households. It permits not only the identification of an already observed disruption of the financial stability of the development of elements of the territorial system (by means of the coefficient of variation) and of the entire territorial system, but also, using W. Shewhart's control charts and control limits, the assessment of the dynamics of change of the considered indicators – which will make it possible to identify emerging risks of a decline in the financial stability of elements of the territorial system. To confirm the emerging risks of a decline in financial stability identified as a result of the construction of Shewhart's control charts, the author's methodological approach presupposes the construction of regression models reflecting the influence of external and internal factors on the dynamics of key indicators of financial stability of each element of the territorial system. These models will make it possible to identify the factors destabilizing the development of territorial systems, while their autoregressive moving average modeling (ARMA/ARIMA) will make it possible to forecast possible destabilization of territorial systems in the future, and, as a result of stress-testing of model parameters, to formulate a system of forecast scenarios of the dynamics of their financial development. Such an approach to assessing the financial stability of a territorial system provides regional and municipal public authorities with the opportunity to develop effective mechanisms for regulating emerging threats of a decline in the financial stability of the development of territorial systems.

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SUSTAINABLE DEVELOPMENT OF TERRITORIES, BRANCHES, AND PRODUCTION COMPLEXES

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REGIONAL AND SECTORAL DIFFERENTIATION OF CORPORATE SOCIAL RESPONSIBILITY IN THE RUSSIAN FEDERATION: ASSESSMENT METHODOLOGY

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The topic of corporate social responsibility is being actively studied from the perspective of various directions, but its research at the level of individual industries and regions remains underdeveloped. The lack of uniform standards and methodologies makes it difficult to analyze and compare the effectiveness of social initiatives at the interregional and intersectoral levels. In turn, the current situation creates obstacles to identifying leaders in the field of corporate social responsibility and spreading their best practices to other industries and regions where the development of this area is still at an early stage. In this regard, the aim of this study is to determine the regional differentiation of the level of involvement of Russian companies in the practice of corporate social responsibility, taking into account their industry specifics. To achieve this goal, it was necessary to solve the following tasks: to systematize existing methods, approaches, models and ratings for assessing the level of development

of corporate social responsibility in Russian companies, highlighting their key parameters and limitations; to develop an algorithm for assessing the level of involvement of companies in corporate social responsibility, integrating the best practices of existing approaches and enabling cross-industry and interregional comparison. We used general scientific (analysis, synthesis, comparison, etc.) and special (site parsing, rating) methods when preparing our study. Based on the research results, a rating was formed that allows classifying regions according to the degree of presence of companies with varying degrees of corporate social responsibility implementation in the context of industry groups. Further development of this work involves analyzing the conditions that allow certain regions to become centers of concentration of "responsible" business, as well as studying the most effective practices of social responsibility using the example of regions whose enterprises have a constant level of involvement in corporate social responsibility.

Corporate social responsibility, business, region, industry, rating, practice.

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Introduction

The topic of corporate social responsibility (CSR)[1] attracts the attention of economic researchers both in Russia and abroad. This phenomenon is being studied in a wide range of areas: for example, research may concern the analysis of approaches and principles of CSR (Abramov, 2025), the search for factors stimulating its development (Nikitina, 2008; Karpova, Bazhenova, 2023; Kovalev, 2024; Ting, 2021; Le, 2023; Strazzullo et al., 2025), analysis of the motives for implementing responsible behavior practices in enterprises (Badarchi, Ondar, 2023; Graafland, Mazereeuw-Van der Duijn Schouten, 2012; Ali et al., 2022), assessment of the impact of CSR on company performance (Frolova, 2023; Barauskaite, Streimikiene, 2021; Rinawiyanti et al., 2023), creation of social values – CSV (Grzegorczyk, 2022; Narwan, 2024), philanthropy and volunteerism (Zhao, 2024), etc. At the same time, there is a shortage of research aimed at studying the degree of companies' involvement in CSR at the sectoral and regional levels. Although there are similar works, their number is very limited (Kutergina, Klestova, 2017; Shiryaevskii, Shiryaevskaya, 2022).

This situation makes it difficult to conduct interregional and intersectoral comparisons, which, in turn, prevents the identification of regions and industries demonstrating successful implementation of social initiatives and the subsequent dissemination of their experience in other territories where the implementation of CSR has not yet reached the same level. We believe that the existing "gap" in the theory of social responsibility research (which is the basis of the scientific problem in the framework of this work) prevents the implementation of managerial decisions and mechanisms that could be applied in the practice of regional management.

The aim of the study is to determine the regional differentiation of the level of involvement of Russian companies in the practice of corporate social responsibility, taking into account their industry specifics.

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[1] The essence of the concept of "corporate social responsibility", as well as its relationship with other similar concepts, such as "business social responsibility", are presented in the study (Zav'yalova, 2018).

The research objectives are:

1) to systematize existing methods, approaches, models and ratings for assessing the level of CSR development in Russian companies, highlighting their key parameters and limitations;

2) to develop an algorithm for assessing the level of companies' involvement in CSR, integrating the best practices of existing approaches and enabling cross-industry and interregional comparisons.

The scientific novelty of the research is the formation of a rating that makes it possible to classify regions according to the degree of presence of companies with different CSR implementation rates by industry groups. The theoretical significance lies in the fact that the rating results help identify regions that are the centers of concentration of "responsible" business. In particular, consideration of CSR practices of enterprises in such regions will be the subject of subsequent scientific research within the framework of the studied issues.

Materials and methods of the research

The information base of the study is methodological approaches and ratings reflecting the assessments of certain aspects of CSR of Russian enterprises. These include the rating of social efficiency of the largest Russian companies and the rating of responsibility to society (developed by AO "Rating Agency Analysis, Consulting and Marketing"). The research used general scientific (analysis, synthesis, comparison, etc.) and special (site parsing, rating) methods.

Website parsing was one of the key data collection tools for assessing corporate social responsibility. We used the following approaches: automated data collection from the official websites of companies; analysis of

sections on social responsibility; search for information about the regions where companies operate. Data was extracted and exported from the sites using the Web Scraper program.

Our approach to assessment is based on the following principles: the regularity of surveys; consideration of the industry specifics of companies; territorial coverage of activities; "transparency" of the calculation methodology. The following parameters of the company are taken into account: social efficiency; responsibility to society; environmental performance; economic sustainability.

The multi-stage evaluation algorithm includes the selection of participating companies by industry; data collection and analysis through parsing; classification of companies by the level of involvement in CSR (category I – constantly implementing CSR practices, category II – periodically involved in CSR); assessment of the regions of companies' presence; formation of the final rating.

We should emphasize that at the moment there is no generally accepted methodological approach to obtain information on the level of CSR development in the regions. Despite this, a number of official methodologies provide an opportunity to draw conclusions about the degree of CSR development at the level of individual companies. They are represented by both commercial and non-profit organizations around the world. The most famous of them are MSCI, Bloomberg ESG Ratings, Fitch Climate Vulnerability Scores (Fitch Ratings), Moody's, S&P Global, AKRA, etc. However, according to Roscongress experts, there are a number of problems undermining the credibility of existing products, namely the lack of transparency of evaluation methods, the lack of a unified system for assessing the sustainability of companies, as well as the lack of consistency in ratings[2].

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[2] Rating of responsible business in Russia. Roscongress. Available at: https://roscongress.org/materials/reyting-otvetstvennogo-biznesa-v-rossii/?utm_referrer=https%3A%2F%2Fwww.google.com%2F (accessed: 07.08.2025).

AK&M agency, RAEX rating group, VCIOM, and others can be considered the most reputable Russian information and rating agencies that create such ratings. This is due to the validity and openness of their measurement and calculation methods, as well as a large set of company survey parameters and indicators.

In particular, the AK&M news agency has developed a list of ratings (individual ESG rating, social efficiency rating, social responsibility rating, carbon footprint rating, charitable foundation rating), which represents companies whose activities are commensurate with the principles of sustainable development[3].

The RAEX rating group publishes monthly rankings of companies operating in the CIS countries (mainly Russian and Kazakh companies) and having a high level of "culture of responsibility"[4].

In 2024, the investment portal of the Arctic Zone of Russia published a rating that presents the results of a grouping of companies taking a voluntary proactive part in the sustainable development of the territories of the Arctic zone of the Russian Federation (AZRF) and conducting business in this zone[5]. It was compiled with the participation of ANO "Information and Analytical Center of the State Commission for the Development of the Arctic" (ANO "IATS GKA") together with ACRA "Risk Management" (ACRA RM).

According to the results of business social responsibility monitoring, VCIOM publishes a list of companies with leadership positions in the field of CSR with a certain frequency: in particular, according to the results of an online survey conducted in July 2023, the top 5 socially responsible Russian companies, according to Russians, included Gazprom (average score – 6.7 out of 10), Rosatom (6.5 points), RZD (6.2 points), Aeroflot (6.0 points) and Yandex (6.0 points). However, according to VCIOM experts, "… this does not mean that small and medium-sized enterprises are being left out – the only question is the visibility and scale of the problems that they can solve"[6].

Special mention should be made of the author's developments. In particular, a team of authors (Yachmeneva et al., 2022) proposed a methodological approach to assessing corporate social responsibility. The approach developed by them makes it possible to determine the social benefits in the development and implementation of CSR for stakeholders, namely, not only for business, which, according to the authors, is the most pronounced limitation of most existing ratings (Bikeeva, 2020; Bikmukhametova, Aleshkina, 2020; Jojdik, 2013, etc.), but also for society and the state.

A.M. Gurevich presented an industry model of corporate social responsibility of oil refining enterprises. Based on the analysis of empirical sociological materials, the cognitive mechanisms through which Russian society comprehends the social role of business are investigated. The public's perceptions of the most important social projects of companies and the official statements of the leaders of the oil refining industry about their social obligations are compared. Recommendations on the creation of a hybrid corporate social policy management system are formulated (Gurevich, 2024).

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[3] Ratings of companies' social responsibility. AK&M. Available at: https://akmrating.ru/reytingsoceffektivnosty/ (accessed: 07.08.2025).

[4] ESG-ranking of companies. RAEX. Available at: https://raex-rr.com/ESG/ESG_companies/ESG_rating_companies/2025.1/ (accessed: 07.08.2025).

[5] Investment portal of the Arctic zone of Russia. Arctic Russia. Available at: https://arctic-russia.ru/article/arktika-kso-reyting-kompaniy-2024/ (accessed: 07.08.2025).

[6] Business social responsibility: Monitoring. VCIOM. Available at: https://wciom.ru/analytical-reviews/analiticheskii-obzor/socialnaja-otvetstvennost-biznesa-monitoring (accessed: 07.08.2025).

The article by I.R. Badykova presents a methodology for assessing the level of CSR, taking into account the relationship between this area of activity of enterprises and their innovation activity. The scientific novelty of the study is to take into account the impact of CSR on the innovative potential of companies, which is especially important in the context of digitalization and geopolitical changes. The methodology can be useful for analyzing innovatively active enterprises that do not always openly publish data on their social responsibility (Badykova, 2024).

E.A. Zagladoy developed and presented in his dissertation for the degree of Candidate of Sciences (Economics) a methodological toolkit for the empirical study of CSR management in industrial enterprises of the RF and the OECD countries[7].

Figure 1 presents the comparative characteristics of the methods, approaches, models, and ratings considered. In particular, the main criteria for performing a comparative analysis were the regularity of surveys, taking into account the industry specifics of companies, and the presence of territorial restrictions.

A detailed analysis of the methodologies, approaches, models, and ratings related to corporate CSR assessment has shown that few of them meet the required criteria. The ratings of "AK&M" and "RAEX" attracted special attention. Their main advantages are as follows: first, the results of the ratings are provided on a regular basis, and this allows tracking the level of companies' involvement in CSR practices; second, the industry aspect is taken into account, which is also important from the perspective of the topic of this study; third, the companies represented in the ratings are not limited to a specific territorial entity.

However, despite the usefulness of the AK&M and RAEX ratings, it is difficult to use them together to create a new rating. The unavailability of the RAEX rating methodology prevents the assessment of compliance of its results with ratings of other agencies. At the same time, the industry specifics of companies' CSR activities can be most fully seen in the AK&M ratings. Thus, the information collected during the compilation of ratings of the social efficiency of leading Russian companies and responsibility to society conducted by AK&M company will be used to form our own rating.

Algorithm for assessing the level of companies' involvement in CSR by industry and region

At the first stage of the study, we analyzed the positions of Russian companies within the leading CSR industry groups, identified according to the ratings of the AK&M agency. *Table 1* summarizes the results of the analysis (using the example of the social efficiency rating of the largest Russian companies).

Based on the rating of the responsibility of the largest Russian companies to society for the period under review, a comparable analysis was performed. It is worth noting that there is a steady tendency for the positions of the companies included in both AK&M ratings to coincide: the social efficiency of the largest Russian companies and responsibility to society. A distinctive feature is the absence of FGC UES in the first rating, although it was recorded in the second in 2022.

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7   Zaglada E.A. (2025). The mechanism of corporate social responsibility management of industrial enterprises: Abstract of the dissertation. Candidate of Sciences (Economics). Donetsk: Donetsk Academy of Management and Public Administration. 29 p.

Name and developer	Representation of the calculation methodology, availability of information about data providers	Research regularity	Accounting for industry specifics	Limited coverage of the territory
Social efficiency rating of the largest Russian companies (developed by AO "Rating Agency Analysis, Consulting and Marketing")	The calculation methodology is presented on the official website of the developer. The main information providers are data from opinion polls conducted directly by the company's developers, as well as data from the financial statements of the companies themselves	Yes	Yes	No
Rating of responsibility to society (developed by AO "Rating Agency Analysis, Consulting and Marketing")	The calculation methodology is presented on the official website of the developer. The main information providers are data from opinion polls conducted directly by the company's developers, as well as data from the financial statements of the companies themselves	Yes	Yes	No
ESG-ranking of companies (developed by RAEX rating group)	The calculation method is not presented on the official website of the developer, there is no information about information providers	Yes	Yes	No
Arctic & CSR: Company Rating – 2024 (developed by the Information and Analytical Center of the State Commission for the Development of the Arctic (ANO IATS GKA) together with ACRA Risk Management (ACRA RM))	The calculation method is presented on the official website of the developer, there is no information about information providers	No	No	Yes
Monitoring of business social responsibility (developed by VCIOM)	The calculation method is presented on the official website of the developer, the information providers are telephone interview data	No	Yes	No
Methodological approach to assessing corporate social responsibility of the state, business and society (developed by V.M. Yachmeneva, R.A. Timaev and Yu.E. Yachmenev)	The methodology of the research is presented in the relevant section of the scientific article	No	No	No
Industry model of corporate social responsibility of enterprises of the oil processing complex (developed by A.M.Gurevich)	The methodology of the research is presented in the relevant section of the scientific article	No	Yes*	No
Assessment of the level of corporate social responsibility of innovatively active companies (developed by I.R. Badykova)	The methodology of the research is presented in the relevant section of the scientific article	No	Yes*	No
Methodological tools for empirical research of CSR management in industrial enterprises of the Russian Federation and the OECD countries (developer – E.A. Zaglada)	The methodology of the research is presented in the relevant section of the dissertation.	No	Yes*	Yes

Figure 1. Comparative characteristics of methods, models, and ratings related to corporate CSR assessment

* The list of enterprises is limited.

Source: own compilation.

Table 1. List of leading companies according to the data of the social efficiency rating of the largest Russian companies for the period 2021–2024

Name of industry group	Name of the company			
	2021	2022	2023	2024
Ferrous metallurgy	TMK	NLMK	Metalloinvest	Metalloinvest
	OMK	Metalloinvest	MMK	MMK
	NLMK	EVRAZ	Severstal	NLMK
	Metalloinvest	Severstal	–	Severstal
	EVRAZ	–	–	Mechel
	Severstal	–	–	–
Non-ferrous metallurgy and mining	ALROSA	Polymetal	ALROSA	Polyus
	Polyus	Polyus	Polyus	ALROSA
	VSMPO AVISMA	Nornikel	Raspandskaya (Evraz)	Krastsvetmet
	Nornikel	En+	Nornikel	Seligdar
	–	Rusal	En+	Kuzbasrazrez-ugol
	–	–	Polymetal	Nornikel
	–	–	Rusal	Raspandskaya
	–	–	–	Rusal
	–	–	–	En +
Energy industry	RusHydro	Inter RAO	Rosatom	Inter RAO
	Tatenergo	Tatenergo	Inter RAO	TGK-1
	Inter RAO	TGK-1	Tatenergo	Tatenergo
	TGK -1	OGK-2	Unipro	Unipro
	Unipro	Unipro	El5-Energo	El5-Energo
	OGK-2	Enel	–	RusHydro
Energy networks	Rosseti Lenenergo	Rosseti Tyumen	Rosseti Lenenergo	Rosseti Urals Region
	Rosseti	Rosseti Lenenergo	Rosseti Tyumen	Rosseti Tyumen
	Rosseti North-West	FGC UES	Rosseti Centre and Volga Region	Rosseti Lenenergo
	Rosseti Centre	Rosseti Centre	Rosseti Centre	Rosseti Centre and Volga Region
	Rosseti Centre and Volga Region	Rosseti Centre and Volga Region	Setevaya compania	Rosseti Centre
	Rosseti South	Rosseti	Rosseti Volga	Rosseti
	–	Rosseti North-West	Rosseti North-West	Rosseti North-West
	–	BESK	Rosseti	Rosseti Volga
	–	Rosseti Volga	Rosseti Moscow Region	Rosseti Siberia
	–	Rosseti South	–	Rosseti South
	–	–	–	Rosseti Moscow Region
Chemistry and petrochemistry	SIBUR	Uralkali	UEKHK (Rosatom)	Uralkali
	KuibyshevAzot	KuibyshevAzot	PhosAgro	SIBUR
	Acron Group	PhosAgro	KuibyshevAzot	PhosAgro
	PhosAgro	–	SIBUR	Acron Group
	TOAZ	–	–	KuibyshevAzot

End of table 1

Name of industry group	Name of the company			
	2021	2022	2023	2024
Oil and gas production	Sakhalin Energy	Sakhalin Energy	Surgutneftegas	Tatneft
	Gazprom	Tatneft	Tatneft	NOVATEK
	Surgutneftegas	NOVATEK	ИНК	LUKOIL
	LUKOIL	Gazprom	Gazprom	Rosneft
	RNG	LUKOIL	–	Gazprom
	–	Rosneft	–	–
	–	RNG	–	–
	–	INK	–	–
Transport	FGK	Transcontainer	FPK	RZD
	RZD	RZD	RZD	Fesko
	ФПК	FPK	Aeroflot	ФПК
	Aeroflot	Aeroflot	–	Delo
	–	–	–	S7
	–	–	–	Aeroflot
Communication and ICT	Vimpelcom	Vimpelcom	VK	Vimpelcom
	MTS	Vimpelcom	Vimpelcom	Vimpelcom
	Rostelecom	Rostelecom	Vimpelcom	Rostelecom
	Pochta Rossii	Pochta Rossii	Yandex	Yandex

Note: companies were ranked according to their position within the industry group; the number of regions included in the group of leaders was determined by the rating developers.
According to: Ratings of companies' social responsibility. AK&M. Available at: https://akmrating.ru/reytingsoceffektivnosty/ (accessed: 12.11.2025).

Based on the analysis, we identified two categories of companies (according to the CSR involvement level): companies that constantly implement CSR practices; companies that are periodically involved in CSR. The criteria for assigning companies to a particular category are presented below.

Category I: annual presence in ratings; systematic implementation of social programs; stable positions in industry groups.

Category II: occasional participation in ratings; irregular implementation of social initiatives; lack of stable positions in industry groups.

Table 2 shows the full list of these companies by industry group (in accordance with the data from both ratings).

At the second stage, the regions of presence of companies included in both groups were selected according to the level of involvement in corporate social responsibility *(Tab. 3)*.

The region of presence in the framework of this study is understood as the geographical territory in which the company directly carries out business activities, in contrast to the place of official legal registration. Since the vast majority of large and major Russian companies are registered in Moscow and Saint Petersburg, these constituent entities of the Russian Federation were excluded from the analyzed sample.

In terms of industry affiliation, the study does not cover companies belonging to the following sectors: energy networks, transport, communications and information and communication technologies (ICT). The rationale for this limitation lies in the almost ubiquitous geographical presence of organizations in these industries, which can lead to distortion of the analysis results.

In addition, individual companies belonging to other industry groups (including energy and oil and gas production) are excluded from the analytical sample if their business activities cover the territory of most regions of the Russian Federation.

Table 2. List of Russian companies by the CSR involvement level in the context of industry groups

Name of the industry group	Companies that constantly implement CSR practices	Companies periodically involved in CSR
according to the data of the social efficiency rating of the largest Russian companies for the period 2021–2024		
Ferrous metallurgy	Metalloinvest, Severstal	TMK, OMK, NLMK, EVRAZ, MMK, Mechel
Non-ferrous metallurgy and mining	Polyus, Nornickel	ALROSA, VSMPO-AVISMA, Raspadskaya (Evraz), En+, Polymetal, Rusal, Krastsvetmet, Seligdar, Kuzbassrazrez-ugol
Energy industry	Tatenergo, Inter RAO, Unipro	Rosatom, Rushydro, TGK-1, OGK-2, EL5-Energo, Enel
Energy networks	Rosseti Lenenergo, Rosseti, Rosseti North-West, Rosseti Centre, Rosseti Centre and Volga Region	Rosseti Tyumen, FGC UES, BESK, Rosseti Volga, Rosseti South, Setevaya Companiya, Rosseti Moscow Region
Chemistry and petrochemistry	KuibyshevAzot, PhosAgro	SIBUR, Uralkali, UEKHK (Rosatom), Arkon Group, TOAZ
Oil and gas production	Gazprom	Surgutneftegaz, Sakhalin Energy, RNG, Lukoil, Novatek, INC, Tatneft, Rosneft
Transport	RZD, FPC, Aeroflot	FGK, Transcontainer,
Communication and ICT	Vimpelcom, MTS	Pochta Rossii, Rostelecom, VK, Megafon, Yandex
according to the data of the rating of responsibility to society of the largest Russian companies for the period 2021–2024		
Ferrous metallurgy	Metalloinvest, Severstal	TMK, OMK, NLMK, EVRAZ, MMK
Non-ferrous metallurgy and mining	Nornickel, Polyus	ALROSA, VSMPO-AVISMA, SUEK, Raspadskaya (Evraz), En+, Polymetal, Rusal
Energy industry	Tatenergo, Unipro, Inter RAO	Росатом, Русгидро, ТГК-1, ОГК-2, ЭЛ5-Энерго, Энел
Energy networks	Rosseti North-West, Rosseti Centre and Volga Region, Rosseti, Rosseti Centre, Rosseti Lenenergo	Rosseti Tyumen, BESK, Rosseti Volga, Rosseti South, Setevaya Companiya, Rosseti Moscow Region
Chemistry and petrochemistry	PhosAgro, KuibyshevAzot	Arkon Group, TOAZ, SIBUR, Uralkali, UEKHK (Rosatom)
Oil and gas production	Gazprom	Surgutneftegaz, Sakhalin Energy, RNG, Lukoil, Tatneft, Rosneft, Novatek, INC
Transport	RZD, FPC, Aeroflot	FGK, Transcontainer,
Communication and ICT	MTS, Vimpelcom	Pochta Rossii, Rostelecom, VK, Megafon, Yandex
According to: Ratings of companies' social responsibility. AK&M. Available at: https://akmrating.ru/reytingsoceffektivnosty/ (accessed: 13.11.2025).		

Table 3. P Regions of presence of companies belonging to different industry groups and having varying degrees of involvement in CSR

Industry Group	Company name	Regions of presence
Ferrous metallurgy	Metalloinvest (I)	Belgorod, Kursk, Orenburg regions
	Severstal (I)	Belgorod, Vologda, Leningrad, Murmansk, Orel regions
	TMK (II)	Belgorod, Volgograd, Rostov, Sverdlovsk, Chelyabinsk regions
	OMK (II)	Amur, Vladimir, Voronezh, Irkutsk, Kaluga, Kemerovo, Kurgan, Lipetsk, Nizhny Novgorod, Novosibirsk, Rostov, Ryazan, Saratov, Sverdlovsk, Tver, Tula, Ulyanovsk, Chelyabinsk regions, Altai Territory, Krasnoyarsk Territory, Perm Territory, Rep.of Karelia
	NLMK (II)	Belgorod, Lipetsk, Sverdlovsk regions, Altai Territory
	EVRAZ (II)	Kemerovo, Sverdlovsk, Tula regions
	MMK (II)	Belgorod, Voronezh, Kursk, Orenburg, Orel, Penza, Samara, Saratov, Sverdlovsk, Tambov, Ulyanovsk, Chelyabinsk regions, Primorye Territory
	Mechel (II)	Irkutsk, Kemerovo, Moscow, Orenburg, Chelyabinsk regions, Krasnodar Territory, Primorye Territory, Republic of Bashkortostan, Republic of Karelia, Republic of Karelia Republic of Sakha, Republic of Udmurtia
Non-ferrous metallurgy and mining	Polyus (I)	Irkutsk, Magadan regions, Krasnoyarsk Territory, Republic of Sakha
	Nornikel (I)	Murmansk Region, Trans-Baikal Territory, Krasnoyarsk Territory
	ALROSA (II)	Arkhangelsk Region, Rep. of Sakha
	VSMPO-AVISMA (II)	Sverdlovsk Region, Perm Territory
	Raspadskaya (Evraz) (II)	Kemerovo Region, Republic of Tyva
	En+ (II)	Irkutsk, Kemerovo regions, Krasnoyarsk Territory
	Polymetal (II)	Magadan, Sverdlovsk regions, Khabarovsk Territory, Republic of Sakha, Chukotka AA
	Rusal (II)	Volgograd, Irkutsk, Kemerovo, Murmansk, Samara, Sverdlovsk regions, Krasnoyarsk Territory, Rep. of Khakassia
	Krastsvetmet (II)	Moscow, Nizhny Novgorod, Sverdlovsk regions, Krasnoyarsk Territory
	Seligdar (II)	Irkutsk, Orenburg regions, Altai Territory, Khabarovsk Territory, Republic of Buryatia, Republic of Sakha, Chukotka AA
	Kuzbassrazrezugol (II)	Kemerovo Region

End of table 3

Industry Group	Company name	Regions of presence
Energy industry	Tatenergo (I)	Republic of Tatarstan
	Unipro (I)	Moscow, Smolensk regions, Krasnoyarsk Territory, Perm Territory, Khanty-Mansi AA
	Rosatom (II)	Voronezh, Kaluga, Kursk, Leningrad, Murmansk, Nizhny Novgorod, Penza, Rostov, Saratov, Sverdlovsk, Smolensk, Tver, Tomsk, Chelyabinsk regions, Krasnoyarsk Territory, Republic of Sakha, Republic of Udmurtia, Chukotka AA
	Rushydro (II)	Amur, Volgograd, Magadan, Moscow, Nizhny Novgorod, Novosibirsk, Ryazan, Samara, Saratov, Sakhalin Regions, Kamchatka Territory, Krasnoyarsk Territory, Perm Territory, Primorye Territory, Khabarovsk Territory, Republic of Dagestan, Republic of Sakha, Republic of Khakassia, Chuvash Republic, Chukotka AA, Jewish Autonomous Region
	TGK-1 (II)	Leningrad, Murmansk regions, Republic of Karelia
	OGK-2 (II)	Amur, Vologda, Leningrad, Pskov, Rostov, Ryazan, Sverdlovsk, Tyumen, Chelyabinsk regions, Krasnodar Territory, Stavropol Territory, Republic of Chechnya
	El5-Energo (Enel) (II)	Sverdlovsk, Tver regions, Stavropol Territory
	BESK (II)	Republic of Bashkortostan
Chemistry and petrochemistry	KuibyshevAzot (I)	Samara Region
	PhosAgro (I)	Vologda, Leningrad, Murmansk, Saratov regions
	SIBUR (II)	Amur, Voronezh, Kursk, Leningrad, Moscow, Nizhny Novgorod, Omsk, Samara, Tver, Tomsk, Tyumen regions, Krasnodar Territory, Krasnoyarsk Territory, Perm Territory, Republic of Tatarstan, Khanty-Mansi AA, Yamal-Nenets AA
	Uralkali (II)	Perm Territory
	UEKHK (Rosatom) (II)	Sverdlovsk Region
	Arkon Group (II)	Kaliningrad, Murmansk, Novgorod, Smolensk regions, Perm Territory
	TOAZ (II)	Samara Region
Oil and gas production	Gazprom (I)	Khanty-Mansi AA, Yamal-Nenets AA
	Surgutneftegaz (II)	Khanty-Mansi AA
	Sakhalin Energy (II)	Sakhalin Region
	RNG (II)	Irkutsk, Samara, Tyumen regions, Republic of Sakha
	Lukoil (II)	Astrakhan, Volgograd, Kaliningrad region, Perm Territory, Republic of Kalmykia, Komi Republic, Republic of Tatarstan, Nenets AA, Khanty-Mansi AA District, Yamal-Nenets AA
	Novatek (II)	Yamal-Nenets AA
	INK (II)	Irkutsk region, Krasnoyarsk Territory, Republic of Sakha
	Tatneft (II)	Republic of Tatarstan

Note: the category of the company's involvement in CSR (I – constantly implementing CSR practices; II – periodically involved in CSR).
Source: compiled on the basis of parsing the official websites of companies represented in the framework of the AK&M ratings.

At the third stage of the study, a rating was created that allows identifying the regions of presence of companies from different industry groups, taking into account their level of involvement in CSR. We carried out our work in several stages: first, the regions where enterprises belong to CSR group I were determined, it means that they constantly implement relevant practices; then the regions of presence of companies of the II involvement group that participate in CSR only periodically were identified; after that, all the selected regions were grouped by industry.

During the comparative analysis, it turned out that in some sectors of the national economy there are subjects of the Federation, whose enterprises belong simultaneously to both groups in terms of the level of involvement in CSR. For such cases, the following classification rule is adopted: the region is attributed to the presence of companies of a higher (I) group in terms of CSR involvement.

Table 4 presents the final version of our rating.

Table 4. Rating of regions by the level of involvement of local companies related to various industry groups in CSR practices

Industry Group	The category of companies' involvement in CSR	Name of the Federal district	Name of the region
Ferrous metallurgy	I	NWFD	Vologda, Leningrad, Murmansk regions
		CFD	Belgorod, Kursk, Orel regions
		VFD	Orenburg Region
	II	NWFD	Republic of Karelia
		CFD	Vladimir, Voronezh, Kaluga, Lipetsk, Moscow, Ryazan, Tambov, Tver, Tula regions
		SouFD	Rostov Region, Krasnodar Territory
		VFD	Volgograd, Nizhny Novgorod, Penza, Saratov, Samara, Ulyanovsk regions, Perm Territory, Republic of Bashkortostan, Republic of Udmurtia
		UFD	Sverdlovsk, Chelyabinsk, Kurgan regions
		SibFD	Irkutsk, Kemerovo, Novosibirsk regions, Altai Territory, Krasnoyarsk Territory
		FEFD	Amur Region, Primorye Territory, Republic of Sakha
Non-ferrous metallurgy and mining	I	NWFD	Murmansk Region
		SibFD	Irkutsk Region, Krasnoyarsk Territory
		FEFD	Magadan region, Trans-Baikal Territory, Republic of Sakha
	II	NWFD	Arkhangelsk Region
		CFD	Moscow Region
		VFD	Volgograd, Nizhny Novgorod, Orenburg, Samara regions, Perm Territory
		UFD	Sverdlovsk Region
		SibFD	Irkutsk, Kemerovo regions, Altai Territory, Krasnoyarsk Territory, Republic of Tyva, Republic of Khakassia
		FEFD	Magadan region, Khabarovsk Territory, Republic of Buryatia, Republic of Sakha, Chukotka AA

End of table 4

Industry Group	The category of companies' involvement in CSR	Name of the Federal district	Name of the region
Energy industry	I	CFD	Moscow, Smolensk regions
		VFD	Perm Territory, Republic of Tatarstan
		SibFD	Krasnoyarsk Territory, Khanty-Mansi AA
	II	NWFD	Vologda, Leningrad, Murmansk, Pskov regions, Republic of Karelia
		CFD	Voronezh, Kaluga, Kursk, Ryazan, Tver regions
		SouFD	Rostov Region, Krasnodar Territory, Stavropol Territory
		NCFD	Republic of Dagestan, Republic of Chechnya
		VFD	Volgograd, Nizhny Novgorod, Penza, Samara, Saratov, regions, Republic of Bashkortostan, Republic of Udmurtia, Chuvash Republic
		UFD	Sverdlovsk, Tyumen, Chelyabinsk regions
		SibFD	Novosibirsk, Tomsk regions, Republic of Khakassia
		FEFD	Amur, Magadan, Sakhalin Region, Jewish Autonomous Region, Kamchatka Territory, Primorye Territory, Khabarovsk Territory, Republic of Sakha, Chukotka AA
Chemistry and petrochemistry	I	NWFD	Vologda, Leningrad, Murmansk regions
		VFD	Samara, Saratov regions
	II	NWFD	Kaliningrad, Novgorod regions
		CFD	Voronezh, Kursk, Moscow, Smolensk, Tver regions
		SouFD	Krasnodar Territory
		VFD	Nizhny Novgorod Region, Perm Territory, Republic of Tatarstan
		UFD	Sverdlovsk, Tyumen regions
		SibFD	Omsk, Tomsk Regions, Krasnoyarsk Territory, Khanty-Mansi and Yamal-Nenets AA
		FEFD	Amur Region
Oil and gas production	I	SibFD	Yamal-Nenets and Khanty-Mansi AA
	II	NWFD	Kaliningrad Region, Republic of Komi, Nenets AA
		SouFD	Astrakhan region, Republic of Kalmykia
		VFD	Volgograd, Samara regions, Perm Territory, Republic of Tatarstan
		UFD	Tyumen Region
		SibFD	Irkutsk Region, Krasnoyarsk Territory
		FEFD	Sakhalin Region, Republic of Sakha

Note: NWFD – Northwestern Federal District; CFD – Central Federal District; SouFD – Southern Federal District; VFD - Volga Federal District; UFD – Ural Federal District; SibFD – Siberian Federal District; FEFD – Far Eastern Federal District.
Source: own compilation.

The rating demonstrates that the regions belonging to the following federal districts have leading positions in terms of enterprise involvement in CSR: Northwestern, Central, Volga, Siberian and Far Eastern federal districts. The obvious leaders in terms of local enterprises belonging to CSR group I are regions such as the Vologda, Leningrad, Murmansk regions, as well as the Khanty-Mansi Autonomous Area.

The leading positions of the listed federal districts, as well as individual subjects in the rating in terms of the level of involvement of enterprises in CSR, can be explained by a complex of factors related to the economic, social and infrastructural features of these territories. Large industrial clusters are concentrated in these regions, including mining, metallurgy, chemical industry and transport. Representatives of these sectors have traditionally been actively involved in CSR, as their activities directly affect the environment and the social sphere. For example, oil and gas companies that implement large-scale social and environmental programs play a significant role in the Khanty-Mansi AA (Stepanova, 2012; Savchuk, Cherepanova, 2022).

Large companies based in these regions strive to strengthen their reputation and increase employee and customer loyalty through CSR. This is especially true for international and federal players who operate in several regions of the Russian Federation. CSR programs help them meet global standards and attract investments[8].

Territories with a more developed infrastructure and a high level of urbanization (for example, the Central and Northwestern Federal Districts) have more opportunities to implement CSR projects. Access to educational, cultural, and medical facilities facilitates business cooperation with NCOs and local authorities[9].

In regions with harsh climatic conditions and remote settlements (for example, in the Murmansk Region and the Far East) CSR is becoming an important tool for maintaining social stability. Companies often take on functions that local authorities cannot always provide, for example, the development of social infrastructure in single-industry towns (Stepanova, 2012; Savchuk, Cherepanova, 2022).

Finally, in Russia, CSR development is actively promoted at the state level. State corporations and companies with state participation play a key role in the implementation of the principles of social responsibility. This trend is more pronounced in the Central and Northwestern Federal Districts, where administrative centers and large state-owned enterprises are located[10].

Among the industry groups, energy and ferrous metallurgy demonstrate the greatest success in the field of CSR. In the case of energy, this result is due to the wide representation of companies, while the leadership of ferrous metallurgy in the field of corporate social responsibility is explained by the fact that ferrous metallurgy is one of the most resource-intensive and environmentally sensitive industries. Enterprises are forced to actively implement CSR principles in order to reduce the negative impact on the environment and improve the working conditions of employees. This not only meets international standards,

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[8] What is corporate social responsibility, why is it needed and where to start? Skillbox. Available at: https://skillbox.ru/media/management/chto-takoe-korporativnaya-sotsialnaya-otvetstvennost-zachem-ona-nuzhna-i-s-chego-nachat/ (accessed: 14.11.2025).

[9] Corporate social responsibility: Let's figure it out for three. Cfin. Available at: https://www.cfin.ru/anticrisis/macroeconomics/government_program/csr.shtml (accessed: 14.11.2025).

[10] Corporate social responsibility Is a new business philosophy. Vnesheconombank. Available at: https://www.veb.ru/common/upload/files/veb/kso/ksobook2011.pdf (accessed: 14.11.2025).

but also enhances the reputation of companies in the market.

As an example, PAO Severstal is implementing a number of projects in the field of corporate social responsibility, covering the environment, the social sphere, employee support and the development of its regions of presence. For example:

1) in 2023, the company allocated 6.1 billion rubles for environmental protection activities, including the installation of wastewater phytotreatment systems at the enterprises of CherMK, Olkon and Karelsky Okatysh[11];

2) sustainable development is an important strategic area of Severstal's work; in 2023, the company developed a strategy for sustainable development until 2030; it is planned that 98.5% of waste will be fully recycled by 2030[12];

3) as part of the development of territories and support for local communities, a comprehensive program is being implemented to improve the quality of the urban environment in Cherepovets; in 2023, 1.5 billion rubles were allocated for these purposes[13];

4) in 2024, the collective agreement was updated, which includes expanded measures to support employees; for example, the payment at the birth of a child was increased more than five times (to 28,640 rubles), and the payment for child care from 1.5 to 3 years – up to 12 thousand rubles per month[14];

5) By the end of 2025, Severstal planned to allocate about 220 million rubles for vocational education in Cherepovets[15].

Moreover, Severstal implements several initiatives within the framework of corporate social responsibility aimed at supporting small and medium-sized businesses (SMEs). The main directions include the creation of specialized services, financial instruments, infrastructure development and technological support. In particular, in 2025, Severstal offered various financial solutions for SMEs, cooperating with partner banks: the ability to arrange installments online with an interest-free period of up to 30 days and a limit of up to 1 million rubles for the purchase of its own products[16]; the opportunity to receive a deferred payment with factoring (up to 60 days)[17].

These initiatives reflect the company's strategic approach to sustainable development and its commitment to the principles of corporate social responsibility.

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[11] Severstal's Sustainable Development Report: The Company's main social projects and achievements for 2023. Agency for Social Information. Available at: https://asi.org.ru/2024/04/18/severstal-otchitalas-o-glavnyh-soczialnyh-proekta-i-dostizheniyah-za-2023-god/ (accessed: 14.11.2025).

[12] Severstal's Sustainable Development Report: The Company's main social projects and Achievements in 2023. Agency for Social Information. Available at: https://asi.org.ru/2024/04/18/severstal-otchitalas-o-glavnyh-soczialnyh-proekta-i-dostizheniyah-za-2023-god/ (accessed:14.11.2025).

[13] The goal of sustainable development is to increase environmental, climate and social investment. Public Chamber of the Russian Federation. Available at: https://www.oprf.ru/news/tsel-ustoychivogo-razvitiya--rost-ekologicheskogo-klimaticheskogo-i-sotsialnogo-investirovaniya (accessed: 14.11.2025).

[14] PAO Severstal has significantly improved the terms of the collective agreement. PAO Severstal. Available at: https://severstal.com/rus/media/archive/pao-severstal-znachitelno-uluchshilo-usloviya-kollektivnogo-dogovora-/ (accessed: 14.11.2025).

[15] Severstal's CSR and Sustainability Report became the winner of the Moscow Stock Exchange Annual Reports Competition. Donors Forum. Available at: https://1.donorsforum.ru/reports/otchet-o-kso-i-ustojchivosti-razvitiya-severstali-stal-pobeditelem-konkursa-godovykh-otchetov-moskovskoj-birzhi/ (accessed: 14.11.2025).

[16] How to buy metal from a manufacturer on favorable terms. Severstal for small and medium-sized businesses. Available at: https://severstal.promo.page/market/kak-kupit-metall-ot-proizvoditelia-na-vygodnyh-usloviiah-62b97aa9e8dad57c83df9e2d_0_0?utm_source=dzen&utm_medium=cpc&utm_campaign=market_msb_all&utm_content=ad2&utm_term=62b5e09b7e9fd214cb4efa6c_3_3# (accessed: 14.11.2025).

[17] Severstal's financial services are designed to help small and medium-sized business customers in their daily work. PAO Severstal. Available at: https://severstal.com/rus/clients/services/financial-solutions/ (accessed: 14.11.2025).

Conclusion

Based on the conducted research, we can conclude the following. Currently, the problem of corporate social responsibility is of great interest to economists, the analysis of this phenomenon covers many different areas. However, despite the growing importance of CSR in the regions and individual sectors of the economy, scientific research in this area is still insufficient. In particular, it is worth noting that there are no uniform standards and methodological approaches that would allow analyzing and comparing the effectiveness of social initiatives on the part of businesses at the interregional and intersectoral levels.

In this regard, it was decided to develop an approach to rating regions, which will be based on an assessment of the level of involvement of local companies related to various sectors of the national economy in CSR. To do this, we performed the following actions: methods for assessing the level of development of social responsibility of Russian companies were selected; a comparative analysis of the results of testing individual methods in retrospect was performed; an assessment of the level of involvement of companies belonging to various industry groups in CSR was carried out; regions of presence of these companies were identified.

As a result, we formed our rating, which made it possible to identify industries and regions that are the centers of concentration of "responsible" business in the context of federal districts and industry groups.

It also seems advisable to offer a number of practical recommendations for regional authorities and business communities that will improve the effectiveness of the implementation of corporate social responsibility practices in Russian regions.

Cooperation with authorities and local communities in social projects is a necessary element of the strategy: it is recommended to create regional platforms for dialogue, where topical issues of social responsibility could be discussed, as well as joint initiatives developed.

Regional authorities need to create conditions for the development of CSR: develop programs taking into account the industry specifics of the region and the experience of CSR leaders; introduce tax incentives for companies implementing social projects; provide support through grants and subsidies; create regional competence centers for business and government interaction.

However, companies themselves should actively implement CSR management systems. It is important not to limit ourselves to statements about social responsibility, but to create special departments for the implementation of initiatives.

Transparent reporting and regular monitoring of the social impact of the business are also required. In particular, the "Standard of Public Business Capital"[18] developed in 2025, which is a form of non-public financial statements of enterprises and at the same time an index assessing the contribution of companies to ensuring long-term public welfare and the implementation of national development goals of the Russian Federation, can contribute to achieving this goal.

The implementation of the proposed recommendations will not only increase the level of social responsibility of businesses in the regions, but also create conditions for the sustainable development of territories, improve the quality of life of the population and create a positive image of companies. It is important to keep in mind that the success of implementing CSR practices depends on the willingness of

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[18] The Ministry of Economic Development and Business have prepared a draft Standard for the public capital of business. Ministry of Economic Development. Available at: https://www.economy.gov.ru/material/news/minekonomrazvitiya_vmeste_s_biznesom_podgotovili_proektstandarta_obshchestvennogo_kapitala_biznesa.html (accessed: 19.11.2025).

all participants in the process to engage in constructive dialogue and joint action.

Further development of this work involves analyzing the conditions that allow certain regions to become centers of concentration of "responsible" entrepreneurship, as well as studying the most effective practices of social responsibility using the example of regions whose enterprises have a constant level of involvement in CSR.

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SECTORAL RESERVES FOR INCREASING LABOR PRODUCTIVITY IN THE REGIONAL ECONOMY (CASE STUDY OF THE VOLOGDA REGION)

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Against the background of limited opportunities for economic growth caused by anti-Russian sanctions and a decrease in the number of employed people, the issue of finding possible ways to activate it is of particular importance. One of the main ways to boost economic growth is to increase labor productivity. There are more studies in the scientific community that aim to solve this problem at the national level. This circumstance actualizes the need for a methodological study

of the issue related to determining the directions of increasing labor productivity at the regional level, taking into account the industry specifics of the economy. The aim of the study is to propose and test methodological tools for identifying industry reserves to increase labor productivity in the region. The information base consists of data from the System of National Accounts, the Unified Interdepartmental Information and Statistical System, and the Federal State Statistics Service. An analysis of the dynamics of labor productivity in the Vologda Region has shown its unevenness due to its high sensitivity to crises. The region holds high positions in this indicator among Russian regions and averages in the Northwestern Federal District. The paper establishes that the highest level of labor productivity is characterized by the production of coke, basic chemicals and fertilizers, cast iron, steel and ferroalloys, as well as the manufacture of computer, electronic and optical products. Industries with untapped potential for increasing labor productivity have been identified, including trade and transportation, wholesale and retail trade, as well as a number of manufacturing industries. The scientific novelty of the research consists in the proposal of an approach to identify industries with reserves for increasing labor productivity, and its testing on the materials of the Vologda Region. The results can be useful for regional authorities to develop strategic documents and substantiate economic policy directions.

Labor productivity, methodological tools, Vologda Region, industry reserves.

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Introduction

The Russian economy has faced a number of difficulties over the previous few years due to the imposition of sanctions restrictions. The restructuring of traditional supply routes with the search for new sales markets, the departure of large Western enterprises, adaptation to a high key rate, and ongoing economic instability limit economic growth opportunities (Shirokova, Lukin, 2024). These problems are also fully relevant for the Vologda Region, whose economy is mainly export-oriented. The demographic situation largely determines the economic dynamics in the region. Currently, there is a decrease in the number of people, including those employed in the economy (-38 thousand people, or 7.6% of the total number of employed in the region in 2017–2023[1]). In the future, a further decline in the population in general and people of working age in particular is predicted (Lukin, 2025). The consequence of these problems is an aggravation of the shortage of personnel, which serves as an obstacle to economic growth and increased production efficiency. Currently, characterized by a nationwide trend towards a forced decline in economic activity, the labor market situation in the Vologda Oblast is less tense. According to the data hh.ru In December 2024, the value of the

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[1]   The average annual number of people employed in the economy (calculations based on data integration) since 2017. EMISS. Available at: https://www.fedstat.ru/indicator/58994

HH index[2] in the region was 3.6, indicating a shortage of job seekers. By December 2025, the value of the indicator had increased to 6.9, moving into a zone of moderate competition. Nevertheless, a shortage of labor resources persists in a number of sectors of the region's economy[3].

In such conditions, it is particularly important to increase labor productivity, which can boost economic growth in the face of a shortage of personnel (Uzyakova, 2020). The importance of this issue is also recognized at the level of government, which is reflected in the strategic objectives of the country's development, the implementation of which is carried out through activities within the framework of the first national and later federal project "Labor Productivity"[4]. Productivity improvement as a response to the shortage of labor resources and the aging of the population is outlined in the Horizon 2040 project, launched by the Agency for Strategic Initiatives and the Russian Export Center[5].

Approaches to calculating labor productivity at the national level are widely represented in the scientific community. They allow studying cross-country differences and identify promising areas for productivity improvement. They apply aggregated indicators, the use of which at the regional level is complicated by the heterogeneity of the structure and coverage of statistical data. Another limitation of methods designed for the national level is that they do not take into account the industry specifics of specific regions. In addition, studies documenting the low labor productivity of the regional economy have not sufficiently explored the issue of identifying industries that are priorities for intervention, since issues of increasing productivity in specific industries at the national level prevail.

Thus, it is important to improve the methodological study of the issue when increasing labor productivity, which makes it possible to determine the directions for activating this process not only at the national but also at the regional level. In connection with the above, the purpose of the study is to propose and test methodological tools for identifying industry reserves for increasing labor productivity in the region. Within the framework of this study, the reserve for increasing labor productivity means a quantifiable difference between the actual level of productivity in a particular industry in a region and its potentially achievable level, determined based on comparison with advanced regions[6], under given conditions without a qualitative change in the technological structure.

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[2] The HH index shows the ratio of the number of active resumes to the number of vacancies in the labor market. HH Statistics. Available at: https://stats.hh.ru/vologodskaya_oblast

[3] Vologda Region has taken up the problem of personnel in the agricultural complex. Komsomolskaya Pravda. Available at: https://www.vologda.kp.ru/daily/27667.5/5055501/; It's not just Severstal that needs workers. The situation on the Vologda Region labor market is rapidly deteriorating. GorodChe.ru. Available at: https://www.gorodche.ru/society/5809742-rabochie-ruki-nujny-ne-tolko-severstali-situaciya-na-rynke-truda-vologodskoy-oblasti-stremitelno-uhudshaetsya/; Vologda region lacks qualified personnel for the use of robotics. News Agency "Vologda Region". Available at: https://vologdaregion.ru/news/2024/7/25/na-vologodchine-ne-hvataet-kvalificirovannyh-kadrov-dlya-primeneniya-robototehniki

[4] 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.

[5] The horizon is 2040. The White Paper. Agency for Strategic Initiatives. Available at: https://asi.ru/library/main/198226/

[6] For example, Vologda woodworking is compared with the woodworking of the Arkhangelsk Region, the republics of Karelia and Komi, which have the highest labor productivity in Russia in this industry.

Theoretical background of the research

The importance of studying labor productivity is determined by its impact on the growth potential of the economy (Goel et al., 2017). There is also an inverse relationship with the quality of economic system growth. When it increases, productivity factors such as wages and technological shifts become more active. Other determining factors include the productivity of using primary resources and the volume of investments (Uzyakova, Shirov, 2024), and the capital ratio of labor (Samusenko, Zimniakova, 2021). This list is not exhaustive. Experts cite such reasons for low labor productivity in Russia as a high degree of depreciation of fixed assets at low rates of their renewal, the use of outdated technologies, inefficient use of labor resources, low labor motivation, etc. (Voikina, 2018; Zotikov, 2022).

The differentiation of Russian regions in terms of labor productivity is determined by the uneven distribution of labor resources and differences in personnel training systems, the concentration of highly qualified personnel in metropolitan regions and major agglomerations, different availability of natural resources, etc. In this regard, financial incentives, improvement of the institutional environment, and provision of targeted support to enterprises by competence centers are becoming key areas in ensuring productivity growth (Trofimova et al., 2022).

The scientific community presents several approaches to measuring labor productivity based on different indicators. Abroad, a number of studies at the national level use GDP data, and purchasing power parity is taken into account when studying cross-country differences. The values obtained are divided either by the number of employees or by the number of hours worked (Zotikov, 2024; Durdyev et al., 2012). The ratio of value added to labor costs, total cost to sales of manufactured products (Hannula, 2002), and production volume to costs (Enhassi et al., 2007) is calculated. Labor productivity is also considered as the output of goods or sales produced by employees of enterprises over a certain period of time (Calcagnini, Travaglini, 2014; Abad et al., 2013), etc. Machine learning methods are used in the academic environment (Golnaraghi et al., 2019).

In Russian practice, the most widely used methods are based on data on the volume of output in value terms and the average annual number of employed people (Tokmurzin, Shed'ko, 2021). Research is being conducted on trends and factors of labor productivity in general (Leonidova, Ivanovskaya, 2021) and in certain industries, such as metallurgy (Kuznetsova et al., 2023), agriculture (Akmarov et al., 2019), and the service sector (Kuchina, Korkina, 2019), and their relationship to structural shifts in employment (Leonidova et al., 2025). Data on the gross output of each type of activity is also used (Uzyakova, Shirov, 2024). Another approach is proposed in the methodology for calculating the labor productivity index developed by the Ministry of Economic Development[7]. It can be calculated for different levels: the economy as a whole, in the sectoral or regional context. This parameter represents the ratio of the indices of the physical volume of gross value added (GVA) and total costs.

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[7]   On approval of the Methodology for calculating the Labor Productivity Index indicator: Order 274 of the Federal State Statistics Service, dated April 28, 2018.

Of particular interest is the monitoring of labor productivity by the Center for Macroeconomic Analysis and Short-Term Forecasting (CMASF)[8]. It compares labor productivity in Russia with similar indicators in other countries of the world, and also identifies internal differences between groups of industries within the national economy. A comprehensive description of the issue under study is presented. Monitoring makes it possible to identify reserves for productivity improvement, to name those sectors of the economy in which it is possible to free up the employed population for its transfer to industries with a shortage of personnel. The calculated indicators here are based on information on GDP and GVA, including PPP, when identifying cross-country differences, and employment.

Thus, the analysis of approaches to labor productivity characteristics makes it possible to combine the data used in the calculation into several groups. The first includes parameters that reflect the volume of production of the industry or the economy as a whole. The indicators of the second group correspond to a cost-based approach, for example, information about labor costs or the cost of production. The third group is employment data. To describe the current level of labor productivity and identify its industry reserves, the most optimal approach is based on data on output and employment due to the availability of up-to-date information in statistical databases and the possibility of comparing them. Since the presented approaches are aimed at calculating labor productivity at the national level, this study adapts the methodology to the regional context, taking into account the specifics of statistical data. It fills a gap in the toolkit for identifying industry reserves in the region.

Research methodology

Our work is based on the above-mentioned CMASF study. The analysis of labor productivity includes two blocks. The first one is devoted to cross-country differences in labor productivity. Calculated as the ratio of GDP to PPP per capita, the indicator served as the basis for indicating Russia's position among the countries of the world, reflecting the share of the median level of three groups of countries: the United States, Western and Northern European countries, as well as Eastern Europe in the period from 2000 to 2023. The second block is devoted to the study of industrial characteristics of labor productivity in Russia. The ratio of GVA to PPP per employee was used as a key parameter for comparison. As in the first block, the values obtained for the sectors of the domestic economy are compared with the levels of European countries and the United States, as well as industry averages. Within the framework of the tools we propose, labor productivity analysis is based on the calculation of an indicator representing the ratio of GVA and the number of employees. Due to the lack of data on the low degree of aggregation of GVA, the industry characteristics used information on the volume of shipped products, given in the comparable prices of 2023 through production indices and price indices[9] for 2017–2023, correlated with the average annual number of employees. The industry reserves for increasing labor productivity were identified by comparing the previously obtained values with the regional average and comparing them with the leading regions.

The first stage is devoted to the characteristics of labor productivity of the Vologda Region economy as a whole. This section defines the Vologda Region's position

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[8] On labor productivity in the sectors of the Russian economy in comparison with other countries. Center for Macroeconomic Analysis and Short-term Forecasting. Available at: http://www.forecast.ru/_ARCHIVE/Analitics/PROM/2025/otr1.pdf

[9] Consumer price indices are taken for the sectors of agriculture, forestry, hunting, fishing and fish farming (except for the foreign economic activity "Forestry and logging").

in terms of this indicator among the regions of Russia[10] and the Northwestern Federal District. The following describes the dynamics of productivity in the period from 2017 to 2023, due to the availability and uniformity of statistical information. At the second stage of the study, attention is paid to the sectoral characteristics of labor productivity in the Vologda Region, its dynamics in the context of large-scale economic activities (TEA). For an in-depth analysis, activities such as "Agriculture, forestry, hunting, fishing and fish farming", "Manufacturing", "Transportation and storage" are broken down into smaller industries. At the third stage, industries with untapped potential for increasing labor productivity are identified. Special attention is paid to the branches of specialization of the Vologda Region. The localization coefficient was used as an indicator for their determination. It is estimated by comparing the share of the industry in the economy of the region and the country based on data on the average number of employees.

Inheritance has several limitations. The paper did not analyze labor productivity in "low-market" groups of industries, which, according to the CMASF study, include public administration, education, and activities in the field of health and social services, where measuring productivity requires the use of specific parameters. Another limitation is the strong aggregation of a number of industries (food production, metallurgical and chemical production, wood processing and the production of wood and cork products). They include foreign economic activity, which are specializations of the Vologda Region economy, and additional calculations have been carried out for them based on data on shipments and the average number of employees.

The information base of the study consists of data from the System of National Accounts, information on the average annual number of people employed in the economy (indicator 58994), the average number of employees (indicator 58699) and the volume of shipped products (indicator 57711) of the Unified Interdepartmental Information and Statistical System (EMISS) and the Federal State Statistics Service, including its territorial division in the Vologda Region.

Research results

Labor productivity in the Vologda Region economy. The Vologda Region occupies a relatively high position among Russian regions in terms of labor productivity. This is indicated by the value of the calculated indicator, the value of which in 2023 in the Vologda Region reached 2149.7 thousand rubles per year per employee (23rd place in the country).

Figure 1 shows the Vologda Region's position among 10 leading regions and 10 outsider regions. For instance, there is a significant lag behind the leader in terms of labor productivity, the Nenets Autonomous Area, where labor productivity reaches 16.3 million rubles per employee per year. In other words, the difference is almost 8 times. In addition, the Vologda Region is significantly inferior to the Yamal-Nenets, Khanty-Mansi and Chukotka autonomous areas, the Sakhalin Region and the Republic of Sakha (Yakutia). At the same time, the Vologda Region is ahead of 67 constituent entities of the Russian Federation, especially the regions of the Southern and North Caucasian federal districts (the excess reaches several hundred percent).

The Vologda Region occupies an average position among the regions of the Northwestern Federal District in terms of labor productivity *(Fig. 2)*. Behind the Murmansk Region, Saint Petersburg and the Republic of Karelia, it is ahead of the other six constituent entities.

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[10] The analysis considered 85 constituent entities of the Russian Federation without taking into account statistical information on the Donetsk People's Republic, the Lugansk People's Republic, the Zaporozhye and Kherson regions, due to restrictions on access to the necessary data.
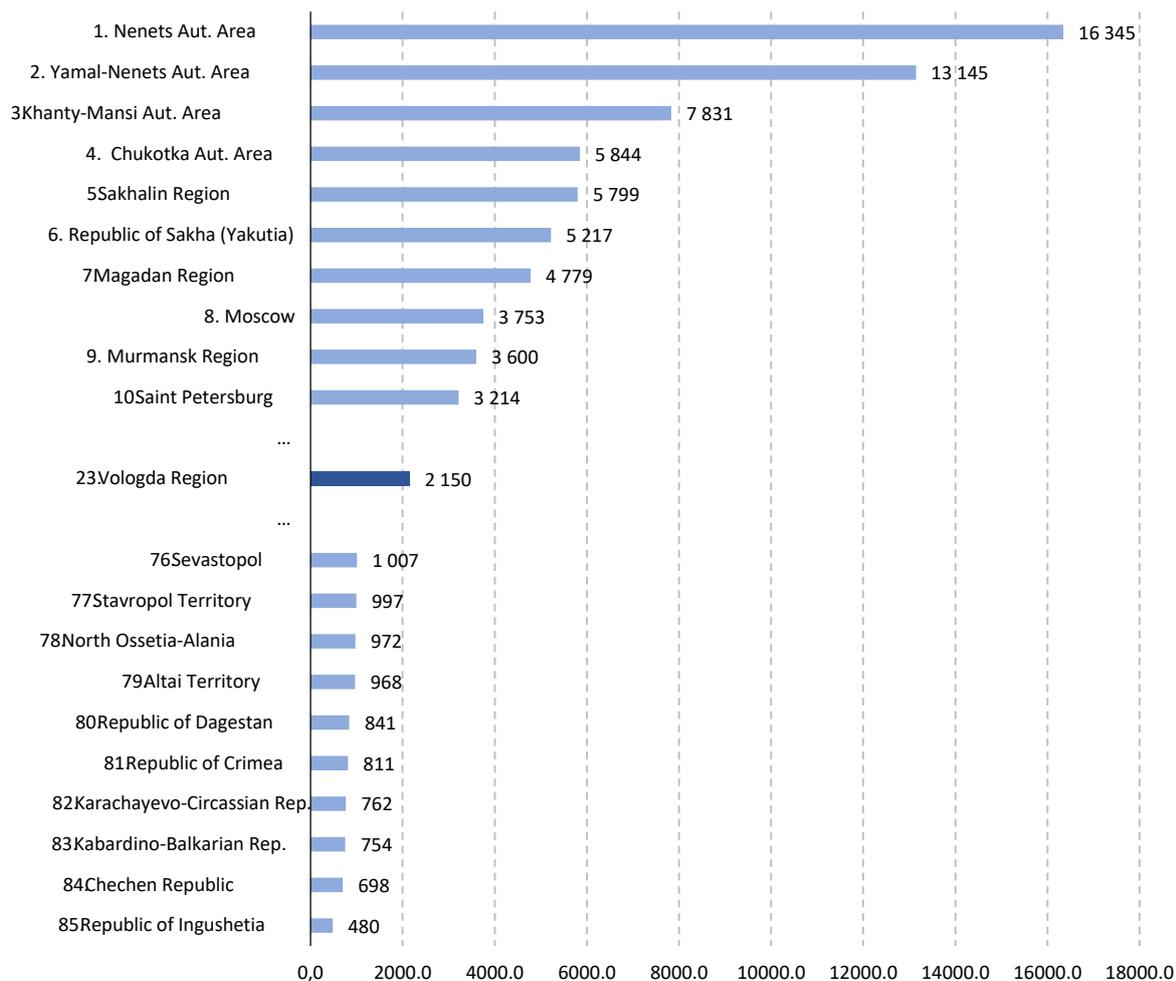
Figure 1. Labor productivity in the regions of Russia in 2023, thousand rubles per employee
According to: EMISS data.
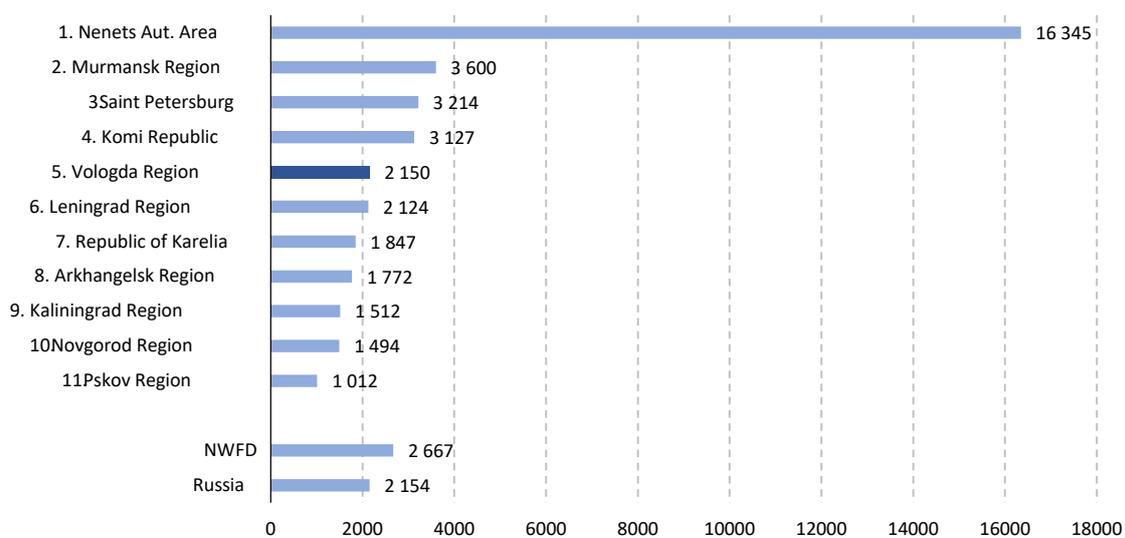
Figure 2. Labor productivity in the regions of the NWFD in 2023, thousand rubles per employee
According to: EMISS data.

The region's labor productivity is characterized by uneven dynamics *(Fig. 3)*. A gradual increase is noted up to 2019, followed by two decreases in 2020 and 2022. They are characterized by a drop in GVA due to the COVID-19 pandemic and the effect of sanctions restrictions, which affected the decline in labor productivity in general.

A feature of labor productivity in the Vologda Region is its proximity to the average Russian level, rather than the average for the NWFD. In 2023, the value of the indicator in the region was only 80.6% of the district average, while in relation to the country it reaches almost 100% *(Fig. 4)*. At the same time, the dynamics in both cases are close, the trends are almost the same – until 2019, there was a gradual increase in the indicator, in the next three years – decrease, followed by an increase in values.

Thus, the Vologda Region is characterized by a relatively high position in labor productivity among Russia's regions and the average in the NWFD, yielding primarily to the autonomous areas and Siberian regions. This position of the region among other regions is determined by the sectoral structure of its economy.
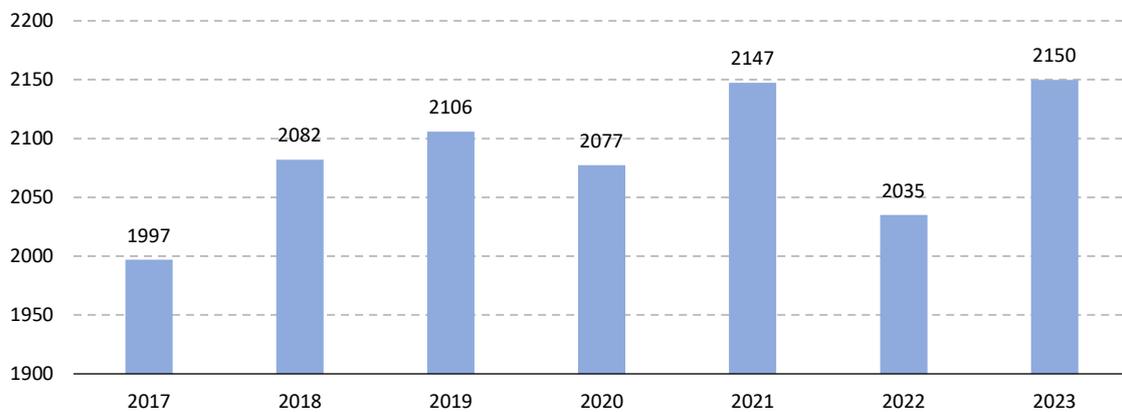
Figure 3. Labor productivity dynamics in the Vologda Region in 2017–2023 (in 2023 prices), thousand rubles per employee
According to: EMISS data.
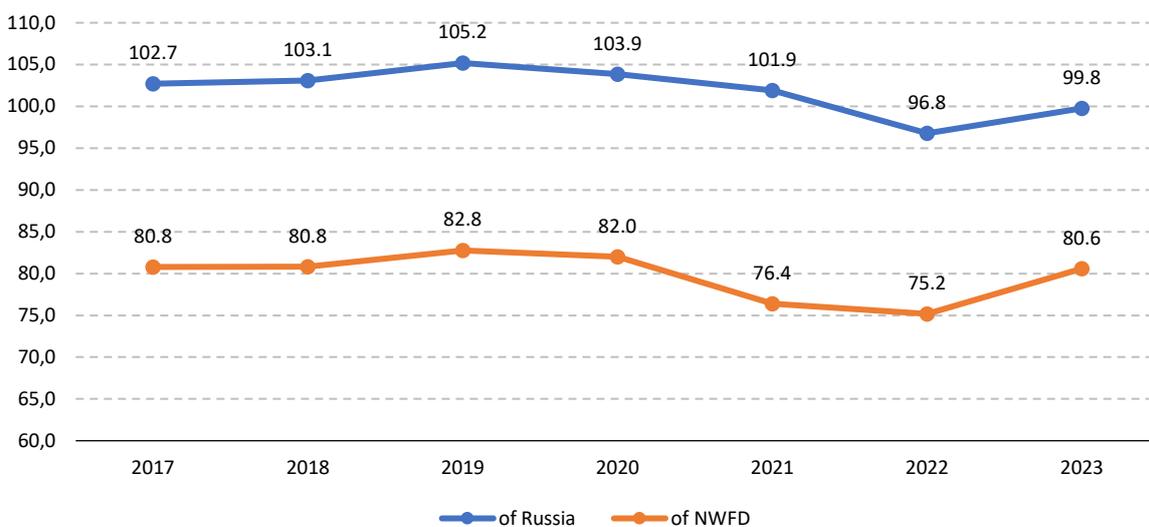
Figure 4. Vologda Region labor productivity, % of the average level of Russia and the NWFD
According to: EMISS data.

Dynamics of productivity in economic sectors. In the context of industries, there are trends similar to the general dynamics of the region's economy. In the period from 2017 to 2023, labor productivity increased by 7.6% on average across industries *(Tab. 1)*. The increase occurred in most groups, with the maximum occurring in hotels and catering enterprises (+67%), agriculture, forestry, hunting, fishing and fish farming (+65.1%). Financial, insurance, and information activities also show good results (+44.5% and +32%, respectively). The largest decrease is typical for construction and administrative activities (-30.2 and -15.8%, respectively), which is due to a drop in GVA in the first case and a decrease in gross value with a simultaneous increase in the number of employees in the second.

In the group of branches of agriculture and forestry, hunting, fishing and fish farming, there is also an increase in labor productivity within the boundaries of the study period. The crop and livestock industry shows the best result (an increase of 1.9 times; *Tab. 2*). In the manufacturing industry, the dynamics is more uneven, but the trends are generally positive – a decrease in the indicator is observed in five out of 22 industries. Two industries stand out the most: the production of computers, electronic and optical products – in a positive way, the production of furniture is in the negative. In the first case, the indicator increased almost sevenfold, in the second it decreased by half, due to a significant reduction in the GVA generated by the industry. In the transportation and storage sectors, only one of the five industries

Table 1. Labor productivity in the sectors of the Vologda Region economy (in 2023 prices), thousand rubles per employee

Type of economic activity	2017	2023	2023 to 2017, %
Total by the surveyed types of economic activity	1,997	2,150	107.6
Activities of hotels and catering establishments	422	705	167.0
Agriculture, forestry, hunting, fishing and fish farming	787	1,300	165.1
Financial and insurance activities	298	431	144.5
Information and communication activities	1,394	1,841	132.0
Professional, scientific and technical activities	1,414	1,775	125.5
Wholesale and retail trade; repair of motor vehicles and motorcycles	802	963	120.1
Education	664	748	112.6
Water supply; sanitation, waste collection and disposal, pollution control activities	1,149	1,274	110.9
Provision of other types of services	423	454	107.4
Health and social services activities	898	949	105.6
Mining operations	1,234	1,278	103.6
Provision of electric energy, gas and steam; air conditioning	1,137	1,168	102.8
Public administration and military security; social security	1,688	1,733	102.7
Real estate operations activities	6,448	6,615	102.6
Activities in the field of culture, sports, leisure and entertainment	1,322	1,308	98.9
Manufacturing industries	5,579	5,504	98.7
Transportation and storage	1,892	1,824	96.4
Administrative activities and related additional services	1,134	955	84.2
Building	1,384	966	69.8
According to: Rosstat data.			

**Table 2. Ratio of the volume of goods shipped to the number of employed
in the Vologda Region (in 2023 prices), thousand rubles per employee**

Type of economic activity	2017	2023	2023 to 2017, %
Agriculture, forestry, hunting, fishing and fish farming			
Crop and animal husbandry, hunting	1,120	2,117	189.0
Fishing and fish farming	603	961	159.2
Forestry and logging	1,106	1,150	104.0
Manufacturing industry			
Manufacture of computers, electronic and optical products	1,900	13,153	692.3
Textile production	695	2,025	291.6
Production of electrical equipment	1,542	4,120	267.1
Production of paper and paper products	2,355	5,205	221.0
Printing and copying of information media	599	1,284	214.4
Manufacture of machinery and equipment not included in other groupings	1,600	2,910	181.9
Clothing production	225	393	175.2
Production of rubber and plastic products	3,892	6,779	174.2
Production of medicines and materials used for medical purposes and veterinary medicine	250	408	163.6
Production of other non-metallic mineral products	4,363	7,098	162.7
Manufacture of motor vehicles, trailers and semi-trailers	5,169	7,844	151.7
Wood processing and manufacture of wood and cork products, except furniture, manufacture of straw products and materials for weaving	1,550	2,151	138.8
Manufacture of other vehicles and equipment	2,093	2,694	128.7
Repair and installation of machinery and equipment	1,333	1,706	128.0
Manufacture of other finished products	732	894	122.2
Food production	3,731	4,540	121.7
Production of finished metal products, except machinery and equipment	5,909	6,210	105.1
Metallurgical production	24,791	24,746	99.8
Manufacture of leather and leather products	165	162	98.1
Production of chemicals and chemical products	43,016	39,119	90.9
Beverage production	5,475	4,464	81.5
Furniture manufacturing	1,368	675	49.4
Production of coke and petroleum products	no data	113,696	-
Transportation and storage			
Water transport activities	1,631	1,749	107.3
Land and pipeline transport activities	1,893	1,824	96.4
Warehousing and auxiliary transportation activities	9,824	8,193	83.4
Postal and courier activities	2,925	2,118	72.4
Air and space transport activities	1,028	344	33.5
Note: The indicator is calculated by dividing the volume of shipped products by the number of people employed in the relevant industries. According to: EMISS data.			

is characterized by positive dynamics – the activity of water transport (+7.3%). The largest decline is observed in the activities of air and space transport, where the ratio of shipments to the number of employees decreased by 66.5%.

Industry characteristics of the ratio of shipments to the number of employees. A more detailed study of labor productivity in the Vologda Region within groups of economic sectors allows identifying a number of their

features and determining reserves for productivity improvement. To compare industries of varying degrees of aggregation, consider the ratio of shipments to the number of employees *(Tab. 3)*. The first positions in terms of the indicator are occupied by foreign economic activity, which is part of the manufacturing industry. The leader is the production of coke and petroleum products. In 2023, this industry became the most productive in the industrial sector in the whole country, with large companies making the greatest contribution,

according to research by the National Research University of Higher School of Economics[11]. One of the sub-sectors, coke production, is one of the specializations of the Vologda Region. The value of the parameter in it is 113.7 million rubles per employee, 46% higher than the national figure, but 16% lower than the average for the NWFD. The lag of the Vologda Region from the regions that specialize in the production of coke and petroleum products and are characterized by the highest labor productivity in this area reaches 64%.

Table 3. Ratio of the volume of goods shipped to the number of employed in the Vologda Region in 2023 relative to the industry average, %

Type of economic activity	From the industry average in the NWFD	From the industry average in the RF	From the industry average to the top 3 regions*	For reference: localization coefficient **
Agriculture, forestry, hunting, fishing and fish farming:	70	134	32	1.07
Crop and animal husbandry, hunting and related services in these areas	116	183	68	0.60
Forestry and logging	113	187	68	5.86
Logging***	126	182	85	5.43
Fishing and fish farming	9	19	7	0.56
Mining operations	5	5	1	0.05
Manufacturing industries:	138	175	67	1.41
Food production	74	93	38	1.11
Production of dairy products ***	113	97	44	2.49
Beverage production	67	74	24	0.79
Textile production	58	74	33	0.50
Clothing production	37	54	24	0.33
Manufacture of leather and leather products	13	10	3	0.29
Wood processing and manufacture of wood and cork products, except furniture, manufacture of straw products and materials for weaving	98	151	49	5.20
Production of paper and paper products	47	60	33	1.90
Production of pulp, wood pulp, paper and cardboard***	64	67	38	3.21
Printing and copying of information media	22	44	10	0.43
Production of coke and petroleum products	84	146	36	0.09
Production of chemicals and chemical products	192	298	46	2.12
Production of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms***	143	352	165	1.97

[11] The role of large companies in increasing labor productivity is assessed. Prime. Available at: https://1prime.ru/20241115/proizvoditelnost-852855997.html

End of the table

Type of economic activity	From the industry average in the NWFD	From the industry average in the RF	From the industry average to the top 3 regions*	For reference: localization coefficient **
Production of medicines and materials used for medical purposes and veterinary medicine	5	4	1	0.04
Production of rubber and plastic products	111	123	67	0.36
Production of other non-metallic mineral products	145	149	80	0.79
Metallurgical production	85	136	49	6.34
Production of cast iron, steel and ferroalloys***	110	138	87	12.04
Production of finished metal products, except machinery and equipment	155	132	78	1.07
Manufacture of computers, electronic and optical products	274	278	122	0.14
Production of electrical equipment	71	72	44	0.22
Manufacture of machinery and equipment not included in other groupings	61	66	40	1.06
Manufacture of motor vehicles, trailers and semi-trailers	313	137	29	0.36
Manufacture of other vehicles and equipment	55	60	24	0.10
Furniture manufacturing	50	61	19	0.94
Manufacture of other finished products	31	33	13	0.96
Repair and installation of machinery and equipment	60	71	26	1.34
Provision of electric energy, gas and steam; air conditioning	55	58	31	1.50
Water supply; sanitation, waste collection and disposal, pollution control activities	80	84	40	1.05
Building	137	153	38	0.74
Wholesale and retail trade; repair of motor vehicles and motorcycles	39	133	40	0.90
Transportation and storage	44	58	25	1.17
Activities of hotels and catering establishments	77	104	35	0.71
Information and communication activities	63	54	41	0.78
Real estate operations activities	40	56	28	0.80
Professional, scientific and technical activities	42	38	20	0.71
Administrative activities and related additional services	65	66	30	0.81
Activities in the field of culture, sports, leisure and entertainment	54	70	30	0.91
Provision of other types of services	56	85	43	0.77

* The average level of the indicator for the three leading regions in the industry. The calculation was carried out for regions with a localization coefficient greater than 0.5.
** The localization coefficient characterizes the degree of specialization of a region in economic sectors. The presence of specialization is indicated by a coefficient value greater than 1.
*** The indicator is calculated on the basis of data on the volume of products shipped and the average number of employees due to the lack of statistical information on employment for industries of this level of segregation.
According to: EMISS and Rosstat data.

The chemical complex is characterized by a high level of productivity. It accounts for 39 million rubles per employee, which is almost twice as high as the average for the NWFD regions, and three times as high for the whole country. The Vologda Region occupies the second position among the constituent entities of the Russian Federation in this indicator, second only to the Tyumen Region. The region has achieved even greater results in the production of basic chemicals and fertilizers, which is mainly due to the activities of a large enterprise of PJSC PhosAgro, which demonstrates high rates of labor productivity growth. The ratio of the volume of goods shipped to the number of employed people in the industry is 63.3 million rubles, which puts the Vologda Region in first place among the regions.

The chemical complex is followed by metallurgy. The ratio of shipments to the number of people employed here is 24.7 million rubles, and the region ranks third. The indicator of labor productivity in metallurgy in the Vologda Region as a whole is ahead of the national level, but inferior to the average in the Northwest. This is due to the structure of the complex – the Vologda Region specializes in ferrous metallurgy, namely in the production of cast iron, steel and ferroalloys, where the figure is 2 million rubles more than in the metallurgy of the Vologda Region as a whole. The positions in the rating among the subjects of the Russian Federation remain the same, but the gap from the leaders is significantly smaller (13% vs 51%). Another example of specialty industries that perform better than the sectors they belong to is the production of dairy products, pulp, and wood pulp, to a lesser extent logging. This is mainly reflected in their proximity to the leading regions.

The fourth place is occupied by the production of computers, electronic and optical products. Despite the fact that this group is not one of the branches of specialization of the Vologda Region, the indicator level in it is higher not only in comparison with the national one, but also the average for the district and the leading regions. This is due to the increase in the production of optical products in recent years due to the needs of the military-industrial complex.

The minimum values of the shipment-to-employment ratio are characterized by industries producing leather goods, clothing, and medicines, as well as a group providing other types of services. In the first sector, the gap from the leading sector in the Vologda Region reaches 702 times. The gap from the average level in the Northwestern Federal District and the country as a whole is also large (87.2 and 89.9%, respectively). In the manufacture of medicines, the deviation in all parameters is even greater. The indicator is ten times lower than in the regions that have achieved maximum results in this industry. A slightly better situation is observed in the production of clothing, the calculated parameter here is inferior to the average for the district and the country by 63.4 and 46.3%, respectively.

When analyzing industries with reserves for increasing labor productivity, it is worth paying special attention to large sectors of the economy, which at the same time are characterized by a relatively low level of productivity compared to the regional average. Based on the parameter of the employed population, in the Vologda Region, these groups include wholesale and retail trade, transportation and storage, as well as wood processing. In total, they account for 32.8% of the total number of employees, while the share in shipments is only 12%. An increase in labor productivity in these sectors to the regional average level can be achieved by reducing the number of people employed in them while maintaining the current volume of GVA. This can lead to the release of 104.5 thousand people (20.8% of the number of people employed in the economy), who can become a potential source to cover the shortage of personnel in the region. In this case, additional training or retraining of employees will be required for their cross-industry flows.

Conclusion

Within the framework of the presented research, a methodological approach has been tested to determine the sectoral reserves for increasing labor productivity at the regional level. Based on the materials of the Vologda Region, an indicator has been calculated representing the ratio of GVA to the number of employed in the economy as a whole and in the context of industries. His analysis pointed to the uneven dynamics of the parameter due to its sensitivity to crises, and also made it possible to characterize the Vologda Region's position on this indicator as high among the country's regions and average at the level of Northwestern Russia. This situation is due to the sectoral structure of the region's economy with a significant contribution from capital-intensive high-performance sectors.

In the sectoral analysis, an indicator similar to the level of labor productivity was used to characterize the transportation and storage groups, the manufacturing industry, as well as agriculture, forestry, hunting, fishing and fish farming. It is calculated by dividing the volume of shipped products by the number of employed people. The industries characterized by the highest value of this parameter include the production of coke, basic chemicals and fertilizers, cast iron, steel and ferroalloys, as well as the manufacture of computer, electronic and optical products. They are ahead of the average for the Northwestern Federal District levels of indicators in the relevant industries and, to an even greater extent, the average for the country as a whole. At the same time, a comparison with the values achieved in the leading regions indicates that there is also growth potential in these industries. The exception is the production of basic chemicals and fertilizers, for which the region ranks first.

The study concluded that the key sectors with reserves for increasing labor productivity are characterized by a reduced value of the shipment-to-employment ratio compared to the regional average, with a high share in the employment structure. These include transportation and storage, wholesale and retail trade, and wood processing. Productivity growth in them can be achieved through modernization of warehouse logistics, digitalization, deepening the processing of raw materials and the development of other areas. The result may be the release of personnel for their intersectoral flows as a way to solve the problem of a shortage of workers in the sectors of the region's economy. The industries producing leather goods, clothing and medicines also have reserves in the group of providing other types of services. The key factor holding back the growth of labor productivity in them is the lack of resources, especially financial ones. It is caused by the lack of own funds from enterprises and difficulties in attracting investors (Simachev et al., 2020), as well as high credit risks.

The scientific novelty of the research consists in the proposal of an approach to identify industries that have reserves for increasing labor productivity, and its testing on the materials of the Vologda Region. The results can be used by regional authorities in the development of strategic documents, as well as to substantiate economic policy directions.

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INNOVATION POTENTIAL OF TERRITORIAL DEVELOPMENT

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REDUCING THE DIFFERENTIATION OF REGIONS' ECONOMIC SPACE BASED ON DIGITAL TRANSFORMATION: THEORETICAL, METHODOLOGICAL AND PRACTICAL ASPECTS

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The subject of the research is the processes of digital transformation of the economic space of the Russian regions. The aim of the work is to identify and analyze the key problems of implementing digital transformation at the regional level in Russia and assess its potential as a tool to reduce the differentiation of the economic space. The research is based on a comprehensive methodology that includes a comparative analysis of the international and Russian digitalization experience. The methods of analysis of regulatory legal acts regulating the digital economy in the Russian Federation, processing and interpretation of relevant statistical data were applied. The analysis of scientific publications on the topic is carried out. Spatial economics approaches were used to assess spatial aspects, which made it possible to analyze the level of digital connectivity of regions and the depth of regional differences in digital development. Theoretical approaches to understanding the digitalization of the economy are systematized. The relevant international experience of digital transformation has been assessed and compared with Russian practice, and adaptation opportunities have been identified. The features and gaps of the current legal regulation of the digital economy in Russia are presented. The best practices applicable for strengthening regional policy in the field of digitalization have been identified. The specific problems of digital transformation at the federal and subfederal levels, as well as the role of digital platforms and the need for their

effective institutional design are investigated. It has been established that the successful digital transformation of the Russian economy requires comprehensive and coordinated actions at all levels of government, from federal to municipal, to reduce inter-regional differentiation. The key obstacles, in addition to the imperfection of legal regulation, are the acute shortage of qualified IT personnel in the regions, insufficient digital infrastructure and limited financial resources of regional budgets. In this regard, it is necessary to develop and implement unified, consistent legislation in the field of the digital economy, strengthen the motivation and competencies of regional and local authorities, provide targeted support to small and medium-sized businesses in the context of digitalization, and implement programs to improve the digital literacy of the population and the level of digital maturity of the territories as a whole.

Digital economy, economic space, region, digital legislation, digital platforms.

Introduction

Globalization and the evolving nature of interregional connections call for a shift in focus from traditional material factors like logistics and capital to intangible assets. These include capabilities in data collection and processing, as well as the accumulated experience of regional collaboration.

The digital transformation of the public sector is now a worldwide trend. Data from the World Intellectual Property Organization[1] (WIPO), analyzing 248 countries, places Russia 59th in the 2024 Global Innovation Index. While primarily measuring innovativeness, this index also sheds light on related areas. It highlights scores for institutional quality (126), business environment (53), infrastructure (76), market development (57), human capital and research (39), and knowledge and technology outputs (52). Against this backdrop, this study therefore aims to identify and analyze the key implementation challenges of digital transformation at the regional level in Russia and to evaluate its potential for mitigating interregional economic disparities.

To achieve this aim, the study sets out the following objectives:

1) to explore the theoretical foundations of the "economic space" concept within the context of digital transformation, analyzing existing interpretations of this notion in digital economy research;

2) bto examine relevant best practices – both international and domestic – for strengthening regional digitalization policies, assessing their adaptability to the Russian context

3) bto identify the key obstacles and problematic areas hindering the advancement of digital transformation at the regional level.

In regional and sectoral economics, a region is defined as a territorial unit that concentrates distinct economic, productive, and technological processes inherent to a specific area or industry. Today, the digitization and digital transformation of regions are of paramount importance, driven by the integration of new technologies into production, governance, communications, and society. Digitization enhances economic efficiency, improves quality of life, and fosters deeper regional integration into the digital

¹ World Intellectual Property Organization (WIPO). Digital Technologies for Business: A Practical Guide. Geneva: WIPO, 2022. 40 p. Available at: https://tind.wipo.int/record/50181?v=pdf (accessed: 03.06.2025).

economy. Crucially, digital transformation also entails the development of data infrastructure, smart technologies, and digital platforms that underpin the growth of specific regions and sectors.

The scientific novelty of this research consists in its theoretical and methodological rationale for digital transformation as an instrument of regional economic policy that shapes spatial development patterns. Furthermore, it identifies the specific contradictions and constraints that define its impact on the level of interregional differentiation within Russia.

Theoretical research in spatial economics provides methods for optimizing regional development that consider territorial specifics, access to resources, and innovation potential. In the context of digitalization, new technologies can significantly improve interregional coordination and interaction, thereby enhancing their competitiveness within the economic space.

At the same time, numerous approaches to the very concept of economic space have emerged, covering its various aspects. For instance, A.G. Granberg, A.V. Suvorova, and several other researchers characterize economic space as a specific territory within whose boundaries object interactions occur. However, this approach has limitations in a post-industrial economy, as it fails to encompass the diverse processes of a globalized economy (Kirillova, Kantor, 2010; Tkachenko, 2010; Getmantsev, Atamas, 2021; Urunov, Morozova, 2024; Minakir, Dzhurka, 2018).

The resource-based approach to defining economic space, examined by V.V. Chekmarev, V.V. Radaev, and others, focuses on resources and addresses the source of economic interest (Pavlenko, Kireeva, 2020; Likhachev, Pushina, 2022; Savina, 2023; Bathelt, Glückler, 2005).

Other scholars, such as O.A. Biyakov, A. Kuklinski, and others, consider the resource-based approach incomplete, as it overlooks relations of joint activity. They view the processual approach as the economic space of a network of interactions among economic agents aimed at collaborative activity (Biyakov et al., 2004; Karimov, Chuvashaeva, 2014; Khuchiev, 2023; Lisichkina, 2015; Papulova, 2020).

The works of S.I. Parinov, E.Yu. Ivanov, and others focus on the informational approach, which frames the understanding of economic space through the lens of information flows between economic agents. This approach suggests that economic space is not confined by territorial boundaries but is created through the exchange of signals and information among participants (Parinov, 2002; Ivanov, 2003; Makar, 2012; Mitrofanov, 2013; Shibusawa, 2000).

Research by many scholars reveals the influence of institutional factors, such as laws, norms, and rules, on the development of economic space, its functional boundaries, and opportunities for growth. Thus, the institutional approach emphasizes the role of institutions in shaping economic space (Inshakov, Frolov, 2007; Tereshchenko, 2012; Khuzhakhmetova, 2021; Anam, 2024).

The spatial approach examines economic space through geographical location and interconnections between objects. The works of O.A. Bulavko and V.V. Chekmarev highlight that spatial organization and resource accessibility play a key role in the effective development of regional economies (Danilova, Rezepin, 2021; Bulavko, Chekmarev, 2022). Unlike the territorial approach, it investigates interactions that may extend beyond borders, considering a broader spectrum of connections and factors.

The essence of the program-targeted approach lies in transitioning an economic system from its existing state to a desired one, adapting it to changing conditions of the internal and external environment. It requires restructuring its internal architecture, linkages, and mechanisms of interaction among participants. Its proponents include V.A. Volkonsky, S.S. Shatalin, M.S. Syupova, K.Yu. Bagratuni, and others (Karkavin, 2014; Mazilov, 2019; Bagratuni, 2021; Panesh et al., 2022).

The systemic approach views economic space as an integrated system where elements are interconnected and form hierarchical structures. Its most important characteristics are the interaction of elements and the emergence of new properties that cannot be predicted by analyzing the elements in isolation. A.I. Tatarkin, A.N. Bubnov, and others emphasize that the systemic approach helps identify feedback loops and emergent properties in economic processes (Tatarkin et al., 2012; Grishin et al., 2020).

In our view, the informational-institutional approach is of the greatest interest, as it concentrates on information and digital interactions through various platforms, as well as their regulation.

Results

Building upon the aforementioned Global Innovation Index, we will analyze existing digital economy programs in other states with similar levels of GDP (PPP): the USA (3rd place), Germany (9th), China (11th), and Japan (13th). The goal is to examine their experiences in the field of digital transformation at the national level.

The experience of the USA and Germany is largely based on the significant influence of federalism. In both countries, a substantial share of initiatives originates from regional or state-level entities. However, their approaches to the legal formalization of digitalization differ markedly. In the United States, digitalization is regulated through specific acts that are often enacted after technologies or new domains have already emerged. These acts typically provide a framework of recommendations, while individual states adapt these principles to their own socio-economic conditions. Non-governmental institutions, such as consortia and industry alliances, play a crucial role. This enhances flexibility but can weaken centralized control.

In Germany, by contrast, there is a framework of strictly prescriptive legislation[2]. Regulation is implemented both at the national level and within the framework of European Union legislation[3] (e.g., GDPR, AI Act, OZG). Germany actively coordinates digital initiatives among its states (Länder), striving for legal coherence and standardization of digital services, particularly in the realm of public service delivery (Hassel et al., 2024). It is also worth noting the European Digital Identity Wallet (EUDI Wallet), launched at the end of 2024. This wallet aggregates a wide range of personal data and official documents, allowing users to store them digitally and grant access at their discretion. It can hold foundational identity documents as well as other key credentials: driver's licenses, educational diplomas and certificates, medical records, and more. Consequently,

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[2]   Europe's Digital Decade: Digital targets for 2030. European Commission. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade   -digital-targets-2030_en (accessed: 01.06.2025)

[3]   Digital Services Act. European Commission. 2024. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/ digital-services-act_en (accessed: 01.06.2025).

the wallet can be used, for instance, to rent a car by presenting a digital driver's license or to apply to a university without using physical documents. Crucially, users retain full control over their data and can share only the specific information required for a given transaction – such as verifying they are of legal age without disclosing their exact date of birth[4].

In China, the government leverages its broad authority to concentrate data control and exercise directive management over digitalization. It prioritizes national platforms while also adopting a proactive stance towards technologies that are not yet widespread. This allows the government to channel the development of digital industries in line with long-term state strategy (Huo, Liu, 2024).

Japan's experience shares some similarities with Russia's, particularly in terms of public service delivery and the aim to reduce administrative burdens through digitalization. Thus, Japan utilizes digitalization to reduce bureaucratic barriers, helping to integrate socially significant sectors into a unified database. Furthermore, emphasis is placed on the Society 5.0[5] concept, which fosters the integration of digital and physical spaces. The Digital Agency has consolidated a vast volume of disparate data into a single platform, unlocking opportunities for more efficient, data-driven management and decision-making. However, a reliance on foreign digital infrastructure persists.

An assessment of each country's experience in shaping institutional factors and establishing the legal framework for digitalizing their economies is presented in *Table 1*.

The Russian digitalization model is mixed but predominantly state-centric. The Ministry of Digital Development serves as both regulator and coordinator, with key decisions made at the federal level. Digitalization is implemented within the framework of national projects and strategies. The Russian market is characterized as state-oriented, yet it lacks a comprehensive, systematic approach. Existing acts regulate only isolated aspects of digitalization, due to the rapidly increasing complexity and specificity of the sectors involved.

Table 1. Approaches to digitalizing the economy

Country	Approach to digitalizing the economy	Regulatory nature	Legislative specifics
USA	Liberal, market-driven	Ex-post, modular	Sector-specific acts and strategies
Germany	Legally formalized	Strictly normative	OZG Act, GDPR, EU AI Act
China	Centralized, directive	Proactive and controlling	Three core laws: Cybersecurity, Data Security, Personal Information Protection
Japan	Managed modernization	Softly normative	Digital Government Act
Russia	Mixed, state-centric	Programmatic, fragmented	Strategies exist, but no systemic law
Source: own elaboration.			

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[4] EU Digital Identity Wallet Home. Digital Building Blocks. Available at: https://ec.europa.eu/digital-building-blocks/sites/spaces/EUDIGITALIDENTITYWALLET/pages/694487738/EU+Digital+Identity+Wallet+Home (accessed: 12.09.2025).

[5] Riding the wave of digital transformation: Insights and lessons from Japan's journey. World Bank Group. 2024. Available at: https://documents1.worldbank.org/curated/en/099352305232428567/pdf/P177977145b03308b19ef61f321c4e404f4.pdf (accessed: 01.08.2025).

Digital transformation in public administration itself implies the development and implementation of six potentially promising areas, as outlined in the national project "Digital Economy of the Russian Federation"[6], aimed at enhancing the efficiency of state processes. The digitalization of public services is carried out through online platforms and involves the use of artificial intelligence and analytics in decision-making.

Strategic planning documents adopted in the Russian Federation in 2017 outline measures to stimulate the development of digital technologies and their application across various economic sectors. More importantly, they identified key constraining factors, including a shortage of qualified personnel, insufficient specialist training, and a limited number of world-class research initiatives.

Previous research on digitalization levels suffered from a significant flaw – an excessive focus on formal indicators, such as equipment provision, internet penetration, or economic efficiency. While these metrics are useful for cross-country comparisons, they fail to capture the multifaceted nature of the digital economy, which involves diverse actors, dynamic processes, and uneven project implementation, especially in the early stages. Furthermore, such data often becomes obsolete due to publication lags in official statistics, while the very concept of digitalization continues to evolve over time[7].

Based on the conducted analysis, the institutional environment remains a weak link. This is evident both in a weak institutional framework due to unstable business conditions and in the regulatory environment. According to a 2019 assessment by Global Business Consulting[8] (GBC), some of these issues persist to this day, with the normative quality of law in the Russian Federation remaining low. GBC identifies the legislative environment as the least developed component of doing business in Russia. In addition, there are problems of system obsolescence, international sanctions, and insufficient resources. On the other hand, advantages include developed digital infrastructure, strong private IT organizations, and sustained government focus on the digital economy.

A crucial element of digitalization is now the shift from digital services to platform-based models. Digital platforms play a key role in digitalizing economies, serving not only as a technological foundation but also as a catalyst for changes in business models, public services, and interregional interaction. In Russia, state-led platforms hold significant importance; however, the institutional formalization of these solutions remains underdeveloped (Lavrik, 2024).

The influence of digitalization, transport infrastructure, and institutional factors on the interregional connectivity of the economic space manifests in a complex manner. Digitalization helps reduce spatial disparities. Research in this field has already demonstrated that the development of Information and Communication Technologies (ICT) positively impacts economic growth, highlighting the benefits derived from digitalization. For instance, a World Bank report notes the formation of a specific understanding regarding the advantages gained

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[6]   Digital Economy of the Russian Federation National Program. Government of the Russian Federation. Available at: https://docs.cntd.ru/document/436754837 (accessed: 12.08.2025).

[7]   Digital Russia Index. Skolkovo, Moscow School of Management. Moscow: Skolkovo, 2019. Available at: https://sk.skolkovo.ru/storage/file_storage/00436d13-c75c-46cf-9e78-89375a6b4918/SKOLKOVO_Digital_Russia_Report_Full_2019-04_ru.pdf (accessed: 02.08.2025).

[8]   Digital Transformation in Russia: Keeping Competitive. Chicago: Baker McKenzie, 2019. 24 p. Available at: https://www.bakermckenzie.com/-/media/files/insight/publications/2019/05/digital_transformation_in_russia_keeping_competitive.pdf?la=en (accessed: 01.08.2025).

from digitalization. However, another side of the issue emerges: since Russia is a transition economy, it faces a number of problems created by the development of the internet. Distortions are noted in the dominant positions of digital platforms relative to traditional methods of delivering goods and services. Nevertheless, Russian companies demonstrate that they operate in both digital and traditional markets. It is also noted that the share of digital revenue for most companies is growing significantly faster than traditional revenue, and hybrid business models are being utilized.

It has also been determined that the state fails to keep pace in forming the institutional environment in line with the dynamic development of the ICT sector. Summarizing the results of international research, it can be concluded that Russia possesses a substantial technological foundation for digitalization, yet a number of problems persist, requiring systematic changes[9].

One of the indicators for assessing the effectiveness of digital economy development is a set of specific metrics. According to research conducted by the Higher School of Economics[10] (HSE), from 2017 until 2022, the share of household and organizational expenditures on digital products has been growing. However, expenditures on digital economy development as a percentage of GDP, based on the same metrics, have remained roughly at the same level. These expenditures are primarily associated with the purchase of digital equipment and supplies, as well as payment for telecommunications services. Another issue concerns internal spending on ICT research – funds were mainly sourced from federal budgets, but over the last several years, starting from 2016, a trend toward research funded by organizations' own internal resources is visible.

Today, the level of regional digitalization is assessed using the digital maturity indicator. This is a metric that evaluates the level of digital transformation through the automation of public services, the implementation of cross-cutting technologies, and the development of digital infrastructure in key sectors. The calculation is performed by aggregating normalized data across key domains, where 100% corresponds to the complete digital transformation of processes (depicted with a darker color), while low values indicate fragmented technology use (shown in a lighter color; *Fig. 1*).

The analysis of data across 89 constituent entities of the Russian Federation revealed significant differentiation in the level of digital maturity of state and municipal governance, as well as key economic sectors and the social sphere. Regions were divided into three groups: those with low digital maturity (less than 80%), medium level (80–90%), and high level (above 90%). The group with the lowest indicators included 11 regions, encompassing the new territories (the Donetsk and Lugansk people's republics, Zaporozhye and Kherson regions), as well as the Republic of North Ossetia–Alania (64%) and the Jewish Autonomous Region (71.8%). This indicates the need for targeted support for these entities, taking into account the specific characteristics of the lagging territories.

The largest group consists of regions with a medium level of digital maturity (44 entities). This category includes regions demonstrating steady development of digital infrastructure with potential for further growth. Of particular note is the group of 34 leading regions with scores above 90%. This group includes the Belgorod Region and the city of Moscow

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⁹ Digital Transformation of Russian Firms. World Bank Group. Washington, D.C.: World Bank, 2024. 52 c. Available at: https://documents.worldbank.org/en/publication/documents-reports/ documentdetail/099101824180532047/bosib1 3bdde89d07f1b3711dd8e86adb477 (accessed: 03.08.2025).

¹⁰ Indicators of the Digital Economy: 2023. Statistical Digest. HSE University. Available at: https://issek.hse.ru/ mirror/pubs/share/892389163.pdf (accessed: 16.08.2025).
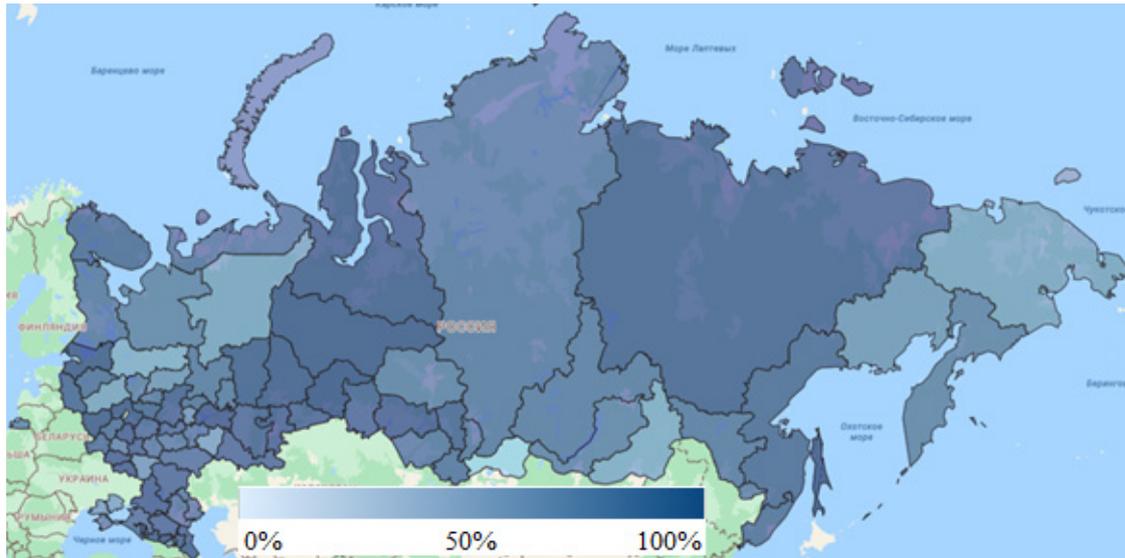
**Figure 1. "Digital maturity" of state and municipal governance, key economic sectors,
and the social sphere (including healthcare and education) for 2025**
Compiled from: Share of Russian software used in the activities of state authorities of the constituent entities of
the Russian Federation. Federal State Statistics Service (Rosstat). Available at: https://fedstat.ru/indicator/62815
(accessed: 20.10.2025).

(100%), the Republic of Tatarstan and the Moscow Region (99.7%), as well as the oil and gas autonomous areas – Khanty-Mansi (95.5%) and Yamal-Nenets (95%).

Regions are following the national trend and are utilizing various tools that can not only enhance governance efficiency but also reduce interregional differentiation through the adoption of successful solutions. For example, within the federal project "Smart City", a modern urban environment is being created in regions of the Volga Federal District, where technologies help improve the daily lives of residents and the work of municipal services. The project covers major cities and is implemented as part of the national projects "Housing and Urban Environment" and "Digital Economy"[11].

In the Nizhny Novgorod Region, the digital platform "Smart Region" is being used, which encompasses all municipalities in the region. It involves data integration, rapid response capabilities, and systematic management of municipal services[12].

Furthermore, many digital organizations, due to the specifics of their work and the large volume of information they collect and analyze, offer their solutions to regions and municipalities. This can involve various solutions to pressing issues. For example, providing a regional Utility Services Platform to make this process transparent, convenient, and efficient for all participants: citizens, managing companies, and authorities. Alternatively, it could be a Regional Situational Center created to obtain a complete and reliable picture of the region for decision-making[13]. Such problem-solving solutions are often first developed within one region as a pilot project and later scaled up for subsequent commercialization.

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[11] "Smart City" on the Volga: What Smart Technologies Are Being Implemented in the Volga Federal District. Volga News. Available at: https://pfo.volga.news/article/532056.html (accessed: 23.09.2025).

[12] NTA-Privolzhye. Access to the "Smart Region" Platform Granted to All Nizhny Novgorod Municipalities. Economic News. Available at: https://nta-pfo.ru/news/economy/2024/news_687317 (accessed: 21.10.2025).

[13] Tsifrobank (Digital Bank). Case Studies and Best Practices. Available at: https://cdo2day.ru/cases/ (accessed: 21.10.2025).

To assess the level of business digitalization in the regions, a composite index was formulated, combining seven key technological domains: the use of cloud services, big data processing and analytics technologies, digital platforms, ERP systems, the Internet of Things (IoT), geographic information systems (GIS), and artificial intelligence technologies. All index components carry equal weight (1/7), ensuring a balanced assessment without the predominance of any single technological direction *(Fig. 2)*. The results are visualized using a gradient scale where the shading intensity of the territories corresponds to the values of the resulting indicator, ranging from minimum (light tones) to maximum (saturated tones). Three autonomous areas – Khanty-Mansi, Yamal-Nenets, and Nenets – were excluded from the analysis due to a lack of data at the regional level; therefore, the study covers 82 constituent entities of the Russian Federation.

The analysis of business digital activity in Russian regions revealed a significant gap in this indicator among the constituent entities.

Values range from 8.98% in the Republic of Tyva to 30.17% in the Chechen Republic. Regions are divided into three groups: 20 entities with low activity (less than 16.56%), 43 regions with average indicators, and 19 leaders where more than 20% of businesses use digital technologies. Notably, Moscow and Saint Petersburg fell into the average group, while the Chechen Republic showed a high result.

The geographic distribution reveals distinct clusters: regions with high activity are concentrated in Central Russia and the Urals, while the underperformers are located predominantly in the south and east of the country. This points to a persistent digital divide between central and peripheral regions, requiring targeted support measures. The data underscore the necessity for a differentiated regional policy that considers the specifics of each entity. Studying the experience of leading regions can help develop effective digitalization programs, while the 12 regions with indicators below 15% require priority attention and targeted business support to reduce the technological gap.
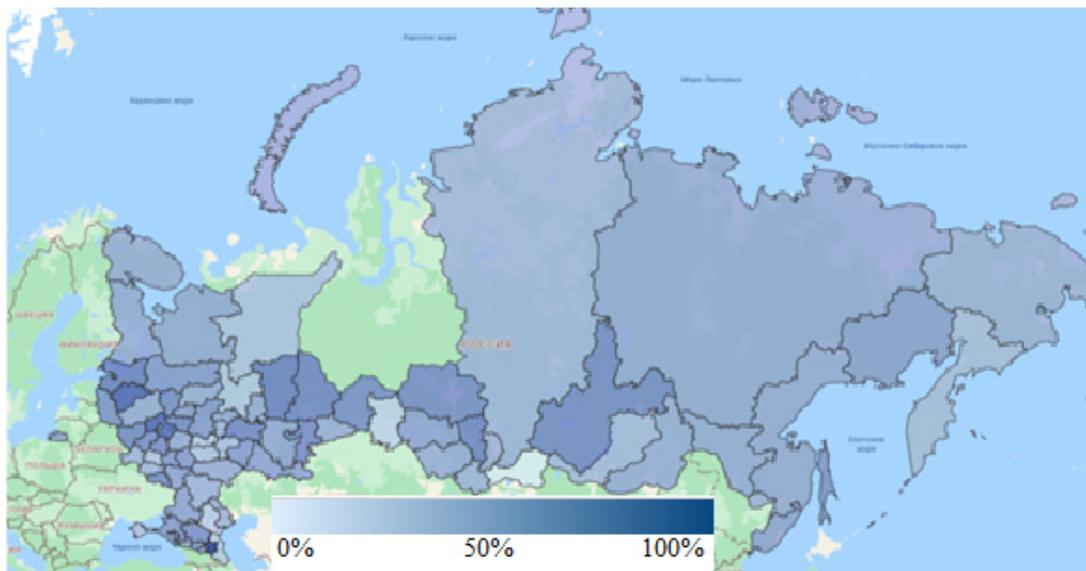
Figure 2. Overall business activity in using digital technologies for 2022
Calculated based on: Mendeley Data. Russian regions in the context of digital transformation: ESG-management for sustainable business development, Mendeley Data, V1. DOI: 10.17632/53msftm56j.1. Available at: https://data.mendeley.com/datasets/53msftm56j/1 (accessed 23.10.2025).

Despite the measures applied by both national governments and regional authorities, the question of methodology for assessing regional digitalization remains pertinent. The existing indicators do not capture the entire multifaceted process of economic digitalization. Furthermore, data are collected and processed unsystematically, and there is a limitation inherent in formal indicators, which were primarily associated with assessing the level of informatization.

Conclusions

Summarizing the findings of the conducted research, two main vectors can be identified that contribute to interregional integration, leverage the advantages of the digital economy, and mitigate challenges arising from the new operational mode of the economic system. Accordingly, the key issues requiring comprehensive resolution are as follows.

The first vector is the state. Let us examine in detail the findings concerning the Russian state, its legislative activity, and the conditions for conducting favorable operations in the ICT sector.

Underdeveloped legislation. An assessment of other countries' experiences revealed that the Russian Federation lags behind the pace of digitalization. A legislative foundation for the new realities needs to be established. The current state and characterization of the digital economy, digital data, as well as the legal elaboration of programs, do not fully align with modern trends. This manifests in fragmented approaches, weak linkages and coordination across all levels, and the absence of a systemic law defining the relationship between public and private sectors in the ICT field.

Insufficient legal grounding and weak regulation of digital platforms. Platforms of any kind lack a specific legal status as objects of public infrastructure and, at the same time, pose challenges to Russia's economic security.

Activities of private digital platforms. Marketplaces play a significant role in facilitating interstate economic activity. Small businesses are almost entirely unprotected from unfair practices by these platforms. This typically manifests in discriminatory search results, the imposition of unfavorable terms, unfair competition within the platform, and influence over product pricing. Imperfect legislation in this area negatively impacts small businesses.

Insufficient oversight over the quality and circulation of digital data. Although regulators and supervisory agencies exist, their focus is generally directed at large organizations such as banks and IT companies with well-funded security measures, while small and medium-sized enterprises largely remain unattended. This leads to systematic data leaks and a low level of information security. In addition, government bodies are severely constrained by limited resources and cannot fully execute their duties in this direction.

Lack of mechanisms for interregional digital cooperation. Despite the existence of federal platforms and services, mechanisms for interregional interaction and solutions developed at the federal level are not fully integrated and adapted at the level of the constituent entities. This leads to fragmentation, a decline in the quality of digital services, and creates barriers to data exchange. Furthermore, some regions engage in duplicated activities without coordinating with each other, resulting in inefficient resource utilization.

Now let us examine the challenges at the regional level.

1. *Human resources.* Regions face a shortage of specialists both in the ICT field and in interdisciplinary areas, leading to slow adoption of digital solutions in the public and private sectors.

2. *Competencies.* This point extends the previous one but is not a direct consequence

and represents a more profound issue. The insufficient level of digital competencies among civil servants and SMEs hampers regional development, thereby reducing the potential economic impact of digitalization. Furthermore, there is a noted inadequacy in accelerated training programs in this field, resulting in a market saturated with poorly qualified professionals.

3. *Resources and budgetary constraints.* A major issue concerns the fiscal autonomy of regions and the availability of discretionary funds for developing various electronic systems. As a rule, regions lack their own resources to fulfill requests from the federal center, and private investors show little interest in funding such projects.

4. *Local regulatory framework.* At the local level, there is an underdevelopment of regional legal acts regulating digitalization. The absence of model regulatory templates and outdated legislation further impede the decision-making process.

5. *Low level of digital maturity.* This remains a significant barrier to full-scale digitalization due to the use of outdated IT systems and non-automated processes. Additionally, regions vary substantially in their level of digital maturity, making standardized solutions an incomplete answer. An analysis of modern methods for assessing digitalization revealed that the existing indices and models used for such evaluation have notable shortcomings.

6. *Motivation and incentives.* Despite the large number of state programs, regional authorities lack motivation to address the problems listed above. There is an absence of initiative and engagement in implementing the planned programs. Digitalization is often perceived as a formal, compliance-oriented task rather than a driver of real change. A lack of understanding of the benefits, the additional workload for departments, and the absence of tangible incentives reduce the willingness to work on integrating digital solutions. A key problem remains the declarative nature of various programs and the limited operational measures aimed at sustaining them in the regions.

The digitalization of the Russian economy requires a comprehensive approach to solving current problems at both the state and regional levels. Issues related to the lack of clear legal regulation and infrastructural limitations must be addressed through a system of legislative and institutional measures aimed at simplifying and unifying digital processes. There is a need for the unification of standards and norms at all levels of interaction.

As previously stated, platforms still lack a clear legal status as public infrastructure, and the responsibility for their proper functioning is not always transparent. In this regard, the European Union is the most advanced example; through interstate union, member states have ceded part of their sovereignty to form several departments dealing with mutual integration, harmonization of national legislations, and the creation of unified systems. A specific case in point is the Digital Single Market[14]. The relevant legislation limits the dominance of large services and formalizes criteria for the protection and transparency of algorithms presenting goods and services. It is necessary to create a register of systemically important digital platforms, analogous to the Central Bank of Russia's work with banks, and to tighten laws regarding data breach fines, similar to the GDPR. This would unify the rules for trade, tax systems, and services, significantly simplifying processes

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[14] The Digital Markets Act (DMA). Regulation (EU) 2022/1925. Available at: https://www.eu-digital-markets-act.com/ (accessed: 15.02.2025).

for businesses and improving cross-border and internal economic integration. The application of uniform standards will facilitate interregional cooperation and optimize business processes by reducing administrative barriers.

Furthermore, the European Union widely employs cross-border financing mechanisms, which fall under the competence of specific supranational departments. Less developed regions receive funds from cohesion funds to reduce the digital divide. Simultaneously, the EU aggregates best practices (such as a unified e-ID, e-health, and e-learning services) and establishes common metrics, like the Digital Economy and Society Index (DESI) indicators for digital skills and online services. This enables a consistent improvement in the level of "digital readiness" across regions – a contrast to current Russian practice (Nevskaya, 2020). However, since funding for the development of such programs remains a challenge, there is a need to scale up initiatives aimed at public-private partnerships, especially as practice shows such cooperation to be effective.

Another critical aspect is the development of legislation for gig economy workers. It is necessary to enshrine the concept of a "digital worker" in the Labor Code or to grant such workers rights equal to those of traditional employees. Currently, these workers are classified as self-employed or contractors, which allows companies to evade responsibility for their working conditions and leads to the infringement of their rights.

The use of big data and analytics is a crucial tool for enhancing the effectiveness of interregional economic integration. In the United States, digital platforms actively leverage analytical data to optimize sectors such as logistics, healthcare, and urban infrastructure management. Analytics improves decision-making at all levels, increasing the speed and accuracy of interaction between regions and government bodies, as applied within programs like the Broadband Equity, Access, and Deployment (BEAD) Program[15]. Furthermore, due to the development of private projects, the establishment of tech hubs is widespread, and individual states have broad authority in selecting digital initiatives. Another important aspect is that platforms for "smart cities" and other innovative solutions significantly contribute to the integration of regional economies. Smart city creation programs, similar to those in Germany, enable the integration of transport, energy, and communication systems.

Beyond creating regional educational programs and professional development initiatives, it is necessary to regulate distance learning platforms. The skill level of specialists graduating from such organizations fails to meet market demands and, moreover, negatively impacts the labor market. For instance, the Central Bank of Russia has been engaged in activities related to digital literacy for several years, publishing informational bulletins and conducting various events. Scaling such activities – along with those mentioned above – to other institutions, school curricula, municipal and state employees, and the general public will help reduce the impact of social engineering fraud. It will also foster a better understanding of the benefits and the ways modern technologies impact the economy, ultimately qualitatively raising the overall education level. Additionally, there is a need to establish certification in the digital economy and ensure regular knowledge updates.

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[15]   Broadband Equity, Access, and Deployment Program. National Telecommunications and Information Administration (NTIA). Available at: https://broadbandusa.ntia.gov/funding-programs/broadband-equity-access-and-deployment-bead-program (accessed: 04.06.2025).

Additionally, it is necessary to strengthen the oversight of the Federal Antimonopoly Service (FAS) and the Ministry of Internal Affairs (MIA) over the activities of digital platforms. The FAS's competence includes controlling marketplace commissions charged to sellers, as well as combating and penalizing the abuse of a dominant market position. The jurisdiction of the MIA, meanwhile, encompasses control over information circulation and an increased focus on investigating cybercrimes. The creation of an interdepartmental independent data quality oversight body is a possibility, as is the development of national data standards to ensure their security, accuracy, and relevance. This body could be established on the basis of the MIA, the Federal Security Service (FSB), the Ministry of Digital Development, and the Ministry of Economic Development of the Russian Federation.

Summarizing the research findings, it can be concluded that the successful digitalization of the Russian economy requires comprehensive and coordinated actions at all levels – from federal to regional. Key challenges extend beyond legal regulation to include human resource, infrastructural, and financial constraints faced by the regions. For an effective digital transformation, it is essential to develop unified legislation, strengthen the motivation of local authorities, provide adequate support for small businesses, and enhance the level of digital maturity on the ground.

Future research should focus on analyzing the effectiveness of digital platforms, developing new models for assessing digital maturity, and evaluating the impact of public-private partnerships on the development of regional digital projects. It is important to continue monitoring interregional interactions with a focus on sharing experiences and implementing successful digitalization practices in regions with varying levels of maturity.

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THE IMPACT OF IMPROVED HOUSING CONDITIONS ON THE CONVERGENCE FOR URBAN AND RURAL FERTILITY IN POST-SOVIET RUSSIA

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Housing conditions, or housing availability, is considered in modern research as an important but controversial factor in fertility changes in modern research. In a study using an ordinal logistic model, quantitative estimates of the impact of housing conditions on fertility convergence in post-Soviet society were obtained, separately for urban and rural populations. We have been established that housing availability has a statistically significant impact on the formation of regional convergence clubs of age-related fertility, and this influence varies significantly in importance and intensity depending on the age group of women and their place of residence. The total living area available to the average Russian resident in 1989 had a significant impact over the next 30 years on the formation and disintegration of regional age-specific fertility convergence clubs only in the younger age groups (15–19 and 20–24 years old) of urban and rural populations, as well as in the group of 25–29-year-old rural population. On the contrary, the growth rate of the total area per inhabitant in 2020/1989 manifested itself as a factor in the formation and disintegration of such clubs only in the middle age groups: 25–29 years for the urban population and 30–34 years for the rural population.

Fertility, housing conditions, marginal effects, age-related fertility rate, urban population, rural population, convergence, ordinal logistic model, convergence clubs, regions of Russia, post-Soviet period.

Introduction

According to the 1989 Soviet Census, at the end of the Soviet era, the average resident of the RSFSR had approximately 15 sq. m of total floor area and 10 sq. m of living space per capita. In rural areas, these figures were 16 sq. m and 11 sq. m, respectively[1]. Individual houses or separate apartments were occupied by 78.1% of the urban and 89.8% of the rural population[2]. Centralized hot water supply was available to 68.5% of urban residents and only 10.8% of rural residents[3]. Nearly 4 million Russians lived in houses made of adobe or clay, and over 34 million lived in wooden houses (out of a total of 139.6 million individuals who reported their housing conditions and a total population of 147 million)[4]. Over the more than 30 years of post-Soviet transformations, the housing conditions of the country's residents have improved somewhat. According to the 2020 Russian Census, by the end of 2021, the average Russian had 18 sq. m of total floor area in cities and 23 sq. m in rural areas, with 95–97% of the population living in individual houses or separate apartments. The number of citizens living in houses with wooden exterior walls halved to 17.3 million people[5].

It is evident that the changes in the quantity and quality of housing in the post-Soviet period have closely interacted with the transformation of many social and demographic processes, including fertility. The most general outcome of this process in post-Soviet Russia has been the decline in the total fertility rate (TFR) of the urban population from 1.7 in 1990 to 1.4 children per woman over a lifetime in 2023, and that of the rural population from 2.6 to 1.6 children[6]. At the same time, the fundamental logic of housing construction and purchase subsidies is based on stimulating fertility, which underlines the relevance of studying the link between housing availability (accessibility, cost) and fertility in the country (Zhuravleva, Gavrilova, 2017; Isupova, 2018; Osipova, 2020; Trynov et al., 2020; Vakulenko et al., 2023; Kolbina, 2023).

Another important trend in contemporary demographic development is convergence, i.e., the narrowing of demographic differences between territories as they approach a common long-term equilibrium (O'Connell, 1981; Gabrielli et al., 2021; Stadnik, 2023; Domnich, 2024). This complex and prolonged process involves overcoming numerous obstacles that are difficult to quantify: socio-cultural, economic, organizational, and institutional (Papagni, 2023). The convergence of fertility levels is initially observed within small "clubs" of countries or regions possessing certain similarities, allowing them to reach a local equilibrium relatively quickly (O'Connell, 1981; Dorius, 2008; Strulik, Vollmer, 2013; Nakagaki, 2019). Studies of age-specific fertility rates in Russian regions confirm the formation of such regional convergence clubs for both urban and rural populations in post-Soviet Russia (Domnich, 2025). However, analysis of fertility convergence across the country's regions, while common in itself, has not yet been conducted in relation to housing conditions (Sinitsa, 2017; Shubat, 2019; Rodina, 2023; Domnich, 2024).

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[1] Brief Socio-Demographic Characteristics of the Population of the RSFSR (Based on the 1989 All-Union Population Census). Part 3: Family, Housing Conditions. Moscow: Republican Information and Publishing Center of the RSFSR State Committee on Statistics, 1991. P. 111. Available at: https://www.statmuseum.ru/ru/results/1989/?section=1989&PAGEN_1=1 (accessed: 07.07.2025).

[2] Ibidem. Pp. 130–131.

[3] Ibidem. Pp.140–141.

[4] Ibidem. Pp. 202–203.

[5] Results of the 2020 All-Russian Population Census. Vol. 11: Housing Conditions of the Population. Available at: https://rosstat.gov.ru/vpn/2020/Tom11_ZHilishchnye_usloviya_naseleniya (accessed: 07.07.2025).

[6] Total Fertility Rate. Available at: https://www.fedstat.ru/indicator/31517 (accessed: 07.07.2025).

Questions of fertility convergence (divergence) are closely linked to issues of territorial development. If regions tend to form multiple fertility convergence clubs, such local equilibria may hinder the achievement of a global (nationwide) equilibrium. Deepening interregional inequality in population reproduction in the long term leads to radical social, cultural, and economic changes and is therefore acutely perceived by society, exacerbating accumulated internal contradictions. A key problem becomes the possibility of a region transitioning from a high-fertility convergence club to a club with lower fertility, and a central question is the comparative significance of factors facilitating (or hindering) such a transition. This study focuses on the role of housing conditions, considered a significant factor influencing fertility itself, in the formation and dissolution of regional convergence clubs for age-specific fertility.

The aim of the study is to assess the marginal effects of housing provision as a factor in the formation and dissolution of regional convergence clubs for age-specific fertility in the regions of post-Soviet Russia. The research objectives are: to synthesize global experience in assessing the demographic effects of housing provision; to justify a relevant methodology for evaluating the link between improved housing conditions and the formation (dissolution) of regional fertility convergence clubs; and to implement this methodology using the example of regional convergence clubs for age-specific fertility of the urban and rural population in post-Soviet Russia. The subject of the study is the marginal effects of housing provision on the formation and dissolution of regional convergence clubs for age-specific

fertility among urban and rural populations. The object of the study comprises 79 regions of the Russian Federation from 1990 to 2023[7].

Theoretical foundations of the research

The relationship between housing provision and fertility is ambiguous and nuanced, leading to active discussion in the literature (Mulder, 2013; Pinnelli, 1995). On one hand, the basic logic linking improved housing conditions to increased fertility is supported by several studies in developed countries. Homeowners are more likely to have children than renters (Lin et al., 2016; Mulder, Wagner, 2001), and couples often purchase housing before becoming parents (Mulder, Wagner, 2001). However, purchasing a home is typically expensive, potentially creating a negative income effect – housing and having children may compete for limited resources, reducing the likelihood that parents who have improved their housing will have additional children (Flynn, 2017; Chudnovskaya, 2019). In a tight housing market (i.e., with high prices or low supply), it is more difficult for young people to obtain separate housing (Haurin et al., 1997; Hughes, 2003; Lauster, 2006), and more expensive housing generally correlates with later and lower fertility (Simon, Tamura, 2009; Yi, Zhang, 2010; Clark, 2012).

Research using diverse Russian data also yields contradictory results.

A study based on data from the HSE Russian Longitudinal Monitoring Survey (RLMS-HSE) for 1994–2014 (over 33,000 observations) found that housing area has a significant, albeit weak, negative influence on the probability of a woman without a partner deciding to have a child within a year, and a significant weak positive influence for women with a partner but no children. If a woman

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[7] The cities of Moscow, Saint Petersburg, and Sevastopol, as well as the republics of Ingushetia, Crimea, and Chechnya, are excluded from the sample.

with a partner already has children, housing area does not influence the decision to have a child within a year (Zhuravleva, Gavrilova, 2017, p. 161). Furthermore, housing area statistically significantly increases the age of a woman at childbirth if she has a partner, but does not affect the age at childbirth for single women (Zhuravleva, Gavrilova, 2017, p. 163). An analysis of factors affecting the total fertility rate (TFR), as well as fertility rates for the first, second, third, and fourth child across 85 regions of the country from 2005 to 2017, showed that housing provision (living area) had no statistically significant effect on any of these indicators (Trynov et al., 2020, p. 814).

Research on the effectiveness of regional maternity capital programs, using factor analysis of the TFR on a sample of 80 regions for 1996–2020, established that the cost per square meter on the secondary housing market had a statistically significant negative effect in regions with a TFR below 1.7 children, as well as in regions with a predominance of Orthodox Christianity (Vakulenko et al., 2023, p. 1088). This underscores the relevance of directing maternity capital programs towards improving housing conditions. At the same time, an analysis of the institutional framework of state pronatalist policy suggests that subsidizing housing improvements through maternity capital primarily stimulates the construction industry (Kolbina, 2023).

In the subjective perception of the population, housing provision as an incentive for childbearing and state support measures for improving housing conditions traditionally retain high importance. For instance, according to the 2015 Russian Microcensus, the most popular fertility incentive among all women, regardless of their reproductive plans (one, two, or three children), was an interest-free housing loan (Isupova, 2018). A survey by the Public Opinion Foundation also showed that mortgage repayment assistance for large families remains a sought-after measure in demographic policy (Osipova, 2020).

The dynamics of age-specific fertility indicators (for age groups 15–19, 20–24, 25–29, and 30–34) among the urban and rural populations of Russian regions allow for grouping the latter into convergence clubs (local equilibria), where fertility indicators tend towards a common asymptote (Domnich, 2025). It was found that the number of such clubs increases for younger maternal ages and decreases for older ages. A dependency on the type of settlement was also discovered: there are more convergence clubs in rural areas than in urban ones. For young age groups of both urban and rural populations (15–19 and 20–24 years), as well as for the rural population aged 25–29, regions were identified that demonstrate divergence and do not belong to any convergence club (which is strictly proven mathematically within the applied method). The number of regions in individual clubs varies from small (starting from 2) to substantial (up to 79). The composition of the clubs differs for various age groups and for urban versus rural populations[8].

Regional convergence clubs (*C1, …, CN*) are ordered in descending order of the mean age-specific fertility rate in 2023. The number of clubs varies depending on the age group, and their composition is largely determined by the type of settlement. Specifically, in the younger age groups (15–19 and 20–24 years), regional clubs with the highest average fertility rates (*C1*) are formed differently in urban and rural areas. For the rural population, these clubs include regions that initially (in 1990) had high fertility and demonstrate convergence

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[8] For the composition of regional convergence clubs for age-specific fertility, see the Appendix.

exclusively among themselves. For the urban population, such clubs include regions with varying initial fertility levels, from very high to extremely low. This indicates that in the post-Soviet period, the decline in fertility among the urban population in traditionally high-fertility regions occurred faster than in regions with medium and low fertility, leading to their convergence.

In the 25–29 age group for the urban population, two major regional convergence clubs are identified, comprising 28 and 51 regions, respectively. For the rural population in this age group, five convergence clubs are identified. Notably, club C1, which in younger age groups of the rural population united exclusively regions with initially high fertility, now consists half of regions that had medium fertility in 1990. In the 30–34 age group for the urban population, a single common convergence club is identified, indicating the achievement of a nationwide fertility equilibrium at this age. For the rural population in this age group, two major regional convergence clubs are identified, uniting 34 and 45 regions, respectively. Fertility dynamics in older age

groups (35–39 and 40–44 years) indicate they have reached a common equilibrium and formed a single club of regions in each case, which holds true for both urban and rural populations.

Research methodology

Assessing changes in housing conditions for the urban and rural population in the regions of post-Soviet Russia can be based on the indicator of total floor area per capita in urban and rural areas, according to the 1989 and 2020 population censuses. Other census indicators describing the quantity and quality of available housing are not comparable due to methodological changes, which imposes significant limitations on the interpretation of results. Based on a comparison of the mean values of the indicator, it can be concluded that housing provision in 1989, as well as the increase in total area by 2020, was higher for the rural population compared to the urban population *(Table 1)*. However, regional differentiation in housing conditions is also consistently higher for the rural population, as evidenced by a greater dispersion between the minimum and maximum values of the indicator compared to the urban population.

Table 1. Descriptive statistics of total floor area per capita in urban and rural areas across 79 regions of Russia in 1989 and 2020, sq. m

Indicator	Urban		Rural	
	1989	2020	1989	2020
Mean	13.9	19.9	15.4	22.5
Median	14	20	15	23
Mode	14	21	14	24
Standard deviation	1.1	2.3	2.6	2.5
Minimum	11	14	10	13
Maximum	16	23	21	27
Number of observations	79	79	79	79
Source: own calculations.				

The formation of regional convergence clubs for age-specific fertility can be interpreted as the result of the influence of numerous factors, including improved housing conditions. The latter act as one of the incentives and/or obstacles in the formation of such clubs. Regions belonging to clubs with the highest average fertility (*C1*) face the greatest difficulties in reducing their fertility, i.e., when attempting to exit this club and join clubs *C2,...,CN* (Papagni, 2023, p. 443). As the average fertility decreases in clubs *C2,...,CN*, the barriers for regions to enter and exit these clubs also diminish.

When modeling barriers to entry and exit of regions from convergence clubs (Bartkowska, Riedl, 2009; Barrios et al., 2019; Matysiak, Olszewski, 2019; Zhang et al., 2019; Jimenez-Moro et al., 2023; Papagni, 2023), the ordinal numbers of regional convergence clubs *C1,...,CN* within each age group are considered as ordinal nominal variables to be modeled using an ordinal logistic model. The model posits the existence of a continuous latent variable y_i^* for each region *i*, which has a linear dependence on a vector of independent variables X_i:

$$y_i^* = X_i\beta + \varepsilon_i.$$

The variable y_i^* can be interpreted as a certain equilibrium level of fertility that determines a region's propensity to belong to one of the convergence clubs. In a situation where y_i^* falls within the range of specific threshold values τ, the equilibrium fertility level in region *i* determines its membership in convergence club *j*:

$$y_i = j, \quad \text{if} \quad \tau_{j-1} \le y_i^* < \tau_j, j = 1, ..., N.$$

The threshold values $\tau_1, ..., \tau_{N-1}$ are to be estimated, while $\tau_0 = -\infty$, and $\tau_N = \infty$. When the variable y_i^* crosses the threshold value τ_j, region *i* ends up in club *j+1*.

The ordinal logistic model is defined as a probabilistic model:

$$\ln\left(\frac{\Pr(y \le j|X)}{\Pr(y > j|X)}\right) = \tau_j - X\beta, j = 1, ... N - 1.$$

The probabilities of belonging to a specific club are estimated using the mean values of the variables *X* and are determined as follows:

$$\Pr(y = 1|X) = \frac{e^{\tau_1 - X\beta}}{1 + e^{\tau_1 - X\beta}}, \text{for } j = 1;$$

$$\Pr(y = j|X) = \frac{e^{\tau_1 - X\beta}}{1 + e^{\tau_1 - X\beta}} - \frac{e^{\tau_{j-1} - X\beta}}{1 + e^{\tau_{j-1} - X\beta}}, \text{for } j = 2, ... N - 1;$$

$$\Pr(y = N|X) = 1 - \frac{e^{\tau_{N-1} - X\beta}}{1 + e^{\tau_{N-1} - X\beta}}, \text{for } j = N.$$

Significant positive values of the coefficients β in this model indicate that a region with a larger value of X_i is, on average, located in a club with a higher ordinal number *j* (i.e., with lower average fertility). If a significant coefficient has a negative sign, an increase in X_i statistically significantly reduces *j*, and the region falls into a club with higher average fertility.

To assess how strongly certain variables determine regional membership in a specific club, the marginal values of predicted probabilities (marginal effects) are also estimated. Marginal effects estimate how the probability of belonging to a club changes when an independent variable changes by one unit, while all other variables are fixed at their sample mean values. Thus, positive marginal effects help a region "consolidate" its position in a particular club, while negative ones help it leave. In accordance with the research objectives, we are primarily interested in the marginal effects of variables assessing housing conditions.

The vector of independent variables X_i for modeling convergence clubs is constructed to reflect both initial conditions and the direction (pace) of development of the vector y_i (Bartkowska, Riedl, 2009; Matysiak, Olszewski,

2019; Zhang et al., 2019). Therefore, the housing conditions factor in the model is represented by two variables: the total floor area per capita in 1989 and its growth rate by 2020[9]. Control variables were also estimated based on data from the 1989 and 2020 population censuses. These include the share of persons aged 16 and over who have never been married (in 1989[10] and its growth rate by 2020)[11], the share of Eastern Slavs (Russians, Ukrainians, Belarusians) in the total population in 1989[12] and its growth rate by 2020[13], as well as the share of women in the corresponding age group in the total population in 1990 and its growth rate by 2020[14]. Due to possible heteroskedasticity of the regression residuals, robust variance estimates obtained using the Huber – White method were employed (Huber, 1967; White, 1980).

The research strategy involved estimating the coefficients β for ordinal logistic regression with only housing condition variables (1) and the full model with control variables (2), as well as calculating the marginal effects of housing condition variables for the model with the full set of variables.

The working hypotheses of the study suggest a differentiation in the effects of housing conditions depending on the population's age group and type of settlement.

Regarding age differences, it is hypothesized that for the processes of formation and dissolution of regional convergence clubs in younger age groups, the initial living area (total area in 1989) is of paramount importance, as it pertains to the birth of first children (Hypothesis *H-1.1*). In contrast, for middle age groups, where second and subsequent children are born, the improvement of housing conditions (the growth rate of total area in 2020/1989) is more relevant (Hypothesis *H-1.2*).

Regarding urban-rural differences, based on the analysis of the composition of regional age-specific convergence clubs (see above), a hypothesis can reasonably be put forward that in cities, the effects of housing conditions equally contribute to regions exiting high-fertility clubs and consolidating their position in low-fertility clubs (Hypothesis *H-2.1*). In contrast, in rural areas, the most significant effects are expected to be associated only with regions exiting high-fertility clubs (Hypothesis *H-2.2*).

The calculation results for the urban population are presented in *Tables 2* and *3*, and for the rural population in *Tables 4* and *5*.

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[9] All variables are calculated separately for urban and rural populations.

[10] Calculated based on: Brief Socio-Demographic Characteristics of the Population of the RSFSR (Based on the 1989 All-Union Population Census). Part 1: Population Size, Sex, Age, Nationalities, Marital Status, Education Level. Moscow: Republican Information and Publishing Center of the RSFSR State Committee on Statistics, 1991. 210 p. Available at: https://www.statmuseum.ru/ru/results/1989/?section=1989&PAGEN_1=1 (accessed: 07.07.2025).

[11] Calculated based on: Results of the 2020 All-Russian Population Census. Vol. 2: Age-Sex Composition and Marital Status. Available at: https://rosstat.gov.ru/vpn/2020/Tom2_Vozrastno_polovoj_sostav_i_sostoyanie_v_brake (accessed: 07.07.2025).

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[13] Calculated based on: Results of the 2020 All-Russian Population Census. Vol. 5: National Composition and Language Proficiency. Available at: https://rosstat.gov.ru/vpn/2020/Tom5_Nacionalnyj_sostav_i_vladenie_yazykami (accessed: 07.07.2025).

[14] Calculated based on: Resident Female Population by Age as of January 1. Available at: https://www.fedstat.ru/indicator/33459 (accessed: 01.07.2025).

Research results

The obtained system of econometric estimates is characterized by pronounced differentiation across economic (age groups and settlement types) and econometric (type of equation and indicator) features. Housing conditions, as well as their improvement, have a positive effect on the variable y_i^*, promoting a region's transition to a club with lower average fertility.

In the younger age groups of both urban and rural populations (15–19 years and 20–24 years), as well as in the 25–29 age group of the rural population, the most important factor was the initial housing conditions, i.e., the total floor area available to the average urban or rural resident in 1989. Thus, demographic transformations in post-Soviet Russia, despite their rapid pace, are closely linked to the initial conditions in which the urban and rural population of a specific region

found themselves at the end of the Soviet era, especially when it comes to younger ages. At the same time, the growth rate of total area per capita in 2020 relative to 1989 as a factor in the formation of regional fertility convergence clubs begins to manifest in the 25–29 age group for the urban population and in the 30–34 age group for the rural population. Moreover, in both cases, the influence of changes in housing conditions prevails over the initial housing provision: the influence of the latter factor becomes insignificant for the urban population aged 25–29, and for the rural population aged 30–34, it is noticeably weaker than the influence of the growth rate of living area. The process of formation and dissolution of regional fertility convergence clubs in middle age groups is sensitive to the extent to which housing conditions have been improved in the post-Soviet period.

Table 2. Influence of housing conditions on the formation and dissolution of regional fertility convergence clubs for the urban population of post-Soviet Russia

Age	15–19		20–24		25–29	
Specifications	(1)	(2)	(1)	(2)	(1)	(2)
Total area per resident in 1989	0.691***	1.356***	0.925***	1.302***	0.133	-0.251
Growth rate of total area per resident in 2020/1989	1.369	2.362	2.637	3.584	3.140*	4.776**
Control variables	-	+	-	+	-	+
τ_1	10.497***	12.799	15.790***	39.180***	5.727	13.562
τ_2	11.734***	14.317	18.304***	41.859***	-	-
τ_3	12.195***	14.842	19.460***	43.057***	-	-
τ_4	13.298***	16.074	20.621***	44.263***	-	-
τ_5	14.736***	17.650	-	-	-	-
τ_6	15.459***	18.417	-	-	-	-
Number of observations	77	77	77	77	79	79
Wald χ^2	8.06**	31.17***	16.73***	12.62	3.15	15.14*
Pseudo R^2	0.044	0.122	0.084	0.131	0.035	0.205

*** – significant at 1% level;
** – significant at 5% level;
* – significant at 10% level.
Source: own calculations.

Table 3. Marginal effects of housing conditions on the formation and dissolution of regional fertility convergence clubs for the urban population of post-Soviet Russia

Age	15–19		20–24		25–29	
Club number	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989
1	-0.193***	-0.336	-0.198***	-0.545	0.043	-0.825**
2	-0.061***	-0.107	0.005	0.014	-0.043	0.825**
3	0.008	0.013	0.103***	0.284	-	-
4	0.075***	0.131	0.058	0.159	-	-
5	0.109***	0.189	0.032	0.087	-	-
6	0.030	0.052	-	-	-	-
7	0.033	0.057	-	-	-	-
*** – significant at 1% level; ** – significant at 5% level; * – significant at 10% level. Source: own calculations.						

A comparative analysis of the quality of equations (1) and (2) based on the Wald χ^2 and pseudo-R^2 criteria shows that middle age groups are also noticeably more sensitive to the inclusion of control variables in the specification. The proportion of explained variance of the variable y_i^* (pseudo-R^2) is significantly higher in type (2) equations precisely in the middle age groups. For the urban population, equation (1) in the 25–29 age group is not significant at all according to the Wald χ^2 criterion.

The formation of regional fertility convergence clubs in younger age groups is primarily determined by the fertility of first children, while in middle age groups it is determined by second and subsequent children. Therefore, if initial living area is important for fertility in younger age groups, fertility in middle age groups is more dependent on its expansion (growth rate), as well as on control variables such as ethnic and sex-age composition and the matrimonial behavior of the population. These results, reproducible in both urban and rural areas, confirm hypotheses *H-1.1* and *H-1.2*.

Both the initial size of total living area per capita in 1989 and the rate of its increase by 2020 contribute to regions exiting clubs with relatively high fertility and their subsequent consolidation in clubs with relatively low fertility. However, there are age-related and urban-rural nuances.

For the urban population aged 15–19 and 20–24 years, significant marginal effects facilitating inter-club transitions were established only for total housing area per capita in 1989. In the 15–19 age group, improved initial housing conditions help regions leave high-fertility clubs *C1* and *C2* and consolidate in low-fertility clubs *C4* and *C5*. In the 20–24 age group, they help regions leave club *C1* and consolidate in club *C3*. For the urban population aged 25–29 years, only the marginal effects of the growth rate of living area in 2020/1989 are important: they facilitate regions' transition from club *C1* to club *C2* and consolidation within it.

Table 4. Influence of housing conditions on the formation and dissolution of regional fertility convergence clubs for the rural population of post-Soviet Russia

Age, years	15–19		20–24		25–29		30–34	
Specifications	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Total area per resident in 1989	0.752***	0.575**	0.990***	1.001***	0.584***	0.739***	0.501***	1.677***
Growth rate of total area per resident in 2020/1989	5.425***	2.868	2.508	1.754	-1.084	1.040	-0.512	9.849**
Control variables	-	+	-	+	-	+	-	+
τ_1	17.698***	-14.808	13.340***	22.809***	4.053	27.793***	6.534	57.789***
τ_2	17.942***	-14.511	15.328***	24.971***	6.939	31.274***	-	-
τ_3	19.412***	-12.686	18.127***	27.912***	8.603	33.168***	-	-
τ_4	21.289***	-10.436	19.652***	29.539***	8.784	33.349***	-	-
τ_5	23.930***	-7.479	24.335***	34.630***	-	-	-	-
Number of observations	77	77	77	77	77	77	79	79
Wald χ^2	26.32***	38.73***	31.16***	29.97***	29.68***	43.61***	13.61***	18.9**
Pseudo R^2	0.139	0.234	0.273	0.307	0.211	0.285	0.221	0.563

*** – significant at 1% level;
** – significant at 5% level;
* – significant at 10% level.
Source: own calculations.

Table 5. Marginal effects of housing conditions on the formation and dissolution of regional fertility convergence clubs for the rural population of post-Soviet Russia

Age, years	15–19		20–24		25–29		30–34	
Club number	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989	Total area per resident in 1989	Growth rate of total area per resident in 2020/1989
1	-0.053**	-0.266	-0.019***	-0.034	-0.043***	-0.061	-0.157***	-0.920***
2	-0.005	-0.024	-0.043***	-0.075	-0.056***	-0.078	0.157***	0.920***
3	-0.023*	-0.114	-0.063***	-0.110	0.011	0.015	-	-
4	0.008	0.041	0.007	0.012	0.003	0.004	-	-
5	0.058	0.290	0.095***	0.166	0.085***	0.120	-	-
6	0.015	0.073	0.023	0.040	-	-	-	-

*** – significant at 1% level;
** – significant at 5% level;
* – significant at 10% level.
Source: own calculations.

For the rural population, the size of the initial total area is important primarily from the perspective of overcoming barriers to exiting regional clubs with relatively high fertility. In the 15–19 age group, this means exiting clubs *C1* and *C3*; in the 20–24 group, exiting clubs *C1, C2,* and *C3*; and in the 25–29 group, exiting clubs *C1* and *C2*. Furthermore, in the 20–24 and 25–29 age groups, improved initial housing conditions help regions consolidate in club *C5*. For the population aged 30–34 years, both the initial size of total area per capita in 1989 and its growth rate by 2020 are important for exiting club *C1* and consolidating in club *C2*.

Thus, hypotheses *H-2.1* and *H-2.2* were broadly confirmed but required qualification across age groups.

Conclusion

In contemporary literature, housing conditions are considered an ambiguous factor in terms of their influence on fertility. Under certain conditions, improved housing can either stimulate or suppress additional childbearing. The role of housing conditions in the regional convergence of demographic indicators had not been quantitatively measured until now. This study, using an ordinal logistic model, provides quantitative estimates of the influence of housing conditions on the formation and dissolution of regional convergence clubs for age-specific fertility, separately for urban and rural populations. It examines initial housing provision at the end of the Soviet period (1989) and its growth rate by 2020. Prior to this, identification of regional convergence clubs for age-specific fertility of the urban and rural population in post-Soviet Russia was conducted *(see Appendix)*.

The study establishes that the indicator of housing provision has a statistically significant influence on both the formation and dissolution of regional convergence clubs for age-specific fertility. This influence differs substantially in significance and intensity depending on the population's age group and place of residence.

The total living area available to the average Russian resident in 1989 exerted a significant effect on the formation and dissolution of regional convergence clubs for age-specific fertility only in the younger age groups (15–19 and 20–24 years) of both urban and rural populations, as well as in the 25–29 age group of the rural population. Conversely, the growth rate of total area per capita in 2020 relative to 1989 manifested as a factor in the formation and dissolution of such clubs only in the middle age groups: 25–29 years for the urban population and 30–34 years for the rural population.

An assessment of the marginal effects of housing provision indicators allows us to conclude that their role in the formation and dissolution of regional convergence clubs for age-specific fertility differs qualitatively depending on the type of settlement and age group. By influencing the reproductive behavior of the urban population, both housing provision indicators facilitate both the exit of regions from high-fertility clubs and their consolidation in low-fertility clubs, regardless of age group. In contrast, the influence on the reproductive behavior of the rural population is differentiated across age groups. In the 15–19 age group, an increase in the total living area available to the average rural Russian resident in 1989 helped regions exit high-fertility clubs but did not contribute to their consolidation in low-fertility clubs. A dual effect of housing provision indicators (exit from high-fertility clubs and consolidation in low-fertility clubs) in rural areas is observed only starting from the 20–24 age group.

This is a qualitatively new scientific result, which not only characterizes the dependence of fertility on certain socio-economic factors but also explains the joint dynamics of population reproduction processes in the regions throughout the post-Soviet period. It provides the scientific community and government authorities with both new knowledge about long-term demographic trends and a new experimental toolkit that allows working not only with ontological criteria (the level of fertility in specific regions) but also with epistemological criteria (trajectories of local equilibrium) of the demographic development of territories.

The research results can be applied for more accurate modeling of demographic processes in Russian regions. The scientific significance of the study lies in obtaining robust estimates of the influence of improved housing conditions on the convergence of demographic development indicators in the country's regions, with a breakdown into urban and rural segments. The methodological significance of the study consists in advancing the toolkit of ordinal logistic regression for the quantitative analysis of long-term patterns of social and demographic development under conditions of limited and incomplete data.

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Appendix

The composition of regional clubs for the convergence of age-related fertility of urban and rural populations in the regions of Russia 1990–2023

Region	Urban			Rural			
	15–19	20–24	25–29	15–19	20–24	25–29	30–34
Belgorod Region	C5	C3	C2	C5	C5	C5	C2
Bryansk Region	C4	C2	C2	C4	C6	C5	C2
Vladimir Region	C3	C2	C2	C4	C5	C5	C2
Voronezh Region	C5	C3	C2	C4	C5	C5	C2
Ivanovo Region	C3	C2	C2	C4	C5	C5	C2
Kaluga Region	C2	C1	C1	C5	C5	C5	C2
Kostroma Region	C6	C2	C1	C5	C5	C2	C1
Kursk Region	C3	C2	C2	C4	C4	C3	C2
Lipetsk Region	C4	C2	C2	C4	C5	C5	C2
Moscow Region	C2	C1	C1	-	-	-	C2
Oryol Region	C5	-	C2	C3	C4	C3	C1
Ryazan Region	C4	C3	C2	C5	C5	C5	C2
Smolensk Region	C5	C4	C2	C5	C6	C5	C2
Tambov Region	C2	C2	C2	C4	C5	C5	C2
Tver Region	C4	C2	C2	C4	C5	C3	C2
Tula Region	C3	C2	C2	C4	C5	C5	C2
Yaroslavl Region	C6	C3	C1	C5	C5	C5	C2
Republic of Karelia	C5	C4	C1	C5	C4	C2	C1
Komi Republic	C3	C2	C2	C3	C3	C1	C1
Nenets Autonomous Area	C1	C1	C1	C1	C2	C1	C1
Arkhangelsk Region	C5	C4	C2	C4	C3	C1	C1
Vologda Region	C4	C2	C1	C5	C5	C4	C1
Kaliningrad Region	C5	C3	C1	C4	C5	C5	C2
Leningrad Region	C4	C4	C2	-	-	-	C2
Murmansk Region	C4	C2	C1	C5	C5	C3	C2
Novgorod Region	C2	C2	C2	C4	C5	C5	C2
Pskov Region	C2	C2	C1	C4	C5	C3	C2
Republic of Adygea	C4	C1	C2	C4	C4	C5	C2
Republic of Kalmykia	C4	C2	C1	C5	C5	C5	C2
Krasnodar Territory	-	C1	C1	C5	C5	C3	C2
Astrakhan Region	C1	C1	C1	C3	C4	C3	C2
Volgograd Region	C2	C3	C2	C3	C5	C5	C2

Region	Urban			Rural			
	15–19	20–24	25–29	15–19	20–24	25–29	30–34
Rostov Region	C2	C2	C2	C4	C4	C3	C2
Republic of Dagestan	C1	C1	C2	C1	C2	C2	C2
Kabardino-Balkarian Republic	C1	C1	C1	C4	C3	C3	C2
Karachay-Cherkess Republic	C2	C2	C2	C5	C5	C5	C2
Republic of North Ossetia-Alania	C4	C1	C1	C5	C5	C3	C2
Stavropol Territory	C1	C2	C2	C3	C3	C4	C2
Republic of Bashkortostan	C7	C3	C2	C4	C4	C2	C1
Republic of Mari El	C2	C2	C2	C4	C4	C3	C2
Republic of Mordovia	C7	C5	C2	C6	C5	C5	C2
Republic of Tatarstan	C5	C2	C1	C6	C5	C3	C2
Udmurt Republic	C5	C3	C2	C4	C3	C2	C1
Chuvash Republic	C4	C2	C2	C5	C4	C2	C1
Perm Territory	C2	C2	C2	C3	C3	C2	C1
Kirov Region	C4	C3	C2	C4	C3	C1	C1
Nizhny Novgorod Region	C5	C2	C1	C5	C5	C3	C2
Orenburg Region	C3	C2	C2	C4	C3	C2	C1
Penza Region	C4	C3	C2	C5	C5	C3	C2
Samara Region	C4	C2	C2	C4	C5	C3	C2
Saratov Region	C3	C2	C2	C4	C5	C5	C2
Ulyanovsk Region	C2	C2	C1	C4	C5	C5	C2
Kurgan Region	C2	C1	C1	C3	C3	C2	C1
Sverdlovsk Region	C2	C2	C1	C3	C3	C2	C1
Khanty-Mansi Autonomous Area	C2	C1	C1	C4	C4	C3	C1
Yamal-Nenets Autonomous Area	C4	C1	C1	C2	C2	C2	C1
Tyumen Region	C1	C1	C1	C4	C4	C2	C1
Chelyabinsk Region	C2	C2	C2	C3	C4	C3	C1
Republic of Altai	C2	C2	C2	C1	C2	C1	C1
Republic of Tyva	-	-	C1	C1	C1	C1	C1
Republic of Khakassia	C2	C1	C1	C1	C3	C3	C2
Altai Territory	C3	C2	C2	C3	C4	C2	C1
Krasnoyarsk Region	C2	C2	C2	C2	C3	C2	C1
Irkutsk Region	C1	C1	C1	C1	C3	C2	C1
Kemerovo Region	C1	C1	C2	C1	C4	C5	C2
Novosibirsk Region	C1	C2	C2	C3	C3	C2	C1
Omsk Region	C2	C2	C2	C3	C3	C2	C1
Tomsk Region	C4	C5	C2	C3	C3	C2	C1
Republic of Buryatia	C1	C1	C2	C1	C3	C2	C1
Republic of Sakha (Yakutia)	C1	C1	C2	C3	C3	C2	C1
Trans-Baikal Territory	C1	C1	C2	C1	C2	C2	C1
Kamchatka Region	C1	C1	C1	C3	C3	C2	C2
Primorye Territory	C1	C2	C2	C1	C4	C2	C1
Khabarovsk Territory	C1	C2	C2	C1	C3	C2	C1
Amur Region	C1	C1	C2	C1	C3	C2	C1
Magadan Region	C1	C2	C2	C5	C4	C2	C2
Sakhalin Region	C1	C1	C1	C3	C3	C2	C1
Jewish Autonomous Region	C1	C1	C2	C1	C3	C3	C2
Chukotka Autonomous Area	C1	C2	C2	C1	C1	C1	C2

Source: compiled according to (Domnich, 2025, pp. 27–32).

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ИНФОРМАЦИЯ ОБ АВТОРЕ

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POPULATION AGING FEATURES: ANALYSIS OF REGIONAL DIFFERENTIATION

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The article presents an analysis of the demographic characteristics of population aging in different regions of Russia with a study of middle age and its dynamics. The aim of the study is to analyze the regional characteristics of population aging and differentiation according to this process to assess its impact on the quality of life and human potential of territories. The scientific novelty lies in the application of a dynamic approach that takes into account not only the level of average age, but also its growth rate, which makes it possible to identify new types of demographic trajectories. The first part of the article discusses research on the analysis of aging processes in Russian regions using various classification and grouping methods. For comparison, examples of international approaches to the typification of aging territories by both macro-regions and regions within the country are given. The second part analyzes the average age of the population and its dynamics in Russian regions for the period from 2010 to 2024. The study revealed regional differences in the levels and rates of increase in the average age of the population due to factors of fertility, mortality, migration and cultural characteristics. The oldest regions are concentrated in the Central and Volga Federal Districts, where the average age is highest, while the regions of the North Caucasus Federal District and the Republic of Tuva show a low average age due to high birth rates and traditional family values. An analysis of gender and territorial differences shows that women age more slowly than men, and the urban population as a whole ages faster than the rural population. Within the framework of the

classification, seven groups of regions are identified according to the level and dynamics of average age, which makes it possible to systematize the features of the demographic situation in different parts of the country. In conclusion, the article draws conclusions on the situation with the aging of the population in the Russian Federation and formulates proposals for a differentiated regional policy.

Population aging, regional differentiation, elderly population.

Introduction

In Russia, there is a tendency to increase the share of elderly people in the total population. The share of citizens over 65 was about 24% in 2023 according to Rosstat; and by 2046 it is projected to increase to 27% (Wang, 2025). According to the forecasts of the World Bank, the aging of the Russian population will continue in the coming decades, which is associated, in particular, with an increase in life expectancy. By 2030, older people will make up almost a third of the country's population. Such a situation may require reforming the pension system and redistributing resources in favor of healthcare and social support for the elderly.

The increase in population aging was influenced by the second demographic revolution, which began in Western Europe in the late 18th and mid-19th centuries (Kolesov, Kalachikova, 2023). It was caused by the development of the capitalist mode of reproduction due to the development of trade, technology and industry. As a result of the revolution, there was a significant decrease in mortality while reducing the birth rate after its significant growth, which led to an increase in life expectancy. As a result, the number of people who have reached retirement age has increased dramatically in the 20th century. Russia is also facing these demographic changes.

In terms of the demographic burden of people over 65, Russia ranks 49th among more than 200 countries and territories (Petrosyan et al., 2019). Similar indicators can be seen in developing countries that completed demographic transition early. These are the countries of Latin America and the Caribbean, where the population of European origin prevails, as well as relatively young European countries, where Catholic Christianity has traditionally been strongly influenced. Latin American countries are similar to Russia in that they are experiencing accelerated population aging, associated with a simultaneous decrease in the number of young age groups and an increase in life expectancy at older ages.

Demographic changes in Russia are also caused by a decrease in the birth rate and mortality, as well as an increase in the life expectancy (Barsukov, 2018). In a situation of simultaneous reduction in the number of deaths and births, the change in the age structure was manifested in a decrease in the share of children and a constant increase in the share of the elderly. The main reason for the aging of the Russian population in the 20th century was a sharp decline in the birth rate, which caused aging to occur faster than in most developed countries. From 1959 to 1989, the share of people over the age of 60 increased from 9% to 15.3% (Popova, Zorina, 2024).

Migration processes, along with the natural movement of the population, have a significant impact on regional differences in age structure. The age selectivity of migration is particularly noticeable, since young people of working age are the most mobile. As a result, the donor regions are losing the most economically active part of the population, which, in turn, accelerates their demographic aging. At the same time, recipient regions can temporarily "rejuvenate" due to the influx of young people (Mkrtchyan, 2014).

Since the end of the 20th century, the age structure of the Russian population has undergone significant changes. From 1989 to 2010, the share of elderly people (65 years and older) more than doubled, from 9.6% to 20.7% (Antipova, Trifonova, 2017). The composition of the regions with the highest proportion of elderly people has changed slightly in dynamics. These are mainly the regions of Central Russia. However, whereas in 1989 only 25 regions had less than 7% of the population over 65 years of age, in 2010 in all constituent entities of the Russian Federation this figure exceeded 7%, and in 63 regions the share of elderly people began prevailing over the share of children. The geography of such territories is extensive and generally coincides with the main settlement area. The types of regions with very old and elderly populations are represented in the European part of the country and beyond the Urals, with this band narrowing to the east.

Among the macro-regions in the period from 1990 to 1998, the Far Eastern Federal District experienced the most significant increase in the aging coefficient (1.16 times) (Shabunova, Barsukov, 2015). At the same time, the growth rate in the Central Federal District was the lowest (1.06 times). During this period, the share of elderly people in the Far Eastern Federal District remained the lowest among all federal districts of the Russian Federation. In the period from 2007 to 2013, most of the macro-regions of Russia faced a "wave of aging". The most noticeable increase in the aging coefficient was observed in the Far Eastern Federal District (1.23 times). The North Caucasus Federal District, on the contrary, showed the smallest increase in the proportion of elderly people, which is why it became the youngest macro-region. For 23 years, from 1990 to 2013, the Central Federal District remained the "oldest" macro-region in Russia.

Overcoming demographic aging is one of the main tasks for the sustainable development of Russian regions. It has a significant impact on the quality of life of citizens and the human potential of territories. The increase in the share of elderly people is changing the structure of consumer preferences, placing new demands on healthcare systems, social services and the labor market, which, in turn, affects the socio-economic situation in the regions. The aging trend of the population requires a revision of society's attitude toward the elderly and the fight against ageism. Surveys show that the main problems for the older generation are poverty and low pensions, deteriorating health and illness, a sense of uselessness and loneliness (Dobrokhleb, 2021).

The aim of this study is to analyze the differentiation of regional trends in population aging and to systematize regional groups of the Russian population aging according to the nature and intensity of demographic aging. This will allow assessing how the differences in this process affect the threats and opportunities for human potential and living standards in different Russian regions.

Research on the differentiation of demographic aging

The research results conducted by A.N. Petrosyan demonstrate that the most intense aging of the population is observed in regions with a low share of elderly people (Petrosyan et al., 2019). This applies to the republics of the eastern part of the North Caucasus, where the rural population predominates, as well as to the Siberian and Far Eastern republics. The northern regions, which are oil production areas, as well as the regions of the Russian North and the Far East, are also aging rapidly. In most regions of Russia, where about two thirds of the country's population lives, aging occurs relatively evenly, with small differences within this group. The main difference between the regions is the division into north and south. In the regions of the Far North and in territories equated to them

(including most of the regions of the North of the European part of Russia, Siberia and the Far East), the share of working pensioners is higher. At the same time, there are fewer working pensioners in the southern (more rural) regions.

To analyze the processes of population aging in Russian regions, researchers use various methods of grouping and classification. S. Bukher developed a system of correlations between 10 indicators and a composite index of population aging in Russia, where subjects were divided into four groups depending on the intensity of population aging (Bukher, 2016). The regions were sorted by 10 indicators in ascending or descending order, depending on how the indicator affected the aging process. The distribution by group turned out to be uniform: 21 regions fell into the "very elderly" category, 20 into the "elderly" category, 19 into the "young" category, and 23 into the "very young" category. The "very elderly" group includes the regions of the European part of Russia, mainly from the Central Federal District (Tula, Ryazan, Voronezh, Tambov regions, etc.). The "very young" group includes the regions of the North Caucasus Federal District (Chechen Republic, Republic of Ingushetia, etc.) and the Asian part of Russia (Chukotka Autonomous Area, Republic of Tyva, etc.).

E.V. Chistova proposed her own method for determining the stage of demographic aging of the population at the regional level (Chistova, 2017). Her approach is based on four principles. The first principle is to determine the aging stage of the population using a developed system of thresholds. This system includes parameters such as the level of aging, its depth, factors and speed. Indicators of the level and depth of aging describe the current situation, while indicators of factors and speed characterize the trends and prospects of this phenomenon in the region. The second principle is the conventionality of the age limit. In the developed method, it is set at the retirement age. The third principle

is to correlate the population of each region with one of the four stages of demographic aging (young population, aging population, old population and deeply old population). The fourth principle is to assess the dynamics of demographic processes in the regions. To do this, the actual values of the indicators are compared with the 1990 levels, which allows obtaining a long time period, avoid the demographic crisis in the 1990s, and align the results with generational theory.

The correlation of regions with the stages of demographic aging showed that 60% of the constituent entities of the Russian Federation have an old and deeply old population (Chereshnev, Chistova, 2017). Only 10 regions, including the regions of the Far North, the North Caucasus and Siberia, have a predominantly young population. This population structure may be due to "rejuvenation" due to migration, high birth rate and natural growth. There are 23 regions of the Russian Federation with an aging population, mainly in the regions of Siberia and the Far East, where the proportion of elderly people is small due to regional peculiarities and migration outflow. Thirty-four regions of the Russian Federation have an older population, mostly regions with relatively high production potential. The 16 regions of the central part of Russia have a deeply old population. A characteristic feature of this stage is the aging of the older population or the "deepening" of aging.

In 2019, before the outbreak of the pandemic, the situation with the distribution of regions by age group looked different (Vorob'eva et al., 2022). The first group with a young population included three regions with high birth rates: the Republic of Tyva, the Chechen Republic and the Nenets Autonomous Area. The second group with an aging population includes 13 regions, mainly from the Ural, Far Eastern and North Caucasian federal districts. The third group with the old population includes 52 regions, covering

almost all federal districts. The fourth group with a very old population included 17 regions representing almost all regions of the Central Federal District. From 2017 to 2019, the number of regions with an older population increased significantly. However, the comparison may not be entirely correct, since in 2019 it was conducted only according to the total fertility rate.

O.O. Sekitski-Pavlenko conducted a classification of regions based on the calculation of the aging index. As a result, a system was created that includes 6 main types and 18 subtypes describing the transformation of the age structure in different Russian regions (Sekitski-Pavlenko, 2023). Depending on the age structure, regions can be divided into six categories: moderately old, old, very old, on the verge of old age, young and very young. In 2022, more than 80% of the country's regions had an old age structure. At the same time, one third of all regions (32 constituent entities) belonged to the category with a moderately old age structure. The old industrial regions of Northwestern, Central Russia and the Urals have a predominantly old age structure with varying degrees of aging intensity. The very young age structure is typical only for the Republic of Tyva and the Chechen Republic, that is, for mono-ethnic and subsidized regions of the country. Both urbanized economically developed regions and low-urbanized subsidized regions are distinguished by their young age structure.

Based on the analysis of data on the proportion of people over the working age in the total population, life expectancy and the depth of aging (share of people over 75 years of age in the total elderly population), V.G. Dobrokhleb and N.A. Kondakova identified seven clusters (Dobrokhleb, Kondakova, 2022). The first list includes 12 regions, including the major cities of Moscow, Saint Petersburg and Sevastopol, as well as the subjects of the North Caucasus and Southern Federal Districts. In these regions, every fifth person is elderly, and life expectancy

is above average. The second cluster includes only two regions – the Republics of Dagestan and Ingushetia. The population here is young, but life expectancy is high, and the proportion of people over 75 is also significant. The third cluster includes 21 regions. Its characteristics are similar to the first one, but the life expectancy here is slightly lower. The fourth cluster includes the republics of Tyva, Sakha (Yakutia), the Chechen Republic, the Tyumen Region and the Khanty-Mansi Autonomous Area. The population here is young, but life expectancy and the depth of aging are lower than in other clusters. The fifth cluster includes two regions of the Far North – the Yamal-Nenets and Chukotka autonomous areas, where there is an outflow of the population who have completed their work, which contributes to the "rejuvenation" of the population. The sixth cluster includes 13 regions, including the territories of the Far North, as well as the republics of Kalmykia, Altai, Khakassia, the Kamchatka Territory, Sakhalin and the Jewish Autonomous Region. The proportion of the elderly population here is high, and life expectancy is below average. The seventh cluster is the most numerous. It includes 30 regions located relatively compactly. In this cluster, the proportion of the elderly population and the depth of aging are high with an average life expectancy.

An analysis of the methods of classifying Russian regions by population aging shows the predominance of the division of subjects according to the ratio of the number of the elderly to the entire population or persons under working age. There is a tendency with the predominance of the aging process in the central and northern regions of Russia. They are characterized by a high share of people over the working age. The young population has regions with high birth rates and/or high migration flows.

Thus, research on the impact of population aging on the quality of life and human potential can be divided into three main groups. The first

one covers works studying the socio-economic burden associated with demographic changes. A.N. Petrosyan and co-authors, as well as S. Bukher, note that the population aging has a different impact on the labor market depending on the region (Petrosyan et al., 2019; Bukher, 2016). In the northern industrial regions, there is a high share of working pensioners, which helps to compensate for the shortage of personnel. At the same time, in the southern, predominantly rural regions, this share is significantly lower, which exacerbates the burden on the economically active population. The second group of studies focuses on the quality of life of the elderly. For example, the classification by V.G. Dobrokhleb and N.A. Kondakova makes it possible to identify regions where the health system faces the most pressing challenges in maintaining active longevity. In some clusters, low life expectancy indicates difficulties in accessing quality medical care, while in other regions, a high proportion of the elderly population requires increased volumes of geriatric care and palliative care (Dobrokhleb, Kondakova, 2022). The third category of research considers aging as a factor influencing spatial development. Works of V.A. Chereshnev and E.V. Chistova and O.O. Sekitski-Pavlenko demonstrate that regions with a high level of population aging, such as Central Russia, are facing a reduction in human capital and a decrease in innovation potential. In contrast, young regions such as Chechnya and Tyva have a demographic dividend, but their development is limited by a lack of jobs or a low level of education (Chereshnev, Chistova, 2017; Sekitski-Pavlenko, 2023).

There is a division of territories according to the degree of population aging and at the global level. M. Mustafina classified subregions and individual countries according to two criteria: the expected time when the share of the population aged 65 and over will reach 14% (before 2050 or in the period up to 2100), and the level of quantum and tempo population aging (Mustafina, 2020). As a result, she identified six types of aging processes: "early aging with low quantum and tempo"; "early aging with high quantum and tempo"; "early aging with very high quantum and tempo"; "late aging with low quantum and tempo"; "late aging with high quantum and tempo"; "late aging with very high quantum and tempo". The lowest rates of aging are observed in the more developed subregions of the world, such as Europe, North America and Australia/New Zealand. These regions belong to the first type. Northern and Southern Africa, which belong to the fourth type, will also age, but with a later onset and relatively low rates. Most of Asia and America, which belong to the second and fifth types, are already aging or will age with high rates. The highest rates of aging are observed in Western Asia and in countries such as Albania and Singapore. These regions belong to the third and sixth types. Afghanistan is estimated to age at its highest rates in the second half of the 21st century.

In the study by I. Kiniorska et al., their own classification of territories with an imbalance in the age structure of the population from 2008 to 2021 was developed (Kiniorska et al., 2023). In total, four groups of countries were identified in Europe. The first group (type A) includes countries where the proportion of people aged 65 and over exceeds 19.3%; the second group (type B) includes countries where the share of people aged 65 and over increased by 3.7 percentage points compared to previous years; the third group (type C) – countries that meet the criteria of types A and B; the fourth group (type D) includes countries that do not meet the criteria of types A and B. In this classification, the proportion of elderly people (19.3%) is calculated as the arithmetic mean for the analyzed group, and the level of increase in the proportion of this age group is expressed as the average difference over the observation period from 2008 to 2021.

Nine countries were included in type A, which accounted for 25% of the total. They form three subgroups in Northern (Baltic States and Sweden), Southern (Italy, Spain, Croatia) and Western (Belgium, Germany) Europe. Most of these countries entered the stage characterized by the presence of an old population in the first half of the 1990s, with the exception of Estonia and Lithuania, where this process began in the first five years of the 21st century. Liechtenstein, Poland, Slovakia, Malta, Ireland and Cyprus are classified as type B. This is the smallest group that will face a sharp increase in the proportion of elderly people in the future. The most pronounced aging is observed in the type C group, which includes twelve countries (33.3% of the total) located in different parts of the continent. The most compact group of them are the countries of Eastern (Bulgaria, Hungary, Romania) and Southern (Greece, Serbia, Slovenia) Europe, which have been suffering from demographic decline for many years. Most of the countries in this group reached the stage of a very old population back in the 1990s, mostly in the second half of the decade. The Type D group includes nine countries. Among them, the states of Northern (Iceland, Norway, Great Britain) and Western (Austria, Luxembourg, Switzerland) Europe predominate. They do not meet the criteria of other types due to the partial rejuvenation of the demographic structure due to intensive migration processes.

L. Šídlo, B. Šprocha, and M. Klapková used both standard indicators (the aging index, the share of people aged 65 and older, etc.) and promising ones (the share of the population with a life expectancy of 15 years or less, the estimated median age, etc.) to determine the main patterns of population aging in Europe (Šídlo et al., 2019). In order to identify the regions most and least affected by population aging, a cluster analysis was conducted. As a result, Europe was divided into five clusters,

from the oldest to the youngest. When using standard indicators of demographic aging, the oldest cluster contained 28 regions. However, when using promising indicators, only 13 regions remained in this cluster. This is due to the way standard indicators are being developed and the upward shift in the age structure. With both indicators, the "old" cluster has regions from Germany, Spain, Italy, and Portugal. When using standard indicators, the "old" cluster contained 88 regions, and when using promising ones – 64. These are mainly regions of Germany, Italy, Spain, Portugal, Romania, Croatia, Hungary, Sweden, Latvia and Lithuania. Using standard indicators, the "young" cluster contained 16 regions, mainly in Ireland, Great Britain and Norway. Using promising indicators, this cluster is expanding to include the territories of Norway, France, Poland and Denmark. The "young" cluster contains more regions and includes both western and eastern regions. The rest of Europe's regions fall into the "middle" cluster, such as the Czech Republic.

Some studies consider the classification of regions within the country according to the level of population aging. G. Qi, Z. Wang and C. Wang studied the evolution of population aging in the Bohai Ring area from 2000 to 2020 (Qi et al., 2025). The deepening trend of population aging and the severity of the spatial clustering characteristics of the region were shown. Y. Wu, Y. Song, and T. Yu assessed spatial differences and the drivers of Chinese population aging using two-stage nested Theil decomposition, ESDA, and spatial econometric models (Wu et al., 2019). The results showed that spatial differences in population aging were noticeable at different scales, and there are different factors in the regions that influence this process. T. Inoue and N. Inoue conducted a non-hierarchical cluster analysis using two statistical indicators of population aging (share of elderly people and index of change in the number of elderly

people), after which they combined small areas into seven clusters (Inoue, Inoue, 2024). There have been shifts in the reduction of the elderly population and its share, especially in areas with a high proportion of the elderly population and a long-term decline in fertility. M. Brajuskovic and co-authors studied regional differences in the northern, central and southern parts of Montenegro (Brajuskovic et al., 2018). They found that the process of demographic aging of the population in all regions of Montenegro intensified and developed slowly but steadily. L. Vidovichova and M.P. Kafkova applied the regional active longevity index in the context of the Czech Republic (Vidovichova, Kafkova, 2016). The first place was taken by the capital Prague with a high level of employment, which is an important indicator in the index.

Research methods

The study of existing classifications and typologies demonstrates the variety of indicators used to describe the regional characteristics of population aging. However, most of these approaches rely on structural indicators at a specific point in time, such as the share of the population over a certain age, which does not always fully reflect the dynamics of the process. The paper proposes to use the average age of the population and the rate of its change to study the differences between regions. The average age takes into account the impact of all demographic processes, including fertility, mortality and migration. A decrease in the birth rate and an increase in life expectancy directly lead to growth in the average age, which makes it a sensitive indicator of the general population aging. Unlike some complex indexes, the average age is easy to interpret. It allows for direct comparisons between regions. The rate of change in average age makes it possible to assess not only the current state, but also the dynamics of demographic changes. The high growth rate indicates intensive and possibly problematic aging associated with a sharp decline in the birth rate and/or the migration outflow of young people.

The empirical basis of the study was the official data from Rosstat on the age structure for the period from 2010 to 2024. The data were taken for 80 regions of the Russian Federation, except for those integrated into another subject (Nenets, Khanty-Mansi and Yamal-Nenets autonomous areas) and new regions of the country since 2014 (Republic of Crimea, Sevastopol, Donetsk and Lugansk people's republics, Zaporozhye and Kherson regions). To determine how the population aging is taking place in different regions, a comparison of the average age of the population and its growth rate was carried out. At the first stage, all subjects will be ranked according to each indicator, after which three homogeneous groups will be formed using equal intervals: "high" (with the highest values), "average" and "low" (with the lowest values). For example, according to the average age of the entire population, "high" includes regions with values from 44.69 to 39.72, "average" – from 39.71 to 34.74, "low" – from 34.73 to 29.76; according to growth rates, "high" includes regions with values from 11.94 to 8.1%, "average" – from 8.09 to 4.26%, in "low" – from 4.25 to 0.42%. This method allows not only identifying extreme cases, but also characterizing the mass of regions occupying the middle positions. The subsequent cross-tabular analysis of the distribution of regions in these groups allows determining stable combinations of the level and dynamics of aging. The results are presented for the entire population, for men and women, as well as for urban and rural residents.

At the second stage, a comprehensive grouping will be carried out to systematize regional trajectories, taking into account the gender and type of settlement. Each group will include regions with similar characteristics in terms of the ratio of average age and its growth rate. This

allows identifying clusters of regions with similar models of demographic aging, taking into account its internal structure and gender aspects.

Results

In the period from 2010 to 2024, an increase in the average age of the population was observed in all constituent entities of the Russian Federation *(Tab. 1)*. The highest value of this indicator remained in the Central Federal District, and the lowest in the North Caucasus. The Central Federal District has the lowest dynamics of changes in average age and its growth rate. This may be due both to the earlier aging of the population in the 20th

century, which slowed down the pace, and to the influx of young people from other regions, especially to Moscow. In the Siberian and Volga federal districts, on the contrary, there is a high dynamics and high rates of increase in the average age of the population due to migration outflow and a decrease in the birth rate.

An increase in the average age of the population in the Volga Federal District has led to changes in the top ten regions with the highest value of the indicator. If in 2010 it included 8 regions from the Central Federal District and 2 from the Northwestern Federal District, then in 2024 – 7 regions from the Central Federal District and 3 from the Volga Federal District *(Tab. 2)*.

Table 1. Dynamics of changes and increase in the average age of the population in the federal districts from 2010 to 2024

Federal district	Average age of the population, years			
	2010	2024	Dynamics (2024–2010)	Growth, %
Siberian	37.4	40.0	+2.6	7.0
Volga	39.0	41.5	+2.5	6.4
Far Eastern	36.7	38.9	+2.2	6.0
Northwestern	39.8	42.2	+2.4	6.0
North Caucasus	34.0	36.0	+2.0	5.9
Ural	37.8	39.8	+2.0	5.3
South	39.4	41.4	+2.0	5.1
Central	41.0	42.5	+1.5	3.7

Note: federal districts are ordered by the increase in the average age of the population.
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284

Table 2. Top 10 regions with the highest average age of the population in 2010 and 2024

Region	Average age of the population (2010), years	Region	Average age of the population (2024), years
Tula Region	42.2	Tambov Region	44.7
Ryazan Region	41.8	Tula Region	44.5
Tambov Region	41.6	Republic of Mordovia	44.0
Voronezh Region	41.4	Ryazan Region	43.8
Moscow	41.4	Penza Region	43.6
Saint Petersburg	41.3	Kirov Region	43.5
Tver Region	41.1	Ivanovo Region	43.4
Pskov Region	41.1	Smolensk Region	43.4
Penza Region	41.1	Vladimir Region	43.2
Ivanovo Region	41.0	Tver Region	43.2

According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284

The highest rates of average age of the population are observed in the Tambov and Tula regions, as well as in the Republic of Mordovia because in these regions, the share of people over 65 is high due to the low birth rate and high mortality.

In the regions of the North Caucasus, Siberian and Far Eastern federal districts, the minimum average age of the population remains *(Tab. 3)*, especially in the Chechen Republic, the Republic of Tyva and the Republic of Ingushetia. These regions are characterized by high birth rates and relatively low mortality rates, which are influenced, among other things, by local traditions and customs related to the family. For example, large families and early marriages are common in the North Caucasus. There is a difference in differentiation between the oldest and youngest regions of Russia. Among the ten oldest, the age difference is less than two years, while among the ten youngest, the difference reaches almost eight years. Consequently, most regions have similar conditions and trends, which makes them more homogeneous in terms of aging.

In the period from 2010 to 2024, the average age of the population increased significantly in the regions of the Northwestern, Far Eastern and Volga federal districts *(Tab. 4)*. In the Komi

Table 3. Top 10 regions with minimum average age of the population in 2010 and 2024

Region	Average age of the population (2010), years	Region	Average age of the population (2024), years
Chechen Republic	27,8	Chechen Republic	29,8
Republic of Tyva	29.1	Republic of Tyva	30.7
Republic of Ingushetia	29.6	Republic of Ingushetia	31.2
Republic of Dagestan	31.4	Republic of Dagestan	34.4
Republic of Sakha (Yakutia)	33.1	Republic of Altai	35.5
Republic of Altai	33.3	Republic of Sakha (Yakutia)	35.6
Chukotka Autonomous Area	33.3	Chukotka Autonomous Area	36.0
Trans-Baikal Territory	34.8	Republic of Buryatia	36.9
Republic of Buryatia	34.9	Kabardino-Balkarian Republic	37.5
Republic of Kalmykia	35.4	Trans-Baikal Territory	37.6
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284			

Table 4. Top 10 regions with the maximum and minimum increase in the average age of the population from 2010 to 2024, %

Region	Increase in the average age of the population	Region	Increase in the average age of the population
Komi Republic	11.9	Moscow Region	0.4
Republic of Karelia	10.9	Republic of Adygea	2.5
Republic of Kalmykia	10.0	Saint Petersburg	3.0
Jewish Autonomous Region	10.0	Kaluga Region	3.3
Arkhangelsk Region	9.9	Moscow	3.6
Sakhalin Region	9.8	Krasnodar Territory	3.8
Republic of Dagestan	9.4	Voronezh Region	3.8
Republic of Mordovia	8.6	Yaroslavl Region	3.9
Kirov Region	8.5	Novosibirsk Region	3.9
Murmansk Region	8.4	Sverdlovsk Region	4.2
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284			

Republic, the republics of Karelia, Kalmykia and other regions, the population is declining and the birth rate is decreasing, which leads to an aging population. In the regions of the Central and Southern federal districts, on the contrary, there is a low growth rate of average age. The reasons for this phenomenon are different: a slowdown in growth in the already old regions (Kaluga, Voronezh, and Yaroslavl regions), a relatively high birth rate (Krasnodar Territory), migration of young people (Moscow and Saint Petersburg), as well as territorial changes (Moscow Region).

There is no noticeable difference in the average age of men and women in different regions. In the subjects of the Central and Volga federal districts, representatives of both genders have a high average age *(Tab. 5)*. The average age of women exceeds men by 5–6 years, which is explained by their physiological characteristics and a more cautious lifestyle.

More obvious differences can be observed between the urban and rural populations *(Tab. 6)*. In the regions of the Central Federal District, the average age of the urban population is higher than in other regions. At the same

Table 5. Top 10 regions with the highest male and female average age in 2024

Region	Male average age, years	Region	Female average age, years
Tambov Region	41.8	Tula Region	47.2
Tula Region	41.2	Tambov Region	47.1
Republic of Mordovia	41.2	Ryazan Region	46.6
Penza Region	40.6	Ivanovo Region	46.5
Moscow	40.5	Republic of Mordovia	46.5
Kirov Region	40.5	Vladimir Region	46.2
Ryazan Region	40.4	Smolensk Region	46.2
Voronezh Region	40.2	Pskov Region	46.1
Leningrad Region	40.2	Penza Region	46.1
Saratov Region	40.2	Kirov Region	46.1
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284			

Table 6. Top 10 regions with the highest average age of urban and rural populations in 2024

Region	Average age of urban population, years	Region	Average age of rural population, years
Tula Region	44.4	Kirov Region	48.1
Tambov Region	44.1	Republic of Mordovia	46.5
Ryazan Region	43.3	Republic of Karelia	46.1
Penza Region	43.1	Ulyanovsk Region	45.8
Orel Region	43.1	Ivanovo Region	45.7
Smolensk Region	43.0	Tambov Region	45.6
Ivanovo Region	42.9	Arkhangelsk Region	45.4
Moscow	42.9	Kostroma Region	45.3
Vladimir Region	42.7	Vladimir Region	45.2
Tver Region	42.7	Pskov Region	45.2
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284			

time, the average age of the rural population is higher in the regions of the Northwestern and Volga federal districts. In general, the average age of the rural population exceeds the average age of the urban population due to the migration of young and working-age people from villages to cities. In the Tula, Tambov and Ryazan regions, the average age of the urban population is higher than in other regions. This indicates that the age of the region largely depends on the urban population. The Kirov Region, the republics of Mordovia and Karelia have the highest average age of the rural population. They are characterized by a decrease in the number of young people in rural areas and low migration attractiveness.

In the regions of the Northwestern Federal District and some regions of the Asian part of Russia, there is a significant increase in the average age of urban residents *(Tab. 7)*. This is especially noticeable in the republics of Komi, Karelia and Mordovia, which may be due to unfavorable geographical and climatic conditions that force people to move to other regions. Similar trends can be observed in rural areas. The largest increase in the average age of residents was recorded in the Kirov and

Arkhangelsk regions, as well as in the Republic of Karelia. In general, the growth rate of the rural population is higher than that of the urban population. This indicates that the proportion of elderly people in villages is increasing.

The low increase in average age in the Central Federal District is more pronounced for rural population than for urban population *(Tab. 8)*. In Kursk, Ryazan, Kaluga and other regions, the increase in average age is slowed down by the high birth rate in rural areas compared to urban areas, as well as earlier aging of the population. In the southern regions of Russia (Republic of Adygea, Krasnodar Territory) and Siberia (Republic of Tyva, Novosibirsk Region), there is a slowdown in the rate of increase in the average age among the urban population, which may also be associated with a higher birth rate.

In 2024, nine regions of Russia had a high average age of the population, which has increased significantly since 2010 *(Tab. 9)*. Four of them are located in the Northwestern Federal District (Komi Republic, Republic of Karelia, Arkhangelsk and Murmansk Regions), two each in the Far Eastern (Sakhalin and Magadan regions) and the Volga region (Republic of Mordovia and Kirov

Table 7. Top 10 regions with the highest increase in the average age of urban and rural populations from 2010 to 2024, %

Region	Increase in the average age of urban population	Region	Increase in the average age of rural population
Komi Republic	11.8	Kirov Region	17.9
Republic of Karelia	10.0	Arkhangelsk Region	15.3
Republic of Mordovia	9.5	Republic of Karelia	14.3
Tomsk Region	9.5	Chukotka Autonomous Region	14.3
Jewish Autonomous Region	9.2	Republic of Mari El	13.6
Sakhalin Region	9.2	Sakhalin Region	13.1
Arkhangelsk Region	8.6	Komi Republic	12.7
Tambov Region	8.1	Primorye Territory	12.6
Magadan Region	8.0	Republic of Kalmykia	12.4
Tyumen Region	8.0	Khabarovsk Territory	11.8
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284			

Table 8. Top 10 regions with minimal increase in average age of urban and rural population from 2010 to 2024, %

Region	Increase in the average age of urban population	Region	Increase in the average age of rural population
Moscow Region	-1.0	Kursk Region	2.0
Republic of Adygea	0.9	Ryazan Region	2.1
Krasnodar Territory	1.0	Pskov Region	2.3
Republic of Tyva	2.4	Kaluga Region	2.5
Saint Petersburg	3.0	Tver Region	3.6
Novosibirsk Region	3.2	Nizhny Novgorod Region	3.8
Yaroslavl Region	3.3	Bryansk Region	3.8
Kaluga Region	3.6	Belgorod Region	4.0
Moscow	3.6	Republic of Adygea	4.0
Sverdlovsk Region	3.6	Lipetsk Region	4.1
According to: Population of the Russian Federation by gender and age. Available at: https://rosstat.gov.ru/compendium/document/13284			

Table 9. Distribution of regions by average age of the population and its growth over the period from 2010 to 2024

Average age \ Growth	High	Average	Low	Total
High		40	10	59
Average	3	14	0	17
Low	1	3	0	4
Total	13	57	10	80
Note: for the average age of the population, "high" – from 44.69 to 39.71 years, "average" – from 39.7 to 34.74, "low" – from 34.73 to 29.76; for the growth in the average age of the population, "high" – from 11.94 to 8.1%, "average" – from 8.09 to 4.26%, "low" – from 4.25 to 0.42%. Source: own compilation.				

Region) federal districts, one in the Siberian Federal District (Tomsk Region). In these regions, there is a noticeable increase in the proportion of elderly people and a decrease in the birth rate, which leads to a decrease in the proportion of young people. Most regions have a high average age of the population and an average growth rate (40 regions, or 50%). In most of them, the average age of the population was already high, so it did not grow so much. No region is characterized by an average age of the population at an average or low level along with low growth. This means that currently there is nowhere a high share of young people (with a high birth rate) at the same time as a low proportion of the elderly (with a low mortality rate). Low average age is observed only in four regions, three of which are located in the North Caucasus Federal District (Chechen Republic, Republic of Dagestan, Republic of Ingushetia), and one more in the Siberian Federal District (Republic of Tyva).

In most regions, the average age of women and its growth rate is also higher than that of men *(Tab. 10)*. In 76.3% of regions, the average age of women is high, while for men this indicator is 68.9%. This indicates that the proportion of older women is increasing due to a longer life span. In 25% of regions, the average age of men is growing slowly (8.9% for women). This may be due to a higher mortality

Table 10. Distribution of regions by average age of men and women and its increase over the period from 2010 to 2024

Growth Average age	High		Average		Low		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
High	8	10	29	44	18	7	55	61
Average	4	4	17	11	1	0	22	15
Low	1	1	1	3	1	0	3	4
Total	13	15	47	58	20	7	80	

Note: for the average age of men, "high" is from 41.83 to 37.47 years, "average" is from 37.46 to 33.1, "low" is from 33.09 to 28.74; for the average age of women, "high" is from 47.17 to 41.63 years, "average" is from 41.62 to 36.09, "low" – from 36.08 to 30.55; for the growth in the average age of men, "high" – from 10.96 to 8.28%, "average" – from 8.27 to 5.59%, "low" – from 5.58 to 2.91%; for the growth in the average age of women, "high" – from 12.36 to 7.88%, "average" – from 7.87 to 3.41%, "low" – from 3.4 to -1.07%.
Source: own compilation.

rate among men. The Republic of Tyva has a low average age of men and its slow growth from 2010 to 2024, which may be due to the high birth rate in the region and the migration of young men.

An analysis of data on the average age of the population and its dynamics in cities and villages shows significant differences in grouping *(Tab. 11)*. In 63 regions, there is an increase in the average age of citizens, and in 79.4% of them this indicator is quite high. Rural residents are characterized by a low increase in average age in 38 regions, of which 57.9% also have a high average age. This may be due to the large variation in the values of the average age increase from 1.97 to 17.92%, which led to low rates in many regions. It is noteworthy that there is no coincidence between the low average age and the low rate of its increase in the place of residence (the urban population is the Republic of Tyva, the rural population is the Kabardino-Balkarian Republic, the Republic of Altai and the Republic of Ingushetia). On the other hand, a high average age and its rapid growth are typical for both urban and rural residents in the regions of the Northwestern Federal District (Komi Republic, Republic of Karelia, Arkhangelsk Region).

Table 11. Distribution of regions by average age of urban and rural population and its growth over the period from 2010 to 2024

Growth Average age	High		Average		Low		Total	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
High	10	5	50	10	5	22	65	37
Average	1	1	11	18	0	13	12	32
Low	0	1	2	5	1	3	3	9
Total	11	7	63	33	6	38	80	78

Note: for the average age of urban population, "high" is from 44.42 to 39.21 years, "average" is from 39.2 to 34.01, "low" is from 34 to 28.8; for the average age of rural population, "high" is from 48.11 to 42.19 years, "average" is from 42.18 to 36.28, "low" – from 36.27 to 30.36; for the growth in the average age of urban population, "high" – from 11.82 to 7.53%, "average" – from 7.52 to 3.25%, "low" – from 3.24 to -1.04%; for the growth in the average age of the rural population, "high" – from 17.92 to 12.6%, "average" – from 12.59 to 7.29%, "low" – from 7.28 to 1.97%.
Source: own compilation.

As a result of grouping the values by 80 regions, 7 groups were identified. There were five regions in the first group: the Republic of Mordovia, the Kirov Region, the Republic of Karelia, the Arkhangelsk Region and the Komi Republic *(Figure)*, characterized by a high average age and rapid growth of this indicator among both men/women and urban/rural populations. In these regions, an increase in the proportion of elderly people, a decrease in the birth rate and a decrease in the number of young people are most noticeable.

The second group turned out to be the most numerous, it included 27 constituent entities of the Russian Federation. These are mainly regions located in the European part of the country in the Central, Northwestern and Volga federal districts. However, there are also representatives of the Far East (Magadan and Sakhalin regions). These regions are characterized by a high average age of the population with an average increase. They are stable in terms of demographic aging, as it began earlier in them than in other regions. The second group also includes subjects where the average age of the rural population is growing slowly, while the increase in the average age of the entire population remains high or average.

The third group includes 23 constituent entities of the Russian Federation, which are mainly located in the southern part of the country. The federal cities of Moscow and Saint Petersburg are also included here. The regions of this group are characterized by either low growth rates of the average age of the population with its high value (Voronezh, Yaroslavl, Kaluga, and Sverdlovsk regions), or
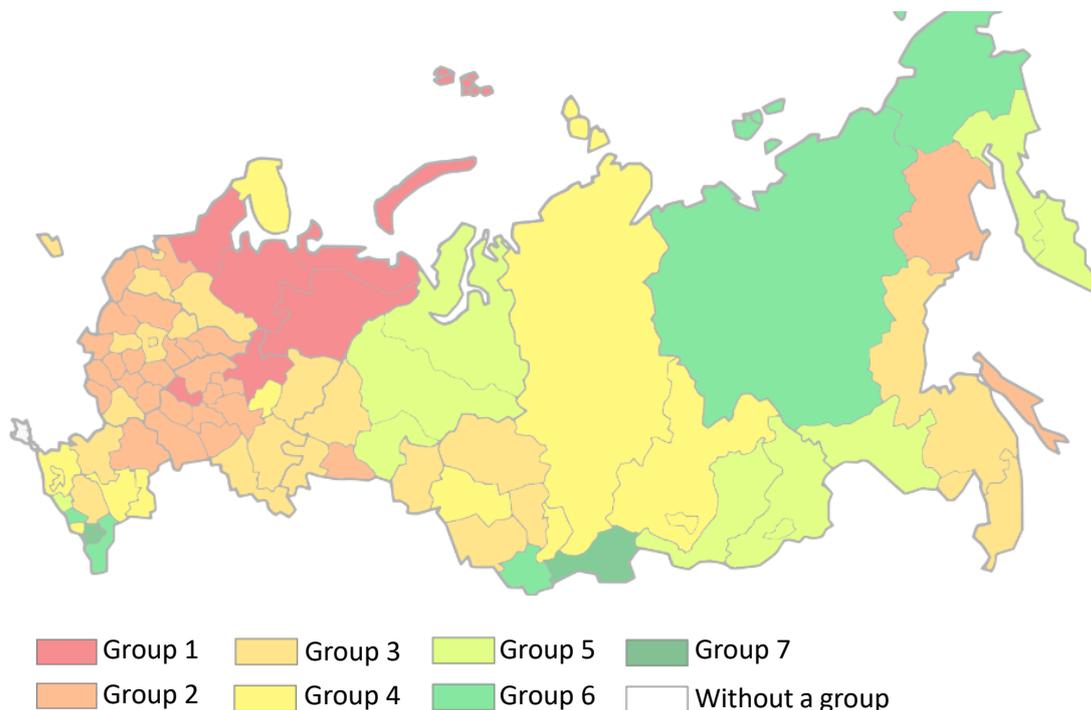
Figure. Grouping of Russian regions by average age and growth rate

Note: group 1 – high average age and rapid growth of this indicator; group 2 – high average age with an average increase; group 3 – low growth rates of average age with a high value or average indicators of the average age of the rural population with a higher average age of the urban population; group 4 – variety of indicators, but in in general, the average values of the average age and its growth rate (however, the average age of the urban population is high); group 5 – average values of the average age and its growth rate; group 6 – low average age of rural residents with relatively low growth rates; group 7 – low average age and growth rates.

Source: own compilation.

average indicators of the average age of the rural population with a higher average age of the urban population (Kemerovo, Tomsk, Rostov, and Kaliningrad regions). In the former regions, there is a slower change in the age structure, while in the latter, fertility rates are lower, mortality is higher, and migration activity is lower.

The fourth group included 11 constituent entities, mainly from the Southern (Krasnodar Territory, Republic of Adygea, Astrakhan Region) and Siberian (Novosibirsk Region, Krasnoyarsk Territory, Republic of Khakassia) federal districts. These regions differ in a variety of indicators, but generally show average values of the average age of the population and the rate of its increase. However, the average age of the urban population remains high, especially among women.

The fifth group includes six constituent entities of the Russian Federation: the Kamchatka Territory, the Amur Region, the Karachayevo-Circassian Republic, the Tyumen Region, the Trans-Baikal Territory, and the Republic of Buryatia. These regions are characterized by average rates of middle age, including for the urban population. In these countries, the birth rate is not so high as to significantly rejuvenate the population, and the death rate is not so low as to significantly age it, so the average age remains moderate.

The sixth group included five constituent entities of the Russian Federation: the Kabardino-Balkarian Republic, the Chukotka Autonomous Area, the Republic of Sakha (Yakutia), the Republic of Altai, and the Republic of Dagestan. These regions are characterized by a low average age of rural residents, as well as relatively low growth rates. This indicates that they are dominated by a young population that is slowly aging. The reasons for this may be a high birth rate or traditional lifestyle.

The seventh group included only three regions: the Chechen Republic, the Republic of Ingushetia, and the Republic of Tyva. They are characterized by low rates of the average age of the population and its growth; high birth rate, which leads to a high share of young people in the total population. This is due to traditional values, religious beliefs, and cultural characteristics that contribute to slowing down the aging process.

Conclusion

The study confirmed the trend toward a gradual increase in the average age of residents throughout the Russian Federation and an increase in the aging process of the population. The relatively young population is concentrated in the North Caucasus Federal District and in the regions of the Asian part of Russia, while the elderly population prevails in the European part of the country due to the low birth rate. An analysis of data on average age and its growth rates in various regions has shown that in half of the subjects from 2010 to 2024, there was a significant population aging, which is manifested in a high average age and high growth rates. This is especially pronounced in the regions of the Volga region, the Northwest and the Far East, where high mortality and a decrease in the birth rate contribute to the population aging.

By gender, the average age of women is higher than that of men, which is associated with a higher life expectancy for women. The share of older women is growing faster, which increases gender inequality in the age characteristics of the population. The average age of men increases more slowly, which may be due to higher mortality among men, especially in young and middle age. In terms of place of residence, the urban population is aging faster than the rural population, but rural areas have a higher average age of the population. This is due to the migration of young people from villages to cities.

All this confirms that demographic aging in Russia is not just a statistical trend, but a significant factor that affects the quality of life and human potential in various regions of the country. An analysis of the regions by average age and the rate of its increase allowed identifying groups with unique characteristics of population aging. In the first group, which includes the regions with the most intense aging of residents (Komi Republic, Republic of Karelia, and others), there is a rapid decline in the number of working-age people and an increase in the demographic burden. This creates serious challenges for the health and social care system. To mitigate these problems, it is necessary to adapt the environment for the elderly and attract migrants.

In the second group, represented by the regions of Central Russia, population aging has become a familiar process. The main problems here are a decrease in innovation activity and a shortage of pension provision. The quality of life of the older generation directly depends on the effectiveness of social support and the development of the silver economy sector. The groups, which include the youngest regions (the subjects of the North Caucasus, the Republic of Tyva), have significant demographic potential. However, solving the problem of the youth demographic burden requires significant investments in education and the creation of new jobs. The lack of employment opportunities for young people can lead to social tension and the outflow of the most active part of the population.

To overcome the negative effects of aging and strengthen human potential, a differentiated regional policy is needed, taking into account the specific characteristics of each group of territories. In regions with intensive aging, it is necessary to consider economic incentive measures aimed at preserving and attracting young people. In the old regions, the efficiency of the social service system should be improved and modern active longevity programs should be introduced. In young regions, it is important to focus investments on the advanced development of human capital, including the construction of new schools and kindergartens, the creation of additional education centers and the development of targeted training programs for priority sectors of the region's economy.

In the future, research should focus on quantifying the impact of aging on such indicators as the availability of medical services, the level of poverty among the elderly, and the volume of transfers from regional budgets to the social sphere. It is also necessary to study in more detail the causes of differences between regions in the degree of population aging (correlation and factor analysis of the causes of changes in the average age of the population as an indicator of the demographic well-being of the region, migration, and economic factors) and to assess how changes in these differences may affect demographic aging.

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ИНФОРМАЦИЯ ОБ АВТОРЕ

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SPATIAL ECONOMETRIC MODEL OF CHINA'S REGIONAL LABOR PRODUCTIVITY: THE ROLE OF POPULATION AGING

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The accelerated aging of China's population poses structural challenges to economic growth, compounded by significant regional imbalances in demographic structure and labor productivity dynamics. The aim of the study is to analyze the key drivers and constraints of regional labor productivity with an emphasis on quantifying the impact of population aging, spatial interaction effects, and other factors in the context of interregional differentiation. The novelty of the research lies in the synthesis of the theory of aging and spatial economics, the inclusion of aging as an independent factor in the model with spatial effects. For the analysis, the methods of calculating Moran indices were used to identify spatial clusters and build SAR models with fixed effects. The empirical database includes data from the National Bureau of Statistics of China for 2001–2022 for 31 provinces. The result of the study was a SAR model that confirmed the significant negative impact of the demographic burden coefficient of older people on the economy, in which every 1% increase reduces labor productivity by five points through a reduction in labor resources and "dilution of capital". The paper reveals a strong positive spatial dependence, regional heterogeneity of effects and the key positive role of capital productivity, which requires the transformation of economic policy towards the creation of innovation corridors and investments in human capital.

Population aging, average labor productivity, economic growth, spatial effects.

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Introduction

The shift in the age structure of the population is one of the most significant challenges of our time. Specifically, at the current stage of social development, there is a clear trend toward an increase in the proportion of elderly people.

It is important to note that this dynamic is progressing faster than changes in other age groups within the global population structure. According to forecast data from the United Nations, by the middle of the 21st century, the global share of people aged 65 and over will reach 16% of the total population. Such a demographic transformation will have a significant impact on the social structure and economy of all states.

The UN has developed clear criteria for assessing the degree of population aging in various countries and regions worldwide: a share of the population aged 65 years and older exceeding 7% characterizes a society as "aging"; a figure of 14% indicates "deep aging", and exceeding 21% signifies "super-aging". Since 2000, the People's Republic of China has moved into the category of "aging" countries: the share

of the elderly population in the country exceeded 7%. By 2021, the situation had worsened: the proportion of citizens over 65 reached 14.19%. China took only 21 years to transition to the stage of deep aging, significantly less than France (126 years), the UK (46 years), and Germany (40 years). Furthermore, statistical data for 2023 indicates that the demographic situation in China continues to deteriorate[1]: the elderly population reached 216 million people, accounting for 15.37% of the country's total residents. This means that for every fourth elderly person in the world, there is a citizen of China. According to demographers' forecasts, the peak of aging in China will occur in 2057, when the number of people over 65 will reach 425 million and constitute between 32.9% and 37.6% of the total population.

Simultaneously, an increase in the old-age dependency ratio is observed. This ratio reflects the number of persons of retirement age (65 years and older) per 100 persons of working age (15 to 64 years). In 2000, this figure stood at nearly 10%; in subsequent years, its value continuously increased *(Fig. 1)*. The working
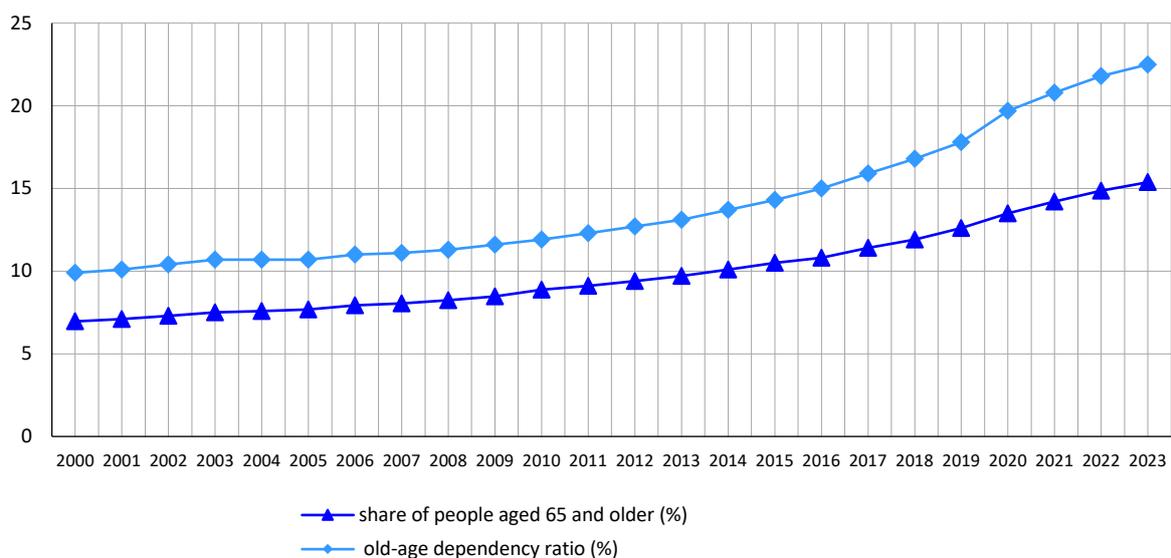

Figure 1. Population aging indicator in China, 2000–2023
Source: stats.gov.cn

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[1] Source: stats.gov.cn.

population bears a huge burden of caring for the elderly; social costs for this cohort are also rising, placing immense pressure on budget expenditures.

Population aging entails a whole range of economic and social consequences. On one hand, an increase in the number of retirement-age people leads to a significant rise in social security expenditures (pensions and healthcare), and the labor market may experience a supply shortage due to the shrinking working-age population. On the other hand, an increase in the number of elderly people with financial savings may lead to the emergence of a range of industries and services targeted at older adults (healthcare, pension funds, cultural and leisure activities). According to expert forecasts, this could create new jobs, stimulate innovation, and ensure economic growth.

The impact of population aging on economic growth

In recent decades, population aging has transformed from a "long-term prospect" into an immediate factor reshaping the economic trajectories of most countries, and China is no exception. The peculiarity of China's situation lies in the fact that rapid population aging coincides with an unprecedented scale of regional economic disparities, making the analysis of its interrelationships with labor productivity particularly complex. Researchers have long noted that age structure directly affects the economy through the quantity and quality of labor – a key element of productivity (Solow, 1956; Bloom et al., 2001). The "demographic dividend", which explained 15% of China's GDP per capita growth in 1982–2000, was precisely the result of an increase in the working-age share of the population and its efficiency (Bloom, Williamson, 1998; Wang, Mason, 2008). Current data show that

when the share of elderly (65+) exceeds 15%, this effect transforms into a "demographic burden", manifested in a shrinking workforce, reduced innovation, and slowing productivity, particularly in poorer regions (Bloom et al., 2010; Kotschy, Bloom, 2023; Maestas et al., 2023).

Analysis at the regional level is necessary not only because of spatial effects but also due to the tangible mechanisms through which aging exerts influence, related to migration, infrastructure, and human resource practices. For Russia, R.V. Kulagin identified the following feature: weighted indicators of employment in older age groups do not have a uniform impact on regional labor productivity indicators (Kulagin, 2024). Similarly, in other countries, researchers note that aging reduces adaptability to technology in moderately developed regions, but in wealthy ones, this is offset by investments in human capital and the "silver economy" (Hu et al., 2012; Li, 2013; Kudinsh et al., 2022). In China, these differences reach extreme proportions: eastern provinces leverage aging as a driver, attracting workers through services for the elderly and experienced specialists (Han, Wang, 2018; Lin, 2025), while western regions suffer from increasingly acute resource shortages and youth out-migration (Man et al., 2021; Antipova, Chen, 2023). This is why such analysis at the regional level is not a luxury but a necessity: without it, policy risks being ineffective.

It should be noted that methodological approaches in studying this topic have been evolving and improving for over half a century. Early work relied on classical production functions and panel data without accounting for spatial interdependence, which was logical and acceptable for the national level but insufficient for a global perspective, as modern world regions are closely interconnected (Solow, 1956; Van Groezen et al., 2005; Wang, Mason, 2008).

Contemporary models already incorporate space: for example, one study used a spatial lag model (SLM) to analyze the age structure of the population and the increasing share of elderly people in Russian regions (Belyakov et al., 2025). However, that study focused on total factor productivity rather than labor productivity. Labor productivity is not only a direct driver of economic growth but also the "primary point of impact" of population aging on the economic system. Yet existing research does not focus on the key mechanisms through which aging directly affects labor productivity via the quantity, quality, and structure of the workforce.

One study brought researchers closer to this problem by demonstrating that aging affects productivity through human capital and innovation (Wu et al., 2025). Other scholars concluded that aging reduces productivity in the United States by 0.9% annually (Maestas et al., 2023). However, their model does not account for two key features of China: migration and spillover effects, without which estimates remain static, while the reality of Chinese regions is dynamic. T.A. Burtseva and colleagues emphasized the importance of regional specificity in Russia but did not employ spatial models; therefore, their conclusions about the "impact of aging" remained general, lacking quantitative assessment of how neighboring regions influence each other (Burtseva et al., 2021).

Despite the extensive body of literature, there are gaps that directly pertain to the practice of analyzing Chinese realities. First, most studies at the national and regional level have been conducted without synthesizing aging theory and spatial economics. Second, aging is rarely considered as an independent factor in modified production functions incorporating spatial effects. A recent study noted that precisely this disconnect between demography and spatial economics hinders the development of adequate policy. This problem is particularly acute in China, where aging is progressing faster than in most countries (Goldin et al., 2024).

The novelty of this study lies in the synthesis of population aging theory and spatial economics, as well as the inclusion of population aging as an independent explanatory factor in modified production functions that account for spatial effects. This allows for filling the existing scholarly gap in analyzing the situation in China at the regional level.

Construction of the theoretical model

To construct a theoretical model, it is important to identify the key factors influencing labor productivity. These include human capital (knowledge and skills of employees), physical capital (industrial equipment and infrastructure), as well as other resources necessary for organizing the production process. Over the past few years, due to population aging worldwide, much attention has been devoted to assessing the impact of the old-age dependency ratio (ODR) on economic growth. Many studies have shown that ODR affects not only labor supply but also average labor productivity, thereby influencing its efficiency (Bloom et al., 2010).

Let us consider the following production function:

$$Y = BL^{1-\alpha}, \qquad (1)$$

where: Y – output; B – labor efficiency; L – labor.

Dividing both sides of equation (1) by L, we obtain the average labor productivity function:

$$y = \frac{Y}{L} = BL^{-\alpha}, \qquad (2)$$

where y – average labor productivity.

The old-age dependency ratio is defined by the following relation:

$$ODR = \frac{N_{old-age}}{N_{working-age}},$$

where:

$N_{old-age}$ – number of elderly people (65 years and older);

$N_{working-age}$ – number of working-age population (15–64 years).

It is worth noting that population aging entails certain negative consequences. In particular, as the share of elderly people in the age structure increases, the working-age population shrinks, which likely reduces labor efficiency. Furthermore, labor efficiency is closely related to capital. Consequently, labor efficiency B can be expressed as:

$$B = f(ODR, K, X),$$

where:

X – vector of variables explaining the level of labor productivity;

K – capital.

Combining these elements, equation (2) can be represented as:

$$y = \frac{Y}{L} = BL^{-\alpha} = f(ODR, K, X)L^{-\alpha}. \quad (3)$$

This means that average labor productivity y depends on labor efficiency, which is influenced by ODR, K, and other variables.

Taking logarithms of both sides of equation (3) yields:

$$lny = ln f(ODR, K, X) - \alpha \ln L. \quad (4)$$

Differentiating equation (4) with respect to time gives:

$$g_y = -\alpha g_L + \beta g_{ODR} + \gamma g_K + \theta g_X, \quad (5)$$

where:

g_y – growth rate of average labor productivity;

g_L – growth rate of employment;

g_K – growth rate of physical capital;

g_{ODR} – growth rate of the old-age dependency ratio.

Let us consider the growth rate of physical capital g_K. Within the framework of the classical Solow model (Solow, 1956), the dynamic change in capital equals new investment minus capital depreciation. The model assumes that new investment equals the product of the saving rate and output:

$$\dot{K} = sY - \delta K, \quad (6)$$

where:

s – saving rate;

δ – depreciation rate.

For further analysis of factors affecting g_K, we divide both sides of equation (6) by the capital stock:

$$g_K = \frac{\dot{K}}{K} = s\frac{Y}{K} - \delta. \quad (7)$$

From this, it is evident that g_K is positively correlated with $\frac{Y}{K}$, i.e., the average capital productivity *(ACP)*. Based on this close relationship, in this study we can approximately use capital productivity to characterize the growth rate of capital.

Thus, equation (5) can be represented as:

$$g_y = -\alpha g_L + \beta g_{ODR} + \gamma ACP + \theta g_X. \quad (8)$$

Expression (8) will serve as the empirical basis for constructing econometric models.

Method for calculating ACP

Since official statistical data on the capital stock in China are not published (only data on fixed capital investment volumes are available), the dynamics of the capital stock within the Solow model framework are as follows:

$$\dot{K}(t) = I(t) - \delta K(t). \qquad (9)$$

Solving the differential equation (9) yields:

$$K(t) = K_0 e^{-\delta(t_0 - t)} + e^{-\delta t} \int_{t_0}^{t} I(\tau) e^{-\delta \tau} \, d\tau, \qquad (10)$$

where:

t_0 – base year;

K_0 – capital stock in that year, approximated by the volume of fixed capital investment in that year.

When the time interval between the base year t_0 and the study year is sufficiently large, the first part of equation (10) approaches zero, which reduces the error caused by inaccurate estimation of K_0.

The base year in this study is taken as 1982. For the provinces of Hainan and Chongqing, which were established later, the base years are 1988 and 1997, respectively. The analysis period covers 2001–2022.

Data and econometric model

For the purpose of regression analysis, panel data from the official website of the National Bureau of Statistics of China for 31 provinces over the period 2001–2022 were used.

To avoid endogeneity problems associated with using the number of employed persons as a regressor, this study employs the share of employed persons in the total population.

In accordance with equation (8), the baseline regression model takes the form:

$$Gr_{ALP_{i,t}} = Gr_{L_{i,t}} + Gr_{ODR_{i,t}} + \\ + ACP_{i,t} + Gr_{N_{i,t}} + Gr_{ODR_{i,t}} * Gr_{L_{i,t}}. \qquad (11)$$

The proposed model allows for assessing the impact of various factors on the dynamics of labor productivity in region i during period t. The dependent variable ($Gr_{ALP_{i,t}}$) is the growth rate of real average labor productivity. The main predictors include indicators characterizing the demographic situation (growth rate of the old-age dependency ratio, $Gr_{L_{i,t}}$) employment (growth rate of the employment share, $Gr_{ODR_{i,t}}$), and capital use efficiency (growth rate of capital productivity, $ACP_{i,t}$). The model also includes control variables, such as the growth rate of the total population ($Gr_{N_{i,t}}$) and an interaction term reflecting the joint influence of demographic factors and employment ($Gr_{ODR_{i,t}} * Gr_{L_{i,t}}$). To account for unobserved factors affecting labor productivity, fixed effects (μ_i) and time effects (ρ_t) are introduced, along with a random error term (ε_{it}).

To control for a number of other economic development factors, additional variables were included in the model: the growth rate of total exports and imports in GRP, the growth rate of domestic patent applications filed, the growth rate of real deposit rates, and the growth rate of real oil prices. However, most of the additional variables did not have a significant impact on the results. A complete list of variables and their characteristics is presented in *Tables 1* and *2*.

Table 1. List of regression variables

Indicator	Notation in models
Growth rate of real average labor productivity	$Gr_{ALP_{i,t}}$
Real average labor productivity (in 2000 prices), yuan/person	ALP
Growth rate of the old-age dependency ratio	$Gr_{ODR_{i,t}}$
Growth rate of the employment share	$Gr_{L_{i,t}}$
Average capital productivity, Y/K	ACP
Growth rate of total population	$Gr_{N_{i,t}}$
Interaction term: growth rate of aging × growth rate of employment	$Gr_{ODR_{i,t}} * Gr_{L_{i,t}}$

Table 2. Descriptive statistics

	Mean	Median	Maximum	Minimum	SD	Observations
Gr_ALP	0.0860	0.0852	0.3073	-0.1437	0.0493	682
Gr_ODR	0.0354	0.0358	0.3247	-0.3678	0.0851	682
Gr_L	0.0078	0.0056	0.9709	-0.3015	0.0492	682
ACP	0.3494	0.3404	0.8330	0.1030	0.1534	682
Gr_N	0.0061	0.0053	0.0562	-0.0571	0.0119	682
Calculated from: https://data.stats.gov.cn/english						

Test for spatial correlation

Ignoring spatial dependence in regional economic development leads to biases in model specification and reduces the validity of conclusions (Anselin, 1988). To test for spatial autocorrelation of variables, this study employs Moran's I index, with values ranging from -1 to 1. Positive values indicate positive spatial autocorrelation, negative values indicate negative autocorrelation, and values close to zero suggest the absence of such autocorrelation (Moran, 1950).

Calculations are based on a spatial weight matrix constructed using inverse geographic distances ($W_{i,j} = \frac{1}{d_{i,j}}$, where $d_{i,j}$ is the distance between regions i and j). The results (*Fig. 2*) confirm significant spatial clustering of key indicators. These include the growth rate of real average labor productivity, average capital productivity, and population growth rates. At the same time, the growth rate of the old-age dependency ratio exhibits statistically insignificant autocorrelation in most periods. However, visual analysis of its spatial distribution (*Fig. 3*) reveals a different picture. The patterns on the map allow for the identification of spatial relationships.

Dynamics of spatial autocorrelation of the main variables (2001–2022)
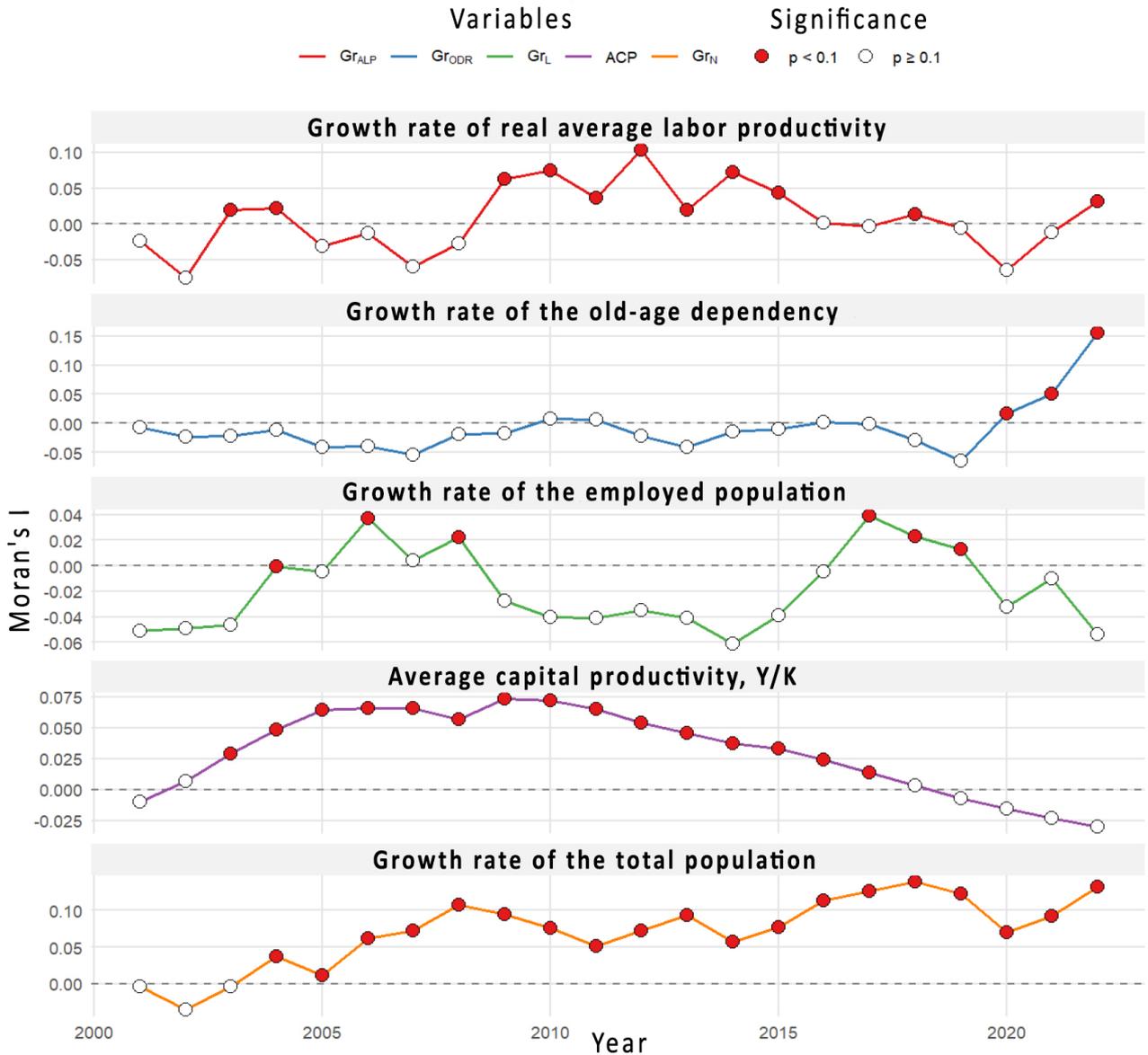
Figure 2. Dynamics of Moran's I for variables
Calculated from: https://data.stats.gov.cn/english

Dynamics of the old-age dependency ratio in China (2002–2022)

Old-age dependency ratio
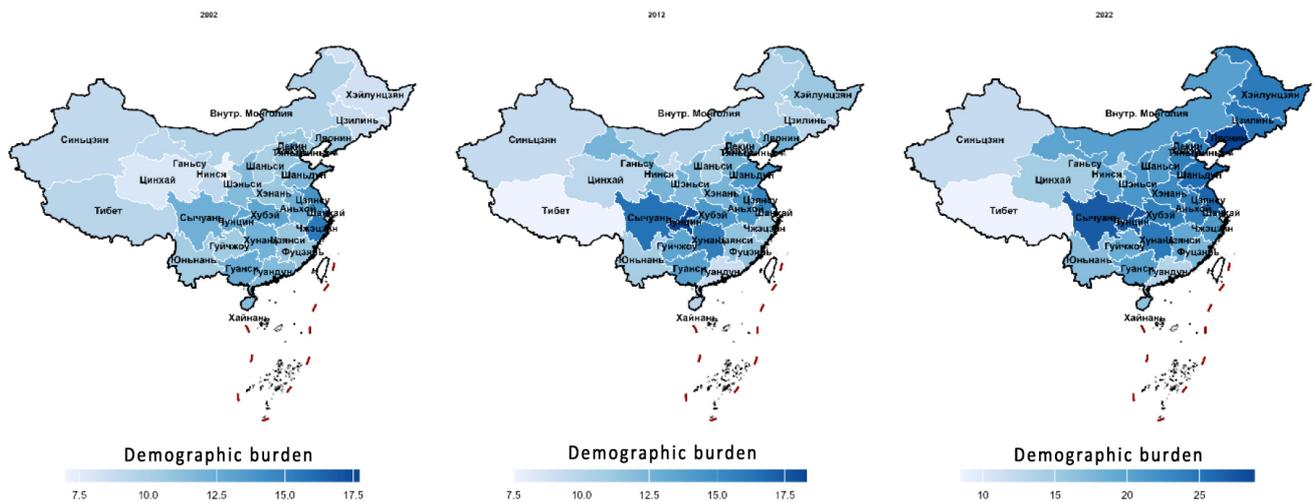
Growth rate of the old-age dependency ratio
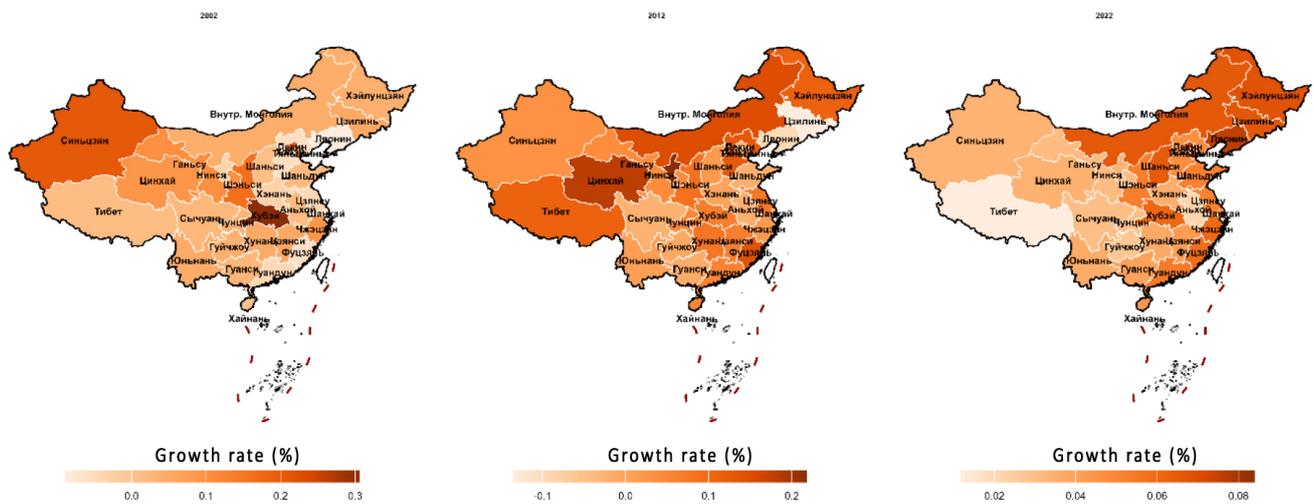
Figure 3. Dynamics of the old-age dependency ratio in China
Calculated from: https://data.stats.gov.cn/english

Results and discussion

Table 3 presents the results of the regression estimates. To test for multicollinearity, the variance inflation factor (VIF) was calculated. All obtained VIF values do not exceed 10, indicating the absence of substantial multicollinearity. The selection of the optimal model specification was based on robust Lagrange multiplier (LM) tests, the results of which indicate the preference for the spatial autoregressive model (SAR) over the spatial error model (SEM). To control for unobserved regional heterogeneity and time effects affecting labor productivity, estimation was carried out based on the SAR model with fixed effects. Thus, a spatial lag model with fixed effects should be specified:

$$Gr_{ALP_{i,t}} = \lambda \left(W * Gr_{ALP_{j,t}} \right) + \beta Gr_{ODR_{i,t}} + \\ + \alpha_1 Gr_{L_{i,t}} + \alpha_2 ACP_{i,t} + \alpha_3 Gr_{N_{i,t}} + \\ + \alpha_4 Gr_{ODR_{i,t}} * Gr_{L_{i,t}} + \mu_i + \rho_t + \varepsilon_{it}, \quad (12)$$

where:

λ – spatial autoregressive coefficient;

W – normalized weight matrix;

(μ_i) – individual effects;

(ρ_t) – time effects;

(ε_{it}) – random errors of the model.

Models 1 and 2 include a spatial lag (SAR) with individual and time effects, respectively. Models 3 and 4 represent standard panel regressions with the same effects for comparison. The stability of the key coefficients across different specifications confirms the robustness of the main findings.

The statistically significant spatial autocorrelation coefficient λ (0.72***, Model 1) confirms a strong positive spatial dependence among regions, reflecting a spillover effect – the diffusion of technologies and capital from coastal clusters to inland provinces. When controlling for time effects, λ decreases (0.19*, Model 2) but remains significant. This underscores the importance of regional clustering, particularly in the context of the "Go West" policy, necessitating coordinated interregional approaches.

The impact of demographic factors demonstrates complex dynamics. The coefficient for the growth rate of the old-age dependency ratio ($Gr_{ODR_{i,t}}$) is consistently negative across all specifications. This result confirms the constraining effect of population aging on labor productivity. Concurrently, employment growth ($Gr_{L_{i,t}}$) also exhibits a negative effect, likely due to "capital dilution" associated with an influx of low-skilled labor.

Table 3. Regression estimation results

Explanatory variables	Model 1	Model 2	Model 3	Model 4
Spatial autoregressive coefficient (λ)	0.72***	0.19*		
$Gr_{ODR_{i,t}}$	-0.05***	-0.04**	-0.10***	-0.04**
$Gr_{L_{i,t}}$	-0.34***	-0.37***	-0.32***	-0.37***
$ACP_{i,t}$	0.06***	0.03**	0.14***	0.03**
$Gr_{N_{i,t}}$	-0.29*	-0.35***	-0.2	-0.35***
$Gr_{ODR_{i,t}} * Gr_{L_{i,t}}$	1.83**	1.99***	1.97***	2.02***
Individual effects	Yes		Yes	
Time effects		Yes		Yes

Note: ***, **, * – significance at the 1%, 5%, and 10% levels, respectively.
Source: own compilation.

Of particular interest is the interaction of demographic factors. The positive coefficient for the product term $Gr_{ODR_{i,t}} * Gr_{L_{i,t}}$ indicates a compensatory mechanism: employment growth mitigates the negative impact of aging. However, current demographic dynamics (shrinking workforce coupled with accelerated aging) have neutralized this buffering effect.

Furthermore, the coefficient for $Gr_{N_{i,t}}$ is substantially negative in most models. This implies that under current economic and social conditions, rapid population growth will constrain labor productivity growth. This dampening effect may be attributed to factors such as increased strain on resource allocation caused by population growth and a reduction in per capita resources.

Average capital productivity ($ACP_{i,t}$) remains a powerful driver: the significant positive coefficient aligns with China's investment-oriented growth model.

The study confirms the fundamental dependence of average labor productivity in China on demographic shifts. Accelerated population aging, which has lost the compensation previously provided by the demographic dividend, represents a serious structural challenge. At the same time, accounting for spatial interdependencies remains a critical condition for correctly modeling regional economic dynamics.

These findings necessitate strategic measures. Intensification of investment in R&D and digitalization must be accompanied by strengthening spatial interactions for the diffusion of innovations; simultaneously, the quality of human capital should be enhanced. Such a comprehensive approach underscores the need for a transition from the traditional extensive growth model, based on cheap labor and substantial investment, to an intensive model. The new paradigm must be founded on technological innovation and efficient resource utilization.

Conclusion

Thus, the study employing spatial econometric methods has made it possible to identify the key drivers and constraints of regional labor productivity in China. The empirical results confirm three principal findings.

First, spatial dependence significantly influences the economic landscape. Consistently positive and statistically significant autoregressive coefficients indicate pronounced effects of technological diffusion and interregional capital flows.

Second, demographic changes impose a dual burden on productivity. Population aging consistently reduces labor productivity growth through the contraction of labor resources and increased social expenditures, as confirmed by all models. Simultaneously, extensive employment expansion provokes "capital dilution", reflecting the constraining influence of low-skilled labor. Critically, the compensatory effect of the interaction between aging and employment growth persists under current conditions.

Third, capital productivity remains the most consistently positive factor. This result confirms the effectiveness of the investment-oriented model but exposes risks to its sustainability.

The study's findings dictate the need for a dual transformation of policy: technological modernization requires overcoming administrative barriers through the creation of "coast-to-inland" innovation corridors, and investment in human capital must replace the focus on quantitative indicators. Targeted retraining of older age groups and flexible pension mechanisms could partially mitigate demographic pressure.

A limitation of the study is the lack of differentiation of the elderly population by skill level, which requires further investigation using microdata. Nevertheless, the results unequivocally indicate that the transition from an extensive model to an economy of innovation and cooperation – optimizing resources through spatial integration and human potential development – becomes an imperative for overcoming the structural challenges of accelerated population aging.

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ИНФОРМАЦИЯ ОБ АВТОРЕ

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MONITORING OF CHANGES: MAIN TRENDS

ECONOMY OF THE NORTHWEST OF RUSSIA IN NOVEMBER 2025: GROWTH OF HOUSEHOLD INCOMES AND INVESTMENTS AMID A SLOWDOWN IN BUSINESS ACTIVITY

Vologda Research Center of the Russian Academy of Sciences (VolRC RAS) continues to acquaint its readers with materials on the state and development trends of the economy of the Northwestern Federal District (NWFD) against the backdrop of all-Russian dynamics.

According to Rosstat data, the Russian economy posted a 0.6% GDP increase in Q3 2025 (compared to 3.1% a year earlier; *Fig. 1*). The Ministry of Economic Development estimated Russia's GDP growth for January–November 2025 at 1.0%[1]. Based on fresh forecasts from leading domestic analytical centers, the growth of Russian GDP for the full year 2025 is expected to be around 0.5–1%[2].

🔽 Changes in the Business Confidence Index (BCI) signal the formation of broadly negative expectations among the country's enterprises. In December 2025, the BCI level for the mining and manufacturing industries dropped to -4.4 and -0.3, respectively (significantly higher a year earlier at -0.2 and 6.7, respectively; *Fig. 2*). In the services sector, the indicator in Q4 2025 stood at -4 compared to -3 a year earlier. The Business Confidence Index in construction rose by 2 p.p. in Q4 2025, yet remained the lowest among the listed sectors at -12%.
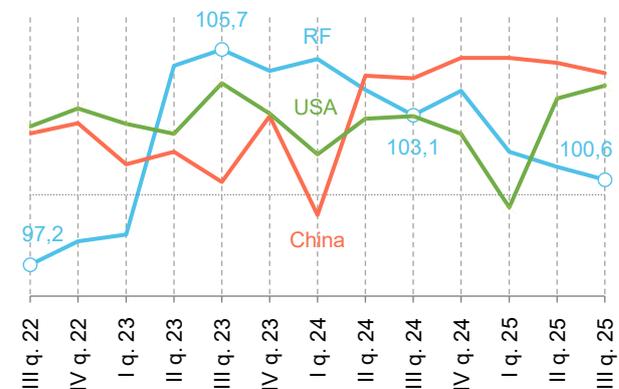
Figure 1. Gross Domestic Product (GDP) Dynamics, % year-on-year

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[1] Here and elsewhere in the text (unless otherwise stated), January–November 2025 is compared with January–November 2024.

[2] Fuel for Development. Available at: https://www.kommersant.ru/doc/8269466 (accessed: 19.01.2026).
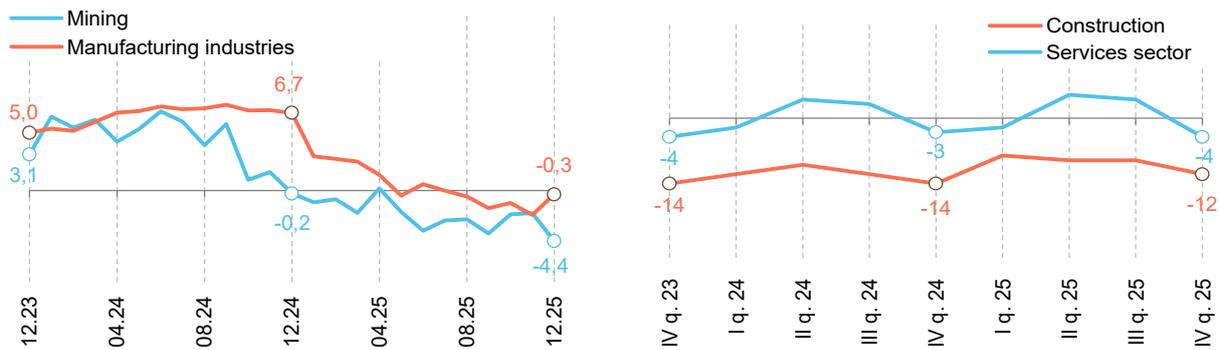
Figure 2. Business Confidence Index, %
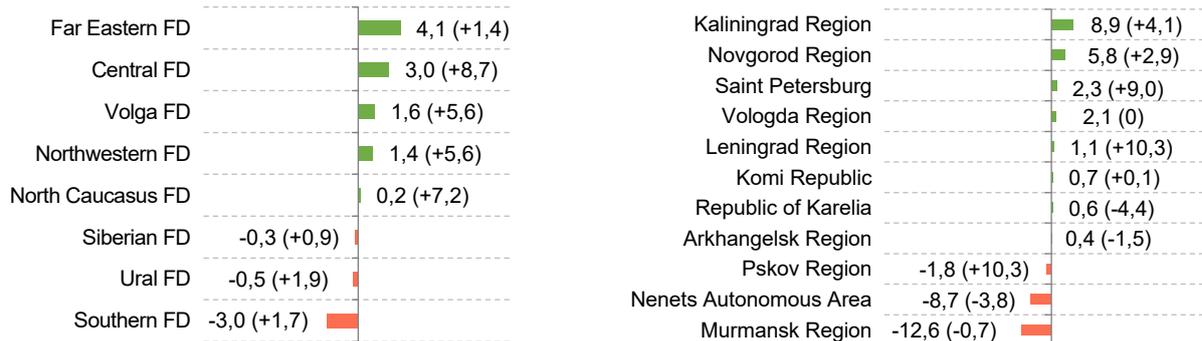
Figure 3. Growth in Output of Goods and Services for Basic Economic Activities*
in January-November 2025 by Federal District and NWFD regions, % change from January-November 2024

*Basic economic activities include crop and animal production, hunting, and related service activities; mining and quarrying; manufacturing; electricity, gas, steam, and air conditioning supply; water supply, sewerage, waste management, and remediation activities; construction; wholesale trade (except for motor vehicles and motorcycles); retail trade (except for motor vehicles and motorcycles); transportation.

Note: Figures in parentheses show the change in the indicator for January-November 2024, % change from January-November 2023.

Optimism regarding prospects for 2026 among manufacturers in the processing industry fell to its lowest level since May 2022 amid concerns about declining demand. However, among those whose expectations remained optimistic, they are primarily linked to hopes for a recovery in sales and planned new investments[3].

1. Gross Output

The output of goods and services for basic economic activities in the Northwestern Federal District (NWFD) as a whole increased by 1.4% *(Fig. 3)*. Most regions in the district showed growth in this indicator, with Kaliningrad and Novgorod regions leading (up 8.9% and 5.8%, respectively). At the same time, a decline in the output of goods and services was noted in Murmansk Region, the Nenets Autonomous Area, and Pskov Region (down 12.6%, 8.7%, and 1.8%, respectively).

Industrial production volume in the NWFD contracted by 0.1%, which may be partly attributed to a significant increase a year earlier (up 8.1%; Russian industry demonstrated a 0.8% increase in output for January-November 2025; *Table 1*). *Mining* in the NWFD accelerated the observed decline in output, now in its third consecutive year, falling by 4.5% (compared to a 1.5% decline nationwide). The performance of this sector in the NWFD was the worst among all federal districts. The contraction in mining affected enterprises in almost all

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[3] Business Activity Index in Manufacturing Sectors Declined in Russia. Available at: https://www.rbc.ru/economics/29/12/2025/69525a929a79476c816a5f34 (accessed: 19.01.2026).

**Table 1. Industrial Production Dynamics,
% year-on-year**

Territory	11 months of 2023	11 months of 2024	11 months of 2025	P*
Industry as a whole				
Russian Federation	104.3	105.1	100.8	-
Northwestern FD	104.9	108.1	99.9	4
Kaliningrad Region	95.1	100.9	110.3	6
Novgorod Region	101.8	103.7	109.0	7
Saint Petersburg	112.5	118.6	103.8	20
Vologda Region	106.2	101.0	102.1	28
Arkhangelsk Region	101.4	101.3	97.8	57
Pskov Region	110.3	111.1	97.7	58
Komi Republic	99.9	100.2	97.2	63
Leningrad Region	108.3	111.0	95.9	68
Nenets Autonomous Area	93.5	97.4	95.5	71
Republic of Karelia	99.5	99.4	94.8	74
Murmansk Region	94.9	101.7	89.4	82
Mining				
Russian Federation	99.0	99.4	98.5	-
Northwestern FD	97.3	99.0	95.5	8
Republic of Karelia	101.1	98.1	100.1	28
Murmansk Region	104.7	94.6	99.8	30
Komi Republic	99.2	100.8	96.1	54
Leningrad Region	108.9	99.7	95.6	58
Nenets Autonomous Area	93.3	97.2	95.5	59
Vologda Region	85.8	102.1	95.2	61
Kaliningrad Region	95.6	97.6	95.2	61
Novgorod Region	90.4	83.7	88.1	73
Pskov Region	96.0	107.0	87.2	76
Arkhangelsk Region	95.4	97.5	78.2	83
Saint Petersburg	84.4	147.2	72.9	84
Manufacturing industries				
Russian Federation	109.0	109.2	102.6	-
Northwestern FD	108.3	111.3	101.4	3
Kaliningrad Region	95.5	100.1	113.4	6
Novgorod Region	102.4	103.6	109.8	9
Saint Petersburg	114.7	120.8	104.9	16
Vologda Region	106.1	101.2	102.8	25
Komi Republic	103.0	98.0	102.5	27
Nenets Autonomous Area	109.1	123.5	102.1	28
Arkhangelsk Region	102.6	102.1	101.9	29
Pskov Region	107.6	111.0	101.2	35
Leningrad Region	111.7	110.5	94.9	69
Republic of Karelia	97.9	99.7	90.2	78
Murmansk Region	89.8	105.0	82.8	83

* Here and hereafter, the rank of the respective region among the subjects of the Federation (for the NWFD – among federal districts) by the dynamics of the indicator in January–November 2025 is shown (unless otherwise specified). Statistical information for the Donetsk People's Republic (DPR), Lugansk People's Republic (LPR), Zaporozhye, and Kherson regions is not considered.

constituent entities of the district, most notably in Saint Petersburg, Arkhangelsk, and Pskov regions (down 27.1%, 21.8%, and 12.8%, respectively). The Republic of Karelia was an exception, registering a 0.1% increase in mining output.

⌃ *Manufacturing* in the NWFD increased output by 1.4% (compared to 2.6% nationwide; a year earlier, the Northwest recorded an 11.3% rise). Most regions in the district demonstrated positive dynamics in this sector, with Kaliningrad and Novgorod regions, as well as Saint Petersburg, posting production growth of 13.4%, 9.8%, and 4.9%, respectively. Conversely, output in this sector fell in Murmansk Region, the Republic of Karelia, and Leningrad Region by 17.2%, 9.8%, and 5.1%, respectively. The intra-sectoral production dynamics in the NWFD's manufacturing industry are characterized by slowing growth.

⌃ Enterprises in the *intermediate demand manufacturing sector* of the NWFD increased their output. Specifically, the production of coke and petroleum products grew by 6.1%, medicinal substances and materials by 2.2%, and rolled metal and chemical products by 1.9% *(Fig. 4)*. At the same time, the indicator for the wood processing industry declined by 3%.

The Kommunar Paper Mill (Leningrad Region) launched Russia's first production of glassine (an ultra-thin paper – a paper base in demand for label production and printing) and also commenced production of decorative impregnated base paper used in the manufacture of furniture boards and laminated plywood. The mill plans to produce up to 300 tons of glassine for tracing paper annually. Previously, such paper was not manufactured in Russia and was imported from European countries. Total investment in the new production line exceeded 1.2 billion rubles, of which 800 million rubles were
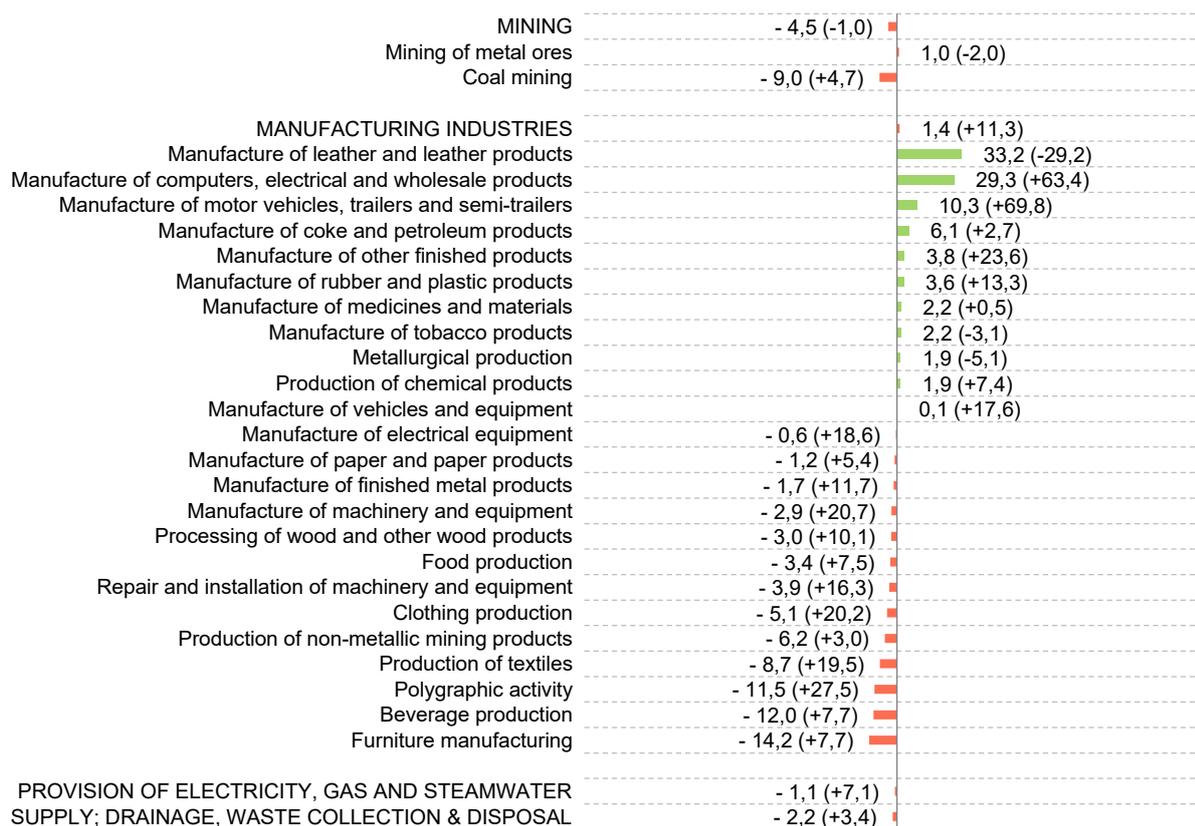
Industry	Value
MINING	- 4,5 (-1,0)
Mining of metal ores	1,0 (-2,0)
Coal mining	- 9,0 (+4,7)
MANUFACTURING INDUSTRIES	1,4 (+11,3)
Manufacture of leather and leather products	33,2 (-29,2)
Manufacture of computers, electrical and wholesale products	29,3 (+63,4)
Manufacture of motor vehicles, trailers and semi-trailers	10,3 (+69,8)
Manufacture of coke and petroleum products	6,1 (+2,7)
Manufacture of other finished products	3,8 (+23,6)
Manufacture of rubber and plastic products	3,6 (+13,3)
Manufacture of medicines and materials	2,2 (+0,5)
Manufacture of tobacco products	2,2 (-3,1)
Metallurgical production	1,9 (-5,1)
Production of chemical products	1,9 (+7,4)
Manufacture of vehicles and equipment	0,1 (+17,6)
Manufacture of electrical equipment	- 0,6 (+18,6)
Manufacture of paper and paper products	- 1,2 (+5,4)
Manufacture of finished metal products	- 1,7 (+11,7)
Manufacture of machinery and equipment	- 2,9 (+20,7)
Processing of wood and other wood products	- 3,0 (+10,1)
Food production	- 3,4 (+7,5)
Repair and installation of machinery and equipment	- 3,9 (+16,3)
Clothing production	- 5,1 (+20,2)
Production of non-metallic mining products	- 6,2 (+3,0)
Production of textiles	- 8,7 (+19,5)
Polygraphic activity	- 11,5 (+27,5)
Beverage production	- 12,0 (+7,7)
Furniture manufacturing	- 14,2 (+7,7)
PROVISION OF ELECTRICITY, GAS AND STEAMWATER	- 1,1 (+7,1)
SUPPLY; DRAINAGE, WASTE COLLECTION & DISPOSAL	- 2,2 (+3,4)

Fig. 4. Growth in Industrial Production Volumes in the NWFD, January-November 2025, % change from January-November 2024

Note: Figures in parentheses show the change in the indicator for January-November 2024, % change from January-November 2023.

provided by the federal Industrial Development Fund as a concessional loan under the flagship "Development Projects" program. In total, 70 units of new high-tech equipment were installed at the enterprise. This has enabled the mill to produce paper with a density below 25 g/m² for the first time, whereas this was previously the minimum for the facility[4].

⌃ A number of industries in the **final demand manufacturing sector** of the NWFD also showed production growth. In particular, output of leather and leather products increased substantially by 33.2% (following a 29.2% contraction the previous year), furniture by 14.2%, other finished goods by 3.8%, and rubber and plastic products by 3.6%. However, production of beverages and food products decreased by 12% and 3.4%, respectively, textiles by 8.7%, and clothing by 5.1%.

On October 17, the new production site of the Pskov-Polymer factory (Nordman brand; Pskov Region) was opened. Prior to the opening, the building, originally constructed during the Soviet era, underwent extensive renovation. It is now a modern, high-tech production workshop that will allow the factory to expand its production capacity[5].

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[4] In Leningrad Region, a Borrower of the Industrial Development Fund Established Russia's First Production of Tracing Paper Base. Available at: https://frprf.ru/press-tsentr/novosti/v-leningradskoy-oblasti-zaemshchik-frp-naladil-pervoe-v-rf-proizvodstvo-bumagi-osnovy-dlya-kalki (accessed: 17.01.2026).

[5] The Pskov-Polymer Shoe Factory Opened a New Production Site. Available at: https://vk.com/wall-223901399_195 (accessed: 17.01.2026).

In the ***investment demand manufacturing sector industries*** of the NWFD, the picture was mixed: against a backdrop of declining production of other non-metallic mineral products, and machinery and equipment (down 6.2% and 2.9%, respectively), a positive development was the high growth rate of output for computers, electronic and optical products, as well as motor vehicles, trailers, and semi-trailers (up 29.3% and 10.3%, respectively, following growth of over 60% a year earlier).

At the Nartis plant (Vologda Region), three new automated lines for the production of smart electricity meters were inaugurated. Automation has improved product quality and increased production capacity from 3,400 to 4,800 meters per day. Within two and a half years, the plant has become one of the region's leaders in revenue. In 2024 alone, the enterprise generated revenue exceeding 25 billion rubles. The new workshop is expected to employ approximately 200 workers[6].

During the Saint Petersburg International Gas Forum, a ceremonial opening was held for a new workshop producing burner units at the Cherepovets Boiler Plant "NORD" (Vologda Region). The launch of production is recognized as a strategic step for the domestic energy sector. The new workshop, spanning 1,450 square meters, will have a capacity to produce up to 300 burners of various models per year, with plans to increase output to 500 units next year. The products will be used both for equipping NORD's own boilers and for supplying external customers[7].

A new workshop of OOO "Armaturz" (a pipeline fittings manufacturer, part of OOO "Nauchno-Proizvodstvennyy Kontsern "KOMPENZ") was opened at the "Gagarin" technopark located in Pankovka (Novgorod Region). The investment project to create a modern production complex for pipeline fittings was signed in June at SPIEF 2025. The investment amounts to approximately 0.5 billion rubles and is expected to create about 200 jobs. The workshop opening is one of the stages of the project's implementation. The new workshop has already employed around 50 residents of Novgorod[8].

Agriculture in the NWFD maintained its previous year's production volumes in January-September 2025 (while Russia saw a 2% increase in output; *Table 2*). Most constituent entities of the district recorded growth in agricultural production, including Vologda, Novgorod, and Arkhangelsk regions, where it increased by 3.6%, 2.1%, and 1.7%, respectively. However, in a number of regions, agricultural output declined, most notably in Murmansk Region (by 15.2%).

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[6] In Cherepovets, Robots Will Help Make Smart Electricity Meters. Available at: https://cherinfo.ru/news/142717-v-cerepovce-roboty-pomogut-delat-umnye-elektroscetciki (accessed: 17.01.2026).

[7] A New Workshop for Burner Unit Production Launched in Cherepovets. Available at: https://vologdaregion.ru/news/2025/10/9/v-cherepovce-zapustili-novyy-ceh-po-proizvodstvu-gorelochnyh-ustroystv (accessed: 17.01.2026).

[8] Novgorod Machine Builders Erected a New Workshop in 8 Months, Now Will Tackle an Office. Available at: https://gazetanovgorod.ru/novosti/novgorodskie-mashinostroiteli-za-8-mesyaczev-vozveli-novyj-czeh-a-teper-vozmutsya-za-ofis.html (accessed: 17.01.2026).

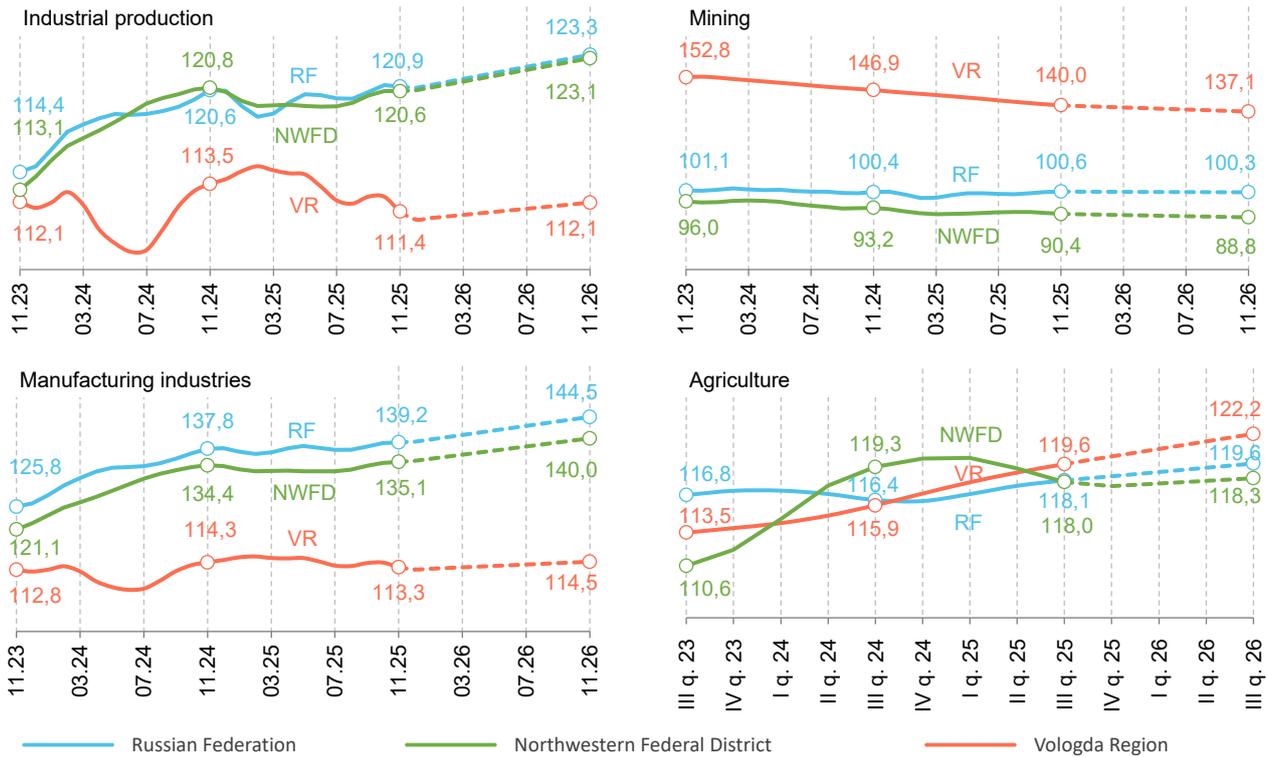**Trends in Industrial and Agricultural Production Development for 2023–2026, % relative to 2018 level**

Industrial production

Mining

Manufacturing industries

Agriculture

	Russian Federation	Northwestern Federal District	Vologda Region

Table 2. Agricultural Production Dynamics, % year-on-year

Territory	9 months of 2023	9 months of 2024	9 months of 2025	P*
Russian Federation	101.2	97.9	102.0	-
Northwestern FD	101.7	106.7	100.0	5
Vologda Region	102.5	100.6	103.6	31
Novgorod Region	102.3	99.0	102.1	38
Arkhangelsk Region	101.6	99.7	101.7	43
Komi Republic	99.5	98.7	100.5	52
Kaliningrad Region	102.2	109.7	100.3	53
Republic of Karelia	101.0	97.9	100.1	55
Leningrad Region	101.9	102.0	99.8	57
Nenets Autonomous Area	102.0	91.5	98.4	64
Pskov Region	100.4	130.1	96.6	69
Murmansk Region	104.2	101.7	84.8	81

*The rank of the corresponding region among the subjects of the Federation (according to the Northwestern Federal District – among the federal districts) is given according to the dynamics of the indicator in January – September 2025, excluding statistical information on the Donetsk People's Republic (DPR), Lugansk People's Republic (LPR), Zaporozhye and Kherson regions.

Positive developments in the **labor market** have slowed.

⌃ The unemployment rate in the NWFD in September-November 2025 continued to decline, reaching 1.9% (compared to 2.2% nationwide; *Table 3*). A decrease in the indicator was recorded in most of the district's regions, with the exception of Saint Petersburg, Leningrad, and Murmansk regions, where the unemployment rate remained at last year's level.

⌃ The volume of employer demand for employees registered with employment services in the NWFD showed an increase of 3% (compared to 2.5% nationwide). Growth in this indicator was recorded in half of the district's regions; specifically, in Pskov Region, the Nenets Autonomous Area, and Leningrad Region, it amounted to 10.4%, 7.9%, and 6.9%, respectively. Conversely, a decrease in the number of registered vacancies was recorded in the other NWFD regions, equaling 11.1% in Murmansk Region and 6.4% in Arkhangelsk Region.

**Table 3. Labor Market Dynamics,
% year-on-year**

Territory	Sept.-November 2023	Sept.-November 2024	Sept.-November 2025	P*
Unemployment Rate, % of the number of the employed				
Russian Federation	3.0	2.3	2.2	-
Northwestern FD	2.5	2.1	1.9	4
Novgorod Region	1.8	1.2	1.0	4
Saint Petersburg	1.5	1.5	1.5	19
Vologda Region	2.6	1.9	1.7	33
Kaliningrad Region	2.9	2.3	1.9	46
Pskov Region	2.6	2.3	2.1	56
Arkhangelsk Region	5.5	2.6	2.4	61
Murmansk Region	2.7	2.5	2.5	63
Komi Republic	4.3	3.3	2.7	64
Republic of Karelia	5.2	3.5	2.8	67
Leningrad Region	2.7	2.8	2.8	68
Nenets Autonomous Area	6.0	4.6	3.9	77
Territory	9 months of 2023	9 months of 2024	9 months of 2025	P**
Employer Demand for Workers				
Russian Federation	116.4	118.6	102.5	-
Northwestern FD	117.0	115.3	103.0	4
Pskov Region	108.6	119.4	110.4	15
Nenets Autonomous Area	117.9	106.8	107.9	20
Leningrad Region	120.2	128.1	106.9	25
Vologda Region	114.3	126.7	105.5	33
Saint Petersburg	121.7	112.9	105.1	35
Kaliningrad Region	111.7	114.8	104.2	38
Republic of Karelia	112.0	112.0	98.9	63
Komi Republic	109.9	110.9	97.9	67
Novgorod Region	121.9	129.9	97.2	72
Arkhangelsk Region	114.3	113.7	93.4	79
Murmansk Region	102.7	102.7	88.9	82

*For the "Unemployment Rate" indicator, the rank of the respective region among the federal subjects (and for the NWFD among federal districts) is provided based on the dynamics of the indicator in September-November 2025. For the "Employer Demand for Workers" indicator, the rank of the respective region among federal subjects (and for the NWFD among federal districts) is provided based on the dynamics of the indicator in January-September 2025. Statistical information for the Donetsk People's Republic (DPR), Lugansk People's Republic (LPR), Zaporozhye, and Kherson regions is excluded.

2. Income Formation

Changes at the income formation stage were characterized by growth in household and state income against a backdrop of deteriorating business profits.

⊙ *Real monetary incomes of the population* in the NWFD increased by 8.2% in January-September 2025 (compared to 8.1% nationwide), with this change observed in all regions of the

district. The main contributors to the indicator's growth in the macro-region were primarily Leningrad Region and Saint Petersburg, where the change was 11.4% and 9.5%, respectively *(Table 4)*. This occurred predominantly due to real accrued wages, which increased by 4.5% nationwide over the same period. Wages for residents of the NWFD grew by a smaller margin – 3%. Two constituent entities of the district were among the worst in the country in terms of wage dynamics: Vologda and Pskov regions saw a decline in wage levels by 1.2% and 0.1%, respectively.

**Table 4. Dynamics of the Population's Income Generation,
% year-on-year**

Territory	9 months of 2023	9 months of 2024	9 months of 2025	P*
Real Monetary Incomes of the Population				
Russian Federation	105.8	108.7	108.1	-
Northwestern FD	104.8	110.0	108.2	-
Leningrad Region	105.8	113.1	111.4	-
Saint Petersburg	104.0	113.2	109.5	-
Pskov Region	105.8	108.4	108.3	-
Novgorod Region	105.8	107.4	108.0	-
Republic of Karelia	105.1	107.0	107.7	-
Vologda Region	103.5	101.1	106.9	-
Kaliningrad Region	109.8	109.2	106.2	-
Arkhangelsk Region	104.2	108.6	104.6	-
Komi Republic	106.7	108.5	104.3	-
Nenets Autonomous Area	103.7	101.6	103.7	-
Murmansk Region	105.4	102.5	101.9	-
Real Accrued Wages				
Russian Federation	107.4	109.0	104.5	-
Northwestern FD	106.5	106.6	103.0	5
Nenets Autonomous Area	107.8	112.2	106.9	15
Republic of Karelia	108.0	113.2	106.9	15
Komi Republic	109.1	109.7	105.6	23
Saint Petersburg	106.9	107.5	105.2	29
Kaliningrad Region	105.9	103.6	103.7	49
Novgorod Region	102.5	105.2	102.6	60
Murmansk Region	106.4	105.3	102.5	61
Arkhangelsk Region	104.1	109.1	101.8	69
Leningrad Region	106.7	104.3	101.7	71
Pskov Region	105.9	106.6	99.9	82
Vologda Region	104.5	106.3	98.8	84

*For the "Real Accrued Wages" indicator, the rank of the respective region among federal subjects (and for the NWFD among federal districts) is provided based on the dynamics of the indicator in January-September 2025. Statistical information for the Donetsk People's Republic (DPR), Lugansk People's Republic (LPR), Zaporozhye, and Kherson regions is excluded.

In the short term, the growth of real wages is likely to continue; however, in the longer term, there are obvious constraints stemming from the financial position of companies and the state[9]. As early as the coming months, a slowdown in the growth rate of real wages can be expected due to easing labor market tightness. In November 2025, the hh-index (HeadHunter job market index) stood at 8.1 points (compared to 7.3 points in October 2025 and 4.2 points in November 2024), indicating a high level of competition among applicants for jobs[10].

⊘ Real incomes of the consolidated budget and the territorial state extra-budgetary fund for the NWFD as a whole decreased by 2.9%, affecting all constituent entities of the district except Kaliningrad Region, where an increase of 1.6% was recorded (nationwide, budget incomes increased by 1.6%; *Table 5*). At the same time, receipts from taxes on business income in the NWFD in January-October 2025 fell by 14.9% (compared to a 13.1% decrease nationwide). The dynamics of receipts from the sale of excisable goods also worsened: in the NWFD, they decreased by 4.5% (compared to a 1.6% decrease nationwide). An important factor behind this phenomenon was the increase in personal income tax (PIT) receipts by 6.7%. Budgetary revenues decreased most significantly in Vologda Region, the Nenets Autonomous Area, and the Komi Republic (by 13.8%, 12.8%, and 10.7%, respectively). The volume of personal income tax in the macro-region grew by 1.3%, with this indicator increasing by 14.9% in Novgorod Region.

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9 Analysis of Macroeconomic Trends. December 2025. Available at: http://www.forecast.ru/_ARCHIVE/Mon_MK/2025/macro63.pdf (accessed: 19.01.2026).

10 Short-Term Analysis of GDP Dynamics. December 2025. Available at: https://ecfor.ru/publication/kratkosrochnyj-analiz-dinamiki-vvp-dekabr-2025/ (accessed: 19.01.2026).

Table 5. Dynamics of Business and Government Income Formation, % year-on-year

Territory	10 months of 2023	10 months of 2024	10 months of 2025
Revenues of the consolidated budget and the budget of the territorial state extra-budgetary fund			
Russian Federation	103.7	101.2	101.6
Northwestern FD	97.3	101.6	97.1
Kaliningrad Region	95.4	110.5	101.6
Murmansk Region	107.7	86.2	99.3
Saint Petersburg	91.5	106.7	99.2
Leningrad Region	120.2	101.6	98.9
Novgorod Region	104.0	86.4	96.0
Republic of Karelia	99.2	95.1	95.5
Arkhangelsk Region	93.3	96.7	94.3
Pskov Region	110.8	93.5	93.2
Komi Republic	94.0	96.4	89.3
Nenets Autonomous Area	74.1	120.7	87.2
Vologda Region	101.4	94.4	86.2
Territory	**9 months of 2023**	**9 months of 2024**	**9 months of 2025**
Receipt of taxes, fees and other mandatory payments to the consolidated budget of the Russian Federation			
Russian Federation	99.3	111.8	106.6
Northwestern FD	119.3	90.4	108.8
Kaliningrad Region	67.5	143.5	131.1
Novgorod Region	95.4	81.9	130.8
Saint Petersburg	148.0	95.8	114.7
Pskov Region	124.1	108.6	112.8
Arkhangelsk Region	86.8	104.7	112.4
Murmansk Region	189.1	40.7	108.4
Leningrad Region	148.2	89.9	105.9
Republic of Karelia	100.7	119.0	95.3
Nenets Autonomous Area	37.6	127.6	92.1
Komi Republic	82.6	55.4	91.6
Vologda Region	135.5	83.2	67.6
Territory	**10 months of 2023**	**10 months of 2024**	**10 months of 2025**
Net financial result of organizations' activities			
Russian Federation	125.4	77.4	81.2
Northwestern FD	98.4	74.6	77.0
Murmansk Region	95.8	15.0	106.3
Saint Petersburg	99.0	60.3	92.7
Pskov Region	146.4	116.2	85.9
Leningrad Region	114.7	119.0	78.9
Komi Republic	91.6	78.7	68.5
Arkhangelsk Region	70.3	98.7	67.1
Kaliningrad Region	148.2	181.8	63.7
Vologda Region	85.5	58.8	34.7
Nenets Autonomous Area	25.0	63.7	17.9
Republic of Karelia	49.3	148.0	17.1
Novgorod Region	78.6	-	-

⬆ ***Receipts of taxes, duties, and other mandatory payments into the consolidated budget*** for the NWFD as a whole increased in real terms by 8.8% in January-September 2025, following a 9.6% decline a year earlier (nationwide, consolidated budget receipts grew by 6.6% after an increase of nearly 11.8% in the previous year). A significant factor contributing to this phenomenon was the increase in the indicator in Kaliningrad and Novgorod regions, as well as Saint P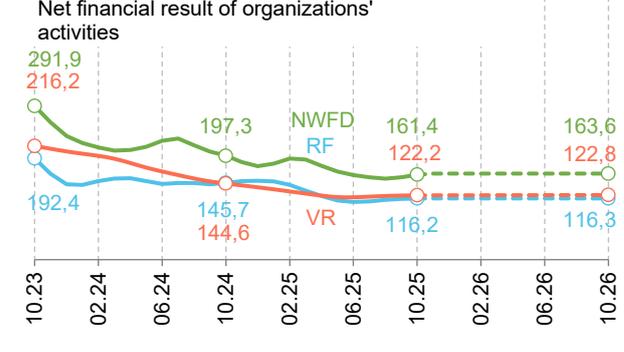etersburg, by 31.1%, 30.8%, an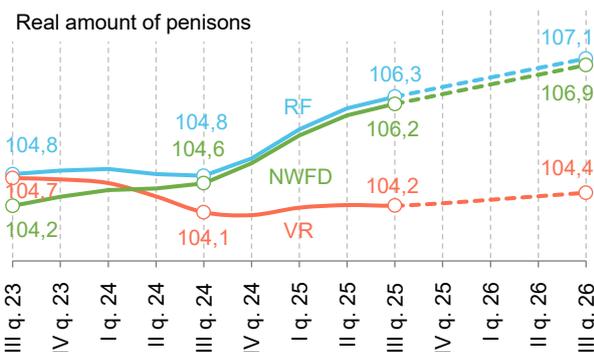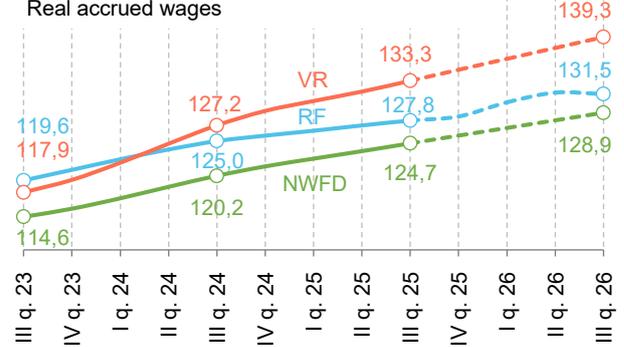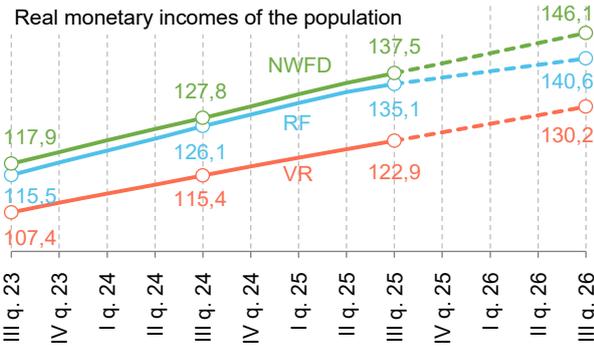d 14.7%, respectively. The overall dynamics of the indicator for the NWFD were negatively impacted by a sharp decline in tax revenues in Vologda Region (down 32.4%), one of whose key specializations is metal product manufacturing.

⬇ ***The net financial result*** of organizations in the NWFD in January-October continued to contract, losing 23% compared to the previous year's level (compared to an 18.8% decline nationwide), following a recorded decrease of 25.4% last year. A decline in the indicator was noted in almost all constituent entities of the district; meanwhile, in Novgorod Region, the

Trends in Labor Market Development for 2023–2026, % relative to 2018 level

Unemployment level

Demand for workforce
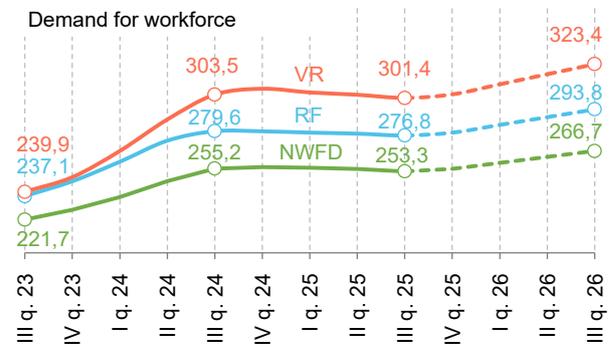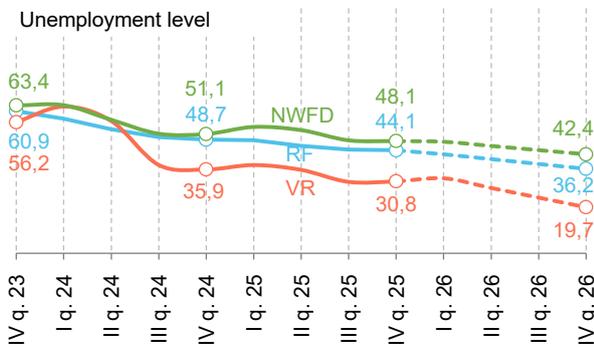
Trends in Income Formation in the Economy for 2023–2026, % relative to 2018 level

Real monetary incomes of the population

Real accrued wages

Real amount of penisons

Net financial result of organizations' activities

Russian Federation — Northwestern Federal District — Vologda Region

financial result of organizations was negative. At first glance, Murmansk Region appears to be an exception to the overall picture; however, its 6.3% growth in the indicator was preceded by an 85% slump last year.

3. Final Use

Consumer demand plays an especially important role as a source of economic growth against the backdrop of declining business income. ⏷ *Retail trade turnover* for the NWFD as a whole decreased by 2.3%, largely due to a decline in the indicator in Saint Petersburg by 8.4%, against an increase of 0.2–6.6% in almost all other constituent entities of the district (nationwide, growth of 2.5% was recorded; *Table 6*). For the district as a whole, turnover of non-food goods contracted by 3.9%, most significantly in Saint Petersburg (down 11.6%; nationwide, it grew by 2.1%). Vologda Region became the leader in the macro-region in terms of growth in retail turnover of non-food goods (15.2%). Turnover of food goods in the NWFD grew by 0.2% (compared to 2.3% nationwide), most significantly in Leningrad Region (up 6.3%). A noticeable negative impact on the indicator was its decline in Vologda Region and Saint Petersburg – by 4.2% and 2.3%, respectively.

Table 6. Consumer Market Development Dynamics, % year-on-year

Territory	11 months of 2023	11 months of 2024	11 months of 2025	P
Retail trade turnover				
Russian Federation	107.7	108.0	102.5	-
Northwestern FD	112.8	106.7	97.7	8
Republic of Karelia	111.7	102.0	106.6	11
Leningrad Region	113.9	106.7	104.9	17
Komi Republic	106.0	108.3	104.6	19
Vologda Region	102.7	105.9	104.3	22
Kaliningrad Region	107.0	112.0	103.8	27
Novgorod Region	102.6	106.4	103.2	38
Pskov Region	101.7	108.4	101.3	65
Nenets Autonomous Area	103.5	102.9	100.2	74
Arkhangelsk Region	102.9	100.1	100.2	74

Territory	11 months of 2023	11 months of 2024	11 months of 2025	P
Murmansk Region	101.1	102.9	99.2	81
Saint Petersburg	118.7	107.4	91.6	85
Volume of paid services provided to the population				
Russian Federation	106.6	104.3	102.7	-
Northwestern FD	110.2	102.7	104.2	2
Saint Petersburg	115.6	101.0	106.2	9
Leningrad Region	110.0	110.2	105.1	16
Kaliningrad Region	107.2	108.8	103.8	25
Pskov Region	101.5	102.0	101.6	51
Republic of Karelia	105.0	103.2	101.4	56
Nenets Autonomous Area	91.3	104.3	100.8	62
Novgorod Region	100.2	100.6	100.6	66
Vologda Region	100.5	102.5	100.3	70
Murmansk Region	101.4	100.3	100.0	73
Arkhangelsk Region	104.7	106.1	99.3	77
Komi Republic	98.2	101.4	98.8	81
Consumer price index (compared to December of the previous year)				
Russian Federation	106.6	108.1	105.3	-
Northwestern FD	106.1	107.6	105.6	5
Arkhangelsk Region	107.7	107.3	104.4	5
Saint Petersburg	105.7	107.6	104.6	10
Komi Republic	106.7	108.1	105.6	37
Vologda Region	106.5	108.2	106.0	50
Republic of Karelia	107.2	107.2	106.1	55
Novgorod Region	105.9	107.3	106.5	66
Nenets Autonomous Area	103.2	105.1	106.8	73
Pskov Region	105.1	107.1	106.8	73
Leningrad Region	105.5	107.5	107.1	78
Kaliningrad Region	107.0	108.5	107.2	82
Murmansk Region	106.4	106.4	107.4	84
Producer price index for manufactured goods (compared to December of the previous year)				
Russian Federation	123.0	107.4	98.3	-
Northwestern FD	112.4	107.7	100.9	4
Nenets Autonomous Area	193.4	95.8	74.0	1
Komi Republic	135.8	107.8	92.3	9
Vologda Region	119.3	103.8	92.8	10
Republic of Karelia	127.4	115.0	95.3	13
Kaliningrad Region	109.0	107.1	102.0	39
Arkhangelsk Region	105.5	109.7	102.8	45
Leningrad Region	109.5	113.0	102.9	46
Novgorod Region	107.4	104.7	105.6	59
Murmansk Region	100.3	107.4	108.0	69
Pskov Region	110.8	109.8	108.4	71
Saint Petersburg	105.8	105.1	111.6	81

⬆ The volume of **paid services** provided to the population in the NWFD increased by 4.2% (compared to 2.7% nationwide). Growth in the indicators was noted in most regions of the district, with Saint Petersburg and Leningrad Region leading (up 6.2% and 5.1%, respectively). Meanwhile, in the Komi Republic and Arkhangelsk Region, the volume of services provided decreased by 1.2% and 0.8%, respectively.

⬆ **Consumer** inflation in the NWFD in November 2025 compared to December of the previous year amounted to 5.6% (compared to 5.3% in Russia). Prices for food goods in the federal district as a whole rose by 4.8%, while prices for non-food goods increased to a lesser extent – by 3.6%. Utility tariffs increased by 11.9% due to a widespread tariff hike effective July 1. Consumer prices for services rose by 8.9%, respectively.

⬆ **Producer prices for industrial goods** in the NWFD as a whole demonstrated an increase of only 0.7% (compared to a 1.7% decrease nationwide). A sharp decline in prices for industrial products in the Nenets Autonomous Area was recorded (down 26%, which was the best result in the country). Prices for industrial products also decreased in the Komi Republic, Vologda Region, and the Republic of Karelia (down 7.7%, 7.2%, and 4.7%, respectively). In the other constituent entities of the NWFD, producer prices for industrial goods increased, with the most significant rise being for industrial products in Saint Petersburg (up 11.6%).

⬆ In **construction**, the volume of work performed in the NWFD increased by 3.4% (compared to 2.7% in Russia; *Table 7*). Among the district's constituent entities, high growth was demonstrated by Leningrad Region, as well as the Komi Republic and the Republic of Karelia (by 32.4%, 31.6%, and 14.8%, respectively). At the same time, the change in the indicator was negative in half of the regions; specifically, in Murmansk Region, the Nenets Autonomous Area, and Kaliningrad Region, the decline was 43.7%, 34.8%, and 24.6%, respectively. It is worth noting that the recorded dynamics of

construction work volume may be partly shaped by the completion of current projects, as there is a deep decline in demand for finished products in the building materials industry[11].

Table 7. Construction Dynamics, % year-on-year

Territory	11 months of 2023	11 months of 2024	11 months of 2025	P
Scope of work on the type of economic activity "Construction"				
Russian Federation	109.5	101.2	102.7	-
Northwestern FD	105.9	101.2	103.4	3
Leningrad Region	111.3	130.1	134.2	7
Komi Republic	96.8	102.8	131.6	8
Republic of Karelia	108.3	59.7	114.8	22
Saint Petersburg	109.8	99.5	100.8	39
Novgorod Region	120.6	95.8	97.2	45
Vologda Region	107.2	105.1	97.0	46
Arkhangelsk Region	129.5	58.6	94.9	52
Pskov Region	97.2	91.6	80.1	74
Kaliningrad Region	116.6	115.9	75.4	78
Nenets Autonomous Area	75.5	85.5	65.2	80
Murmansk Region	69.4	83.8	56.3	82
Housing commissioning				
Russian Federation	100.0	100.7	97.6	-
Northwestern FD	100.4	91.5	100.7	5
Murmansk Region	27.7	128.4	151.6	3
Nenets Autonomous Area	53.1	135.2	118.9	12
Republic of Karelia	101.4	92.0	118.5	14
Novgorod Region	100.7	93.0	113.1	20
Vologda Region	101.6	101.4	111.2	21
Leningrad Region	107.4	96.4	107.7	26
Kaliningrad Region	92.1	97.8	101.0	38
Arkhangelsk Region	104.6	93.0	100.2	44
Komi Republic	101.3	108.3	95.2	54
Saint Petersburg	98.8	78.5	84.7	72
Pskov Region	103.4	94.0	83.3	74
Volume of mortgage loans issued				
Russian Federation	159.4	60.8	74.3	-
Northwestern FD	142.9	64.1	76.3	3
Nenets Autonomous Area	131.8	60.0	95.1	2
Leningrad Region	145.7	58.0	85.1	8
Kaliningrad Region	188.5	69.2	79.5	22
Pskov Region	161.8	62.6	76.5	33
Saint Petersburg	134.4	65.4	75.9	36
Komi Republic	145.9	53.3	75.1	38
Arkhangelsk Region	139.7	82.6	73.6	43
Novgorod Region	153.1	60.8	73.5	44
Murmansk Region	143.0	63.1	73.1	47
Republic of Karelia	164.7	54.6	70.8	59
Vologda Region	161.0	58.5	68.9	68

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[11] Analysis of Macroeconomic Trends. December 2025. Available at: http://www.forecast.ru/_ARCHIVE/Mon_MK/2025/macro63.pdf (accessed: 19.01.2026).

Housing commissioning in the NWFD grew by 0.7% (while nationwide it decreased by 2.4%). Growth in the indicator was observed in most regions of the macro-region. However, three constituent entities of the district saw a sharp decline – in Pskov Region, Saint Petersburg, and the Komi Republic, it amounted to 16.7%, 15.3%, and 4.8%, respectively.

The volume of issued mortgage loans in the NWFD contracted substantially (by 23.7%; compared to 25.7% nationwide). This phenomenon affected all regions of the district, manifesting in a decline in mortgage lending ranging from 4.9% to 31.1%. Note that this was also preceded by a decrease in the indicator the previous year. According to Bank of Russia data, in October and November 2025, 76% and 78% of mortgage loans, respectively, were issued under state support programs. At the same time, in annual terms, the number of mortgage housing loans provided increased by 45.8%, and the volume by 82.8%[12].

Real expenditures of the consolidated budget and the territorial state extra-budgetary fund in the NWFD in January-October 2025 increased by 3.5% (compared to 9.3% nationwide; *Table 8*). Half of the district's constituent entities demonstrated growth in budget expenditures, including Leningrad Region – up 9.8%, Saint Petersburg and Kaliningrad Region – up 5.8% and 4.8%, respectively. At the same time, in a number of macro-region subjects, the indicator decreased, most notably in Novgorod and Murmansk regions (by 6.9% and 4.6%, respectively). Meanwhile, at the national level, growth in social policy expenditures accelerated to 15%; a year earlier, an increase of 1% was recorded for this line item. In the NWFD, an increase in this indicator of 8.6% was also noted (a year earlier, an increase of 1.5% was recorded for this item). Healthcare expenditures nationwide grew by 6.8%, while in the NWFD they decreased by 0.4%.

The **fixed capital investment volume index** for the NWFD in January-September 2025 increased by 13.9%, which was the best result among all federal districts (nationwide growth was only 0.5%; *Table 9*). Two constituent entities of the macro-region ranked among the top five in the country for this indicator, with the largest growth in fixed capital investment volume observed in Leningrad and Vologda regions (by 48.6% and 23.3%, respectively). However, more than half of the NWFD regions saw a decline in investment activity, most pronounced in the Komi Republic and Arkhangelsk Region (by 23.5% and 18.2%, respectively).

Table 8. Dynamics of Expenditures of the Consolidated Budget and the Territorial State Extra-Budgetary Fund, % year-on-year

Territory	10 months of 2023	10 months of 2024	10 months of 2025
Russian Federation	104.0	101.9	109.3
Northwestern FD	107.4	104.3	103.5
Leningrad Region	97.9	113.3	109.8
Saint Petersburg	117.7	106.1	105.8
Kaliningrad Region	100.9	97.8	104.8
Nenets Autonomous Area	92.3	95.1	104.1
Komi Republic	96.8	102.5	102.9
Arkhangelsk Region	102.1	97.6	100.7
Republic of Karelia	97.1	90.3	98.9
Vologda Region	105.6	108.5	98.1
Pskov Region	102.4	92.4	97.4
Murmansk Region	92.9	108.8	95.4
Novgorod Region	117.1	95.8	93.1

Table 9. Fixed Capital Investment Dynamics, % year-on-year

Territory	9 months of 2023	9 months of 2024	9 months of 2025	P*
Russian Federation	110.5	109.0	100.5	-
Northwestern FD	111.6	109.9	113.9	1
Leningrad Region	117.7	128.8	148.6	2
Vologda Region	78.8	129.2	123.3	4
Kaliningrad Region	134.6	81.7	110.5	13
Republic of Karelia	89.7	97.1	102.1	30
Saint Petersburg	121.6	110.9	102.1	30
Nenets Autonomous Area	96.1	113.5	98.8	41
Murmansk Region	97.4	83.8	95.4	50
Pskov Region	100.7	124.4	91.1	60
Novgorod Region	138.0	85.6	88.0	72
Arkhangelsk Region	100.7	82.4	81.8	77
Komi Republic	98.4	109.3	76.5	83

*The rank of the respective region among federal subjects (and for the NWFD among federal districts) is provided based on the dynamics of the indicator in January-September 2025. Statistical information for the Donetsk People's Republic (DPR), Lugansk People's Republic (LPR), Zaporozhye, and Kherson regions is excluded.

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[12] Review of the Mortgage Housing Lending Market. Available at: https://cbr.ru/statistics/bank_sector/mortgage/Indicator_mortgage/1125 (accessed: 19.01.2026).

Such high investment dynamics amid an "economic freeze" have been made possible by the following additional factors. First, there is the inertia from previously launched projects. Many enterprises believed in the economic upturn manifested in 2021 and 2023-2024 and spent money on modernizing old and creating new capacities. Second, in conditions of an acute shortage of qualified workers, the necessity to substitute labor with capital is exerting increasing pressure on our enterprises. Currently, many Russian companies are striving with all their might to increase the share of capital costs and reduce labor costs. This also contributes to sustaining high investment dynamics[13].

Russia as a whole can count on "effective economic sovereignty with the smart building of new international chains." However, at the present moment, the Russian economy is forced to start from a decline in investments in quarter-on-quarter terms and a drop in output in the overwhelming majority of manufacturing industries. <...> Tight monetary policy has led businesses to self-finance investments, with most enterprises postponing them indefinitely[14].

⌄ According to data from the Federal Customs Service, in January-October 2025, Russia's total **export** volume in value terms fell by 4.3%, while **imports** fell by 2.4%. Exports to Europe decreased by 14.9%, to Asia by 1.6%, and to Africa by 14.4%. The only direction where export supplies increased was the group of countries in the "Americas" (up 3.4%). Imports from Europe and Asia decreased by 4.4% and 2.9%, respectively, while imports from Africa increased by 31.4%. Exports of food goods decreased by 11.3%, while imports of this product group rose by 14.2%. The value volume of mineral product exports (their share was 54.9%) also decreased by 14.7%; imports of mineral products fell by 14.9%. Exports of machinery and equipment increased by 25.4%, while imports of this product category decreased by 8.7%, with their share amounting to just under half of total imports.

⌄ **World market prices** for oil in January-November 2025 decreased by 15.5%, and for phosphate fertilizers by 11% *(Table 10)*.

⌃ At the same time, rolled metal became more expensive by 22.1%, and natural gas by 14.7%.

Table 10. Dynamics of World Commodity Prices, % year-on-year

Commodity	11 months of 2023	11 months of 2024	11 months of 2025
Oil	82.2	97.7	84.5
Gas	32.6	80.7	114.7
Rolled metal	69.9	102.6	122.1
Phosphate fertilizers	116.3	93.2	89.0

World prices for metal products show an upward trend: increases were noted both for "flat" rolled products (by 6.9–11.3%) and for "long" products (by 1.1–10.2%). On the domestic market, prices declined: for "flat" rolled metal by 17.5–12.6%, for "long" products by 19.1–17.2%.

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[13] Fuel for Development. Available at: https://www.kommersant.ru/doc/8269466 (accessed: 19.01.2026).

[14] Belousov from CMASF Described a Business Model "Like the 1990s, but for the Benefit of Society". Available at: https://www.rbc.ru/economics/24/12/2025/694ab91a9a7947b6d0e19a6c (accessed: 19.01.2026).

Table 11. Prices for Metal Products on the World Market (EU Countries) per Ton
(as of the beginning of December of the respective year)

| Type of metal product	Unit of measurement	2023	2024	2025	2025, % to	
						2023
"Flat" rolled metal						
Cold-rolled sheet	USD	730	685	763	111.3	104.5
Galvanized sheet	USD	820	793	848	106.9	103.4
Hot-rolled sheet	USD	653	580	635	109.5	97.3
"Long" rolled metal						
Reinforcing steel	USD	743	613	665	108.6	89.6
Structural sections	USD	915	809	892	110.2	97.5
Rolled products	USD	860	698	705	101.1	82.0

Table 12. Prices for Metal Products on the Russian Market per Ton
(as of the beginning of January of the respective year)

Type of metal product	Unit of measurement	2024	2025	2026	2026, % to	
					2025	2024
"Flat" rolled metal						
Cold-rolled sheet	Rub.	80167	86503	74850	86.5	93.4
Galvanized sheet	Rub.	104280	115250	95100	82.5	91.2
Hot-rolled sheet	Rub.	70586	64500	56350	87.4	79.8
"Long" rolled metal						
Rebar	Rub.	74244	59054	48917	82.8	65.9
Beam and Channel	Rub.	85023	82756	68131	82.3	80.1
Round	Rub.	72480	57500	46500	80.9	64.2
Angle	Rub.	73214	62700	51133	81.6	69.8

Trends in Consumer Market and Construction Development for 2023–2026, % relative to 2018 level
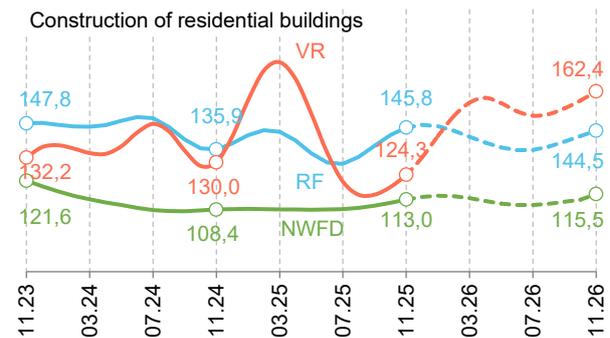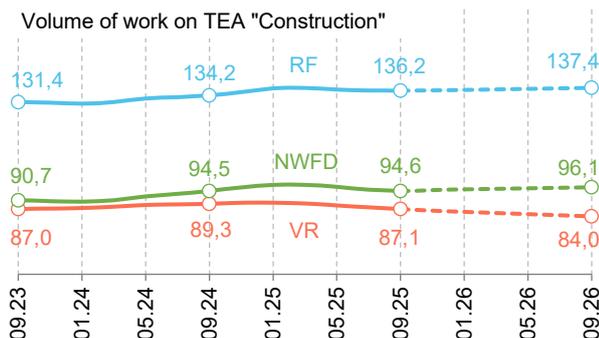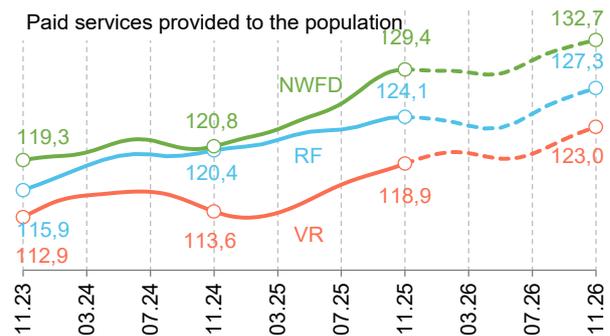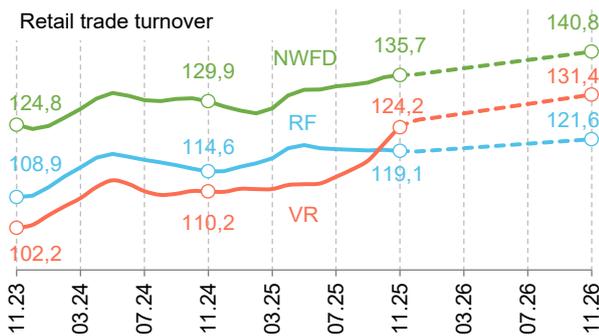
Trends in Investment Activity and Foreign Trade Development for 2022–2026, % relative to 2018 level
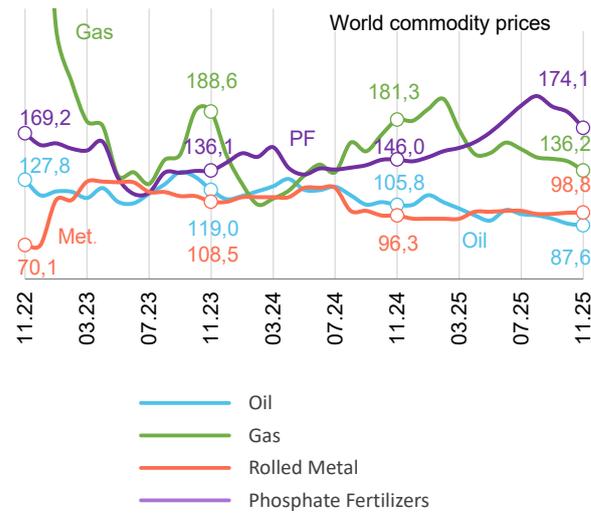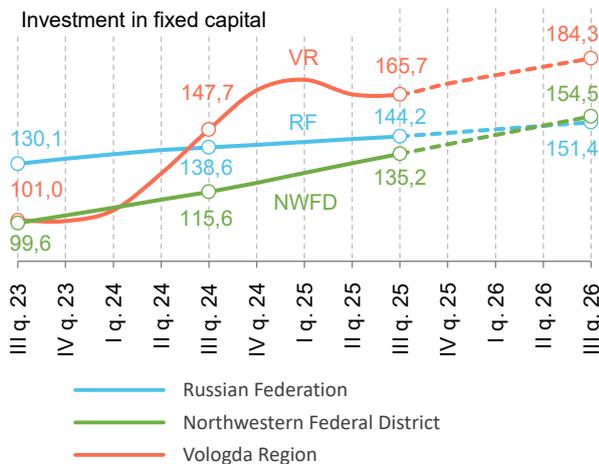
In general, for the period January-November 2025, the economy of the NWFD developed under conditions of complex and contradictory dynamics. On the one hand, positive trends were recorded, supported by growth in the population's real incomes and an increase in government spending. Output growth was observed in manufacturing, especially in intermediate and final demand industries, as well as in certain high-tech and import-substituting segments. The growth of wages and the population's real monetary incomes continued, serving as a key stabilizer for consumer demand; inflation slowed; and the volume of paid services provided to the population demonstrated growth. Fixed capital investment in the NWFD showed significant growth, which was the best result among all federal districts, driven both by the inertia of previously launched projects and by the necessity to substitute scarce labor with capital.

On the other hand, negative factors clearly emerged, indicating a slowdown in business activity and the formation of cautious expectations. A rapid decline in the net financial result of organizations and a decrease in tax receipts from business activities were recorded. The Business Confidence Index in key industries moved into negative territory. The volume of mortgage lending contracted substantially. Retail trade turnover for the district as a whole declined, and industrial production demonstrated a downturn.

Thus, economic growth in the NWFD in 2025 was largely supported by household consumption and government spending, which offset the decline in business incomes and the compression of investment risks. However, to transition to sustainable and balanced growth, the need to accelerate structural transformations becomes evident. Key priorities should include stimulating private investment and improving access to long-term credit resources; enhancing the efficiency of state support measures through their selection, targeting, and concentration on proven instruments; and creating

conditions for reviving business initiative and improving the business climate, which is necessary to overcome the persistent nature of negative expectations. The future dynamics of the district's economy will depend on the successful implementation of these measures, as well as on the ability of businesses to adapt to structural constraints and seize emerging opportunities in high-tech and import-substituting industries. An example of already implemented measures is the expansion of support for the manufacturing sector[15].

Sources: Rosstat, the Ministry of Economic Development of Russia, the Bank of Russia, the Federal Customs Service, the Government of Russia, metalinfo.ru, metaltorg.ru, divercitytimes.com, data.stats.gov.cn, bea.gov, and others.

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[15] RF Government Resolution 1955 dated 28.11.2025 "On Extending the Term of the Experimental Legal Regime in the Sphere of Digital Innovations for the Provision of Transport Services Using Highly Automated Vehicles in the Territories of Certain Constituent Entities of the Russian Federation"; RF Government Resolution 2175 dated 27.12.2025 "On Introducing a Tariff Quota for the Export Outside the Territory of the Russian Federation of Waste and Scrap of Ferrous Metals to States Not Members of the EAEU"; RF Government Resolution 1947 dated 28.11.2025 "On Introducing a Temporary Ban on the Export from the Russian Federation of Waste and Scrap of Precious Metals".

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