Agglomeration Processes in Russian Regions: Specifics and Challenges Related to the Intensification of Positive Effects

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Abstract. Urban agglomerations currently play an important role in the spatial development of most countries, since they are key centers of economic growth, generation and diffusion of innovations. In theoretical and practical terms, as a rule, the greatest attention is paid to studying the largest and large urban agglomerations (under current legislation, in Russia these include agglomerations with a population of more than 1,000 and 500 thousand people, accordingly), while insufficient attention is paid to the real prerequisites and features of the development of other emerging/potential agglomerations (the so-called "second-tier" agglomerations). In this regard, the aim of the study is to identify features and challenges related to the intensification of agglomeration processes in Russia's regions, taking into account the provision of positive effects. To achieve the goal, we use a wide range of general scientific (analysis, synthesis, systems) and applied economic and statistical methods (index, correlation analysis). Scientific

significance of the study lies in the development of methodological approaches and tools for assessing agglomeration processes, determining their specifics in Russian agglomerations of the "second tier". We reveal that the continuing concentration of a significant share of regional production, investment and population in the agglomerations under consideration is the key feature in their development. At the same time, in fact, agglomeration processes extend only to the core of the agglomeration and the territory closest to it; this is manifested in the convergence of their growth rates in key socio-economic indicators. These facts indicate a rather low development of the satellite zone of "second-tier" agglomerations and a weak transmission of positive effects to the periphery, as well as an excessive development of the core, which in the future may be a threat to the stable development of such agglomerations. In the final part of the work, we substantiate priority directions to increase the internal integration of urban agglomerations as open socio-economic systems that will ensure the generation of positive externalities and turn "second-tier" agglomerations into growth points at the macro and regional levels.

Key words: "second-tier" urban agglomerations, large city, satellite area, agglomeration processes, integration of space, strategic priorities of spatial development.

Introduction

The Spatial Development Strategy of the Russian Federation for the period until 2025 (approved by the Government Resolution 207-r, dated February 13, 2019) identifies urban agglomerations as one of the key priorities of the country's spatial development. Along with this, the following list was consolidated:

— 20 cities that are promising centers of economic growth in the Russian Federation and form the *largest and large urban agglomerations* (Moscow, Saint Petersburg, Yekaterinburg, etc.);

— 22 cities — promising centers of economic growth in the *constituent entities of the RF*, forming agglomerations with a population of more *than 500 thousand people* (Yaroslavl, Kaliningrad, Saratov, etc.)[1];

— 23 cities — promising centers of economic growth in the *constituent entities of the RF*, including those forming urban agglomerations with a population of *less than 500 thousand people* (the so-called *"second-tier" agglomerations*, which can be formed around a number of large cities of the country: Belgorod, Arkhangelsk, Veliky Novgorod, Vladimir, Vologda, Kaluga, Komsomolsk-on-Amur, etc.).

Studies by leading scientists[2] (Lola, 2013; Polyan, 2014; Fang, Yu, 2020, etc.), as well as the world practice indicate that agglomeration forms of economic activity concentration differ significantly from each other not only by their place in the hierarchical system of urban settlements of the country, but also by the composition of elements,

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[1] In the Strategy, the 20 largest (with population of more than 1 million people), large (500−1000 thousand people) urban agglomerations are also called "metropolitan"; together with 22 other agglomerations with a population of more than 500 thousand people, they seem to be contrasted with small/medium-sized cities, rural areas and smaller agglomerations in terms of their potential for concentration of economic activity. At the same time, 23 "second tier" agglomerations with a population of less than 500 thousand people are considered as a tool to ensure balanced spatial development of Russia, a counterbalance to "metropolitan" agglomerations.

[2] Pivovarov Yu.L. (1999). *Fundamentals of Geo-Urbanistics: Urbanization and Urban Systems: Textbook for Students of Higher Educational Institutions.* Moscow.

stage and direction of development, place in the system of geographical division of labor. For instance, Chinese researchers (Fang, Yu, 2017) include urban agglomeration, which is a hierarchical system of interconnected cities of different ranks (three cities and more with a total population of more than 20 million people), as well as "metropolitan inter-locking region" among the most developed ones. In a separate category they distinguish town agglomeration, formed around Chinese cities of one hierarchical level, usually small, i.e. with a population of up to 500 thousand people. Such agglomerations are not centers of national and international, but regional competitiveness and can arise not only in regions with industrial economies of new technological modes, but also in areas where there are currently processes of intensification of socio-economic connectivity of the city and adjacent rural areas.

Taking into account the existing specifics of spatial development of contemporary Russia, "urban agglomeration" by its nature and role in the national economy has more similarity with large and largest (metropolitan) agglomerations identified in the Spatial Development Strategy of the Russian Federation, and "town agglomeration" — with the rest of the poorly developed/forming agglomerations of the "second" and "third tier", the core of which are smaller cities (for example, 23 promising centers of economic growth).

As applied to the USSR and modern Russia, the leading Russian researcher of agglomeration processes G.M. Lappo (Lappo, 2012) noted that in the regions of the country the processes of agglomeration of cities of different levels of hierarchy can go in the direction both "from the city" and "to the city", but they are necessarily characterized by an increase in the connectivity of intra-agglomeration space; the closed nature of such links allows for the generation and transmission of positive agglomeration effects to the periphery.

Thus, the necessary condition for resilience and transition to more mature stages of agglomerations' development, generation of positive effects for the country is to ensure internal integration of the core and satellite zone. Such integration should occur not only with regard to production, but also in social, infrastructural, environmental and other spheres of agglomeration space (Rastvortseva, 2013; Volchkova et al., 2016; Fang, Yu, 2020).

We should note that science and management practice currently focus on the analysis of socio-economic processes in the largest and large urban agglomerations. In turn, the specifics of the development of "second tier" urban agglomerations (with population of less than 500 thousand people) are studied to a lesser extent. Among the few Russian works on this issue we can note the studies of specialists from the Institute for Urban Economics[3], the Center for Infrastructure Economics (Dmitriev et al., 2018), the Institute of Economics and Industrial Engineering within the Siberian Branch of RAS (Mel'nikova, 2017). Based on the calculations made, the author of the latter work came to the conclusion that currently not all Russian cities generate positive agglomeration effects, which actualizes the task of a deeper study of the problems that limit the development of agglomerations on their basis.

Insufficient research into the specifics of socio-economic processes taking place in the "second tier" urban agglomerations, including in terms of ensuring the co-development of the core and satellite zone, actualizes the scientific and practical significance of our study.

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[3] Economics of Russian Cities and Urban Agglomerations. Issue 5: Russia's largest urban agglomerations in the global economy (2020). Fond "Institut ekonomiki goroda". Available at: https://urbaneconomics.ru/sites/default/files/vypusk_5_rossiiskie_aglomeracii_v_globalnoi_ekonomike.pdf?ysclid=lmyp9veqol204615622 (accessed: February 10, 2024).

The research object is eight "second tier" agglomerations, the cores of which are the cities identified in Russia's Spatial Development Strategy as promising centers of economic growth of the constituent entities of the RF (Vologda, Arkhangelsk, Tambov, Kaluga, Yuzhno-Sakhalinsk, Khanty-Mansiysk, Surgut, Norilsk). We chose these cities taking into account their geographical location in various federal districts and differences in the specialization of their economy.

The aim of the work is to identify the features and problems of agglomeration processes activation in Russian regions, taking into account the provision of positive effects and implementation of priorities of the Spatial Development Strategy of Russia.

The research hypothesis is that weak internal integration is one of the key problems of development of Russian "second tier" urban agglomerations and limits the potential of their transformation into growth points of macro- and regional levels.

The aim and hypothesis of the work required solving a set of the following *tasks*:

1) to substantiate and validate the methodological approach to the study of agglomeration processes[4], taking into account the internal integration of agglomeration space;

2) to identify the specifics of socio-economic processes taking place in Russian "second tier" urban agglomerations;

3) to substantiate the priority directions of increasing the internal integration of urban agglomerations.

Scientific novelty of the presented research lies in identifying the specifics of the agglomeration processes in the "second tier" agglomerations, which will reveal the problems that limit their development as open socio-economic systems and their transformation into growth points of macro- and regional levels.

Materials and methods

The research algorithm includes the realization of a set of interrelated *stages*.

Stage 1. Determining the composition of the studied urban agglomerations.

We determined the composition of urban agglomerations taking into account simultaneous compliance with the following conditions:

a) 1.5-hour transport accessibility of administrative centers of urban and rural settlements of municipal areas to the agglomeration core city (in the case of municipal districts, former settlements of the district transformed into a district are considered)[5]; a municipal area is included in the agglomeration if more than 2/3 of the number of its settlements are within the isochron of 1.5-hour accessibility;

b) presence of references to agglomeration and its composition in socio-economic development strategies and spatial planning documents of the constituent entities of the RF and municipalities, publications of leading Russian scientists and expert organizations;

c) presence of stable socio-cultural and production links between agglomeration territories (Volchkova, Minaev, 2014)[6].

Accordingly, we determined the composition of eight Russian "second tier" urban agglomerations, which are the object of this study *(Tab. 1)*.

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[4] In this paper, we use the phrases "agglomeration processes" and "socio-economic processes occurring in urban agglomerations" as synonyms and reflect the phenomena within the agglomeration space, including along the line "core — satellite zone".

[5] This threshold level of transport accessibility of agglomeration settlements was determined empirically in practice and is called the Goltz constant. The gradual decay of economic activity and decrease in the productivity of economic entities with the distance from the core has been proved quite thoroughly and convincingly in (Dmitriev et al., 2018; Kozlova, Makarova, 2014).

[6] Reports on the activities of local self-government authorities and key business entities collected from SPARK and Contour.Focus resources were studied.

Table 1. Composition of Russian "second tier" urban agglomerations under consideration

Agglomeration	Agglomeration structure
Arkhangelsk	Urban Okrug city of Arkhangelsk, Urban Okrug city of Novodvinsk, Urban Okrug city of Severodvinsk, Primorsky Municipal District
Vologda	Urban Okrug city of Vologda, Vologodsky, Gryazovetsky, Sokolsky municipal districts (since January 1, 2023 these municipal districts became municipal okrugs)
Kaluga	Urban Okrug city of Kaluga, Babyninsky, Dzerzhinsky, Peremyshlsky and Ferzikovsky municipal districts
Norilsk	Urban Okrug city of Norilsk, Taimyrsky Dolgano-Nenets Municipal District
Surgut	Urban Okrug city of Surgut, Urban okrug city of Nefteyugansk, Urban Okrug Pyt-Yakh, Surgut and Nefteyugansk municipal districts
Tambov	Urban Okrug city of Tambov, Urban Okrug city of Kotovsk, Urban Okrug city of Rasskazovo, Tambovsky, Rasskazovsk, Znamensk and Sampur municipal districts
Khanty-Mansiysk	Urban okrug city of Khanty-Mansiysk, Khanty-Mansiysk Municipal District
Yuzho-Sakhalinsk	Urban Okrug city of Yuzhno-Sakhalinsk, Korsakovsky Urban Okrug, Anivsky Urban Okrug, Dolinsky Urban Okrug
Source: own compilation.	

Stage 2. Methodological approach development to assessing agglomeration processes, including the "core–satellite zone" line.

At present, there is no established unified methodological approach to the assessment of agglomeration processes. Most studies (Rigatti, 2009; Tripathi, 2018; Uchida, Nelson, 2010) actively use the calculation of various kinds of coefficients (coefficient of development, Theil index, Gini coefficient, etc.), which characterize the processes of socio-economic activity concentration and, based on this, assess the impact of agglomeration processes on the change in intra- and interregional heterogeneity (Prakash et al., 2017; Pütz, 2016). In the work (Mirgorodskaya, 2017) they were considered and tested in detail on the materials of the Rostov agglomeration. However, these indicators, in our opinion, do not fully allow studying the processes occurring within the agglomeration in terms of assessing its internal cohesion.

Consequently, based on the results of summarizing the existing studies, we note that the key development trends indicating the activation of agglomeration processes in the territory are:

— concentration of population, production, investment, innovation activity (Sarymova, Guseva, 2022; Rastvortseva, 2013), infrastructure facilities (Grinchel, Antonova, 2012);

— reduction of differences between agglomeration municipalities in terms of the main parameters of socio-economic and infrastructural development (Strange, 2009; Tripathi, 2018); and the reduction of such differences is due to ensuring internal integration and co-development of various elements of the socio-economic space of agglomerations (Fang, Yu, 2020; Volchkova et al., 2016);

— a consequence of the integration of intra-agglomeration space is the synchronization of economic growth rates of municipalities included in the agglomeration (Volchkova. Minaev, 2014).

The previous two trends actually indicate that developed agglomerations are highly integrated spatial socio-economic systems, where co-development of the core and satellite territories is ensured.

Agglomeration is considered as a developing socio-economic system in the framework of our proposed methodological approach to the study of the specifics of agglomeration processes. A set of the following interrelated tasks is solved.

2.1. Assessment of agglomeration development as a spatial socio-economic system:

2.1.1. Calculation of the *development coefficient* to assess the level of formation of the agglomeration's settlement system (urban settlements).

According to the classical approach of the Institute of Geography of the Russian Academy of Sciences (Polyan, 2014), the development coefficient is calculated as follows:

$$K_{dev} = P \cdot (M \cdot m + N \cdot n), \qquad (1)$$

where P – population of agglomeration (million people); M – number of cities of agglomeration; N – number of urban-type settlements in agglomeration; m – share of population of cities in the total population of agglomeration; n – share of population of urban-type settlements in the total population of agglomeration.

The class of agglomeration development is determined based on the values of this coefficient: 1) more than 50 – the most developed urban agglomerations; 2) from 10 to 50 – highly developed; 3) from 5 to 10 – developed; 4) from 2.5 to 5 – underdeveloped; 5) from 1 to 2.5 – least developed; 6) less than 1 – potential (or prospective) urban agglomerations.

In addition, the dynamics of a number of other indicators characterizing the agglomeration settlement system and socio-labor relations will be presented (the share of the core in the agglomeration population; indicators of the transport network development; the scale of commuting[7], which is considered in the vast majority of studies as a key indicator of the presence of agglomeration processes (Volchkova et al., 2014; Lola, 2012); at the same time, in accordance with the approach used in OECD, agglomeration includes a city and a commuting zone, i.e. an area with at least 15% of its employed population working in a city (Dijkstra et al., 2019; Reisich, 2020).

2.1.2. Calculation of the *agglomeration economic gravity coefficient*, which makes it possible to assess the potential for economic interaction of territories within the agglomeration, taking into account the

estimated density of economic activity concentrated within these boundaries. This indicator in one or another modification was used in a number of domestic works (Volchkova et al., 2014; Kozlova, Makarova, 2014; Mirgorodskaya, 2017). In our study, the approach presented in (Voroshilov, 2019) and tested on the materials of the European North of Russia was taken as a basis. Unlike existing studies, it calculates the coefficient values on average for the agglomeration, taking into account the adjustment for interregional differences in the price level, which, in our opinion, allows for more objective comparisons between agglomerations, including those of different levels of hierarchy:

$$G_A = \frac{\sum_{j=1}^{n}(G_{cj} \cdot f_j)}{\sum_{j=1}^{n} f_j}, \qquad (2)$$

where G_A – gravity indicator (economic power of interaction) of agglomeration A, million rubles/kilometer; G_{cj} – interaction indicator between the agglomeration core (c) and its constituent municipality (j); f_j – population of the municipal entity (excluding the agglomeration core) included in the agglomeration A; n – number of municipalities (excluding the core) included in the agglomeration.

In turn, the indicator of interaction between the agglomeration core (c) and the municipality (j) included in this agglomeration (G_{cj}) is calculated according to formula 3:

$$G_{cj} = \sqrt{\frac{p_c \cdot p_j}{d_{cj}^2}}, \qquad (3)$$

where G_{cj} – interaction index between the agglomeration core (c) and the municipality (j) included in this agglomeration; p_c – indicator of the importance of the agglomeration core municipality (volume of products shipped, population, etc.); p_j – indicator of significance of the municipality (j) included in the agglomeration (except for the agglomeration core: volume of product shipment, population, etc.); d_{cj} –

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[7] Commuting is understood as daily or several times a week trips of the population from one settlement (place of residence) to another to work and back.

distance between the agglomeration core (*c*) and the administrative center of the municipality (*j*) included in it.

The information base for calculating the coefficient is statistical data on the indicator "Own-produced goods shipped, works and services performed by own forces (without small businesses)" and data on the distance between the core city and the administrative center of the municipal entity included in the agglomeration, determined using the service "Yandex Maps" (https://yandex.ru/maps/).

Along with this, the indicators characterizing the concentration of production, investment, organizations and individual entrepreneurs will be presented both in general for the studied agglomerations and in the projection "core – satellite zone".

The comparison of the studied agglomerations according to these parameters allows assessing their scale of development and their formation as settlement-economic systems.

2.2. Assessment of internal integration of agglomeration space

2.2.1. Comparison of *the rates of change in the indicators of socio-economic development of agglomeration municipalities, including between the core city and satellite territories,* based on the use of the index method. The presence of internal integration of agglomeration and the spread of agglomeration processes to the periphery is evidenced by the level of differences in the growth rates of municipalities, usually not exceeding 15 percentage points (Volchkova, Minaev, 2014). The relationship between agglomeration processes and the growth/reduction of disparities in the development of the core and satellite zone at different stages of agglomeration development is considered in quite detail in the work of A. Puzanov, R. Popov[8].

2.2.2. Assessment of the *degree of synchronization of intra-agglomeration space development processes* related to obtaining the effects of resource sharing, combining the efforts of enterprises, organizations and authorities within the agglomeration. In our work, to assess these processes we use the method of correlation analysis, which allows us to identify the presence over a long period of time of interdependence of key indicators of development of the core city and the satellite zone of the agglomeration, which somehow indicates the presence of socio-economic links between them[9].

We made all calculations in the study on the basis of official statistics presented in the Database of Indicators of Municipal Entities of Rosstat (https://rosstat.gov.ru/dbscripts/munst/), which contains a significant amount of information on key indicators of socio-economic development of all municipalities in Russia; data from the All-Russian Population Census 2020, SPARK system, Contur. Focus; information from official websites of public authorities of the constituent entities of the Russian Federation, etc. Due to the need to comply with the principle of completeness and comparability of information at the municipal level, the main period of the study includes 2010–2022.

Research results

Let us start the study of the specifics of socio-economic processes occurring in Russian "second tier" urban agglomerations with the key indicators of the development of these agglomerations as open socio-economic systems, i.e., systems that can not only attract resources from the external circuit, but also spread external effects to the periphery.

For instance, the results of calculations of the *coefficient of development of the settlement system* indicate that at present only one *Surgut agglomeration (Tab. 2)* belongs to the class of *under-*

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[8] Puzanov A., Popov R. (2017). *Approaches to Assessing the Development of Urban Agglomerations*. Moscow. Available at: http://www.urbaneconomics.ru/sites/default/files/iue_press.pdf (accessed: February 10, 2024).

[9] According to the Chaddock scale, a certain value of the correlation coefficient R modulo corresponds to the degree of closeness of connection between two parameters: 0.1–0.3 – weak connection, 0.3–0.5 – moderate, 0.5–0.7 – noticeable, 0.7–0.9 – strong, 0.9–0.99 – very strong.

Table 2. Dynamics of the coefficient of urban agglomerations development in 2010-2022

Agglomeration name	Coefficient			
	2010	2021	2022	2022 to 2010, %
Arkhangelsk	1.74	1.68	1.46	84.1
Vologda	1.46	1.45	1.46	100.4
Kaluga	0.82	0.83	0.83	101.7
Norilsk	0.40	0.41	0.39	97.1
Surgut	2.36	2.72	2.74	116.0
Tambov	1.10	1.09	1.02	92.8
Khanty-Mansiysk	0.09	0.11	0.11	129.1
South Sakhalin	0.96	1.02	0.94	97.6
Source: own compilation.				

developed agglomerations, and *four agglomerations* (Arkhangelsk, Vologda, Tambov, also conditionally Yuzhno-Sakhalinsk) – to the *least developed*. The other three (Kaluga, Norilsk and Khanty-Mansiysk) can only conditionally be classified as agglomerations according to this criterion. These facts can be explained by the fact that the cores of such agglomerations are relatively small cities in terms of population (from 110 thousand people in Khanty-Mansiysk to 356 thousand people in Kaluga), as well as poorly developed settlement network of their satellite zone (from 0 to 8 urban settlements). However, in 2010–2022, Khanty-Mansiysk, Surgut and Kaluga agglomerations showed an increase in this coefficient (by 29, 16 and 2%, respectively), which indicates some development of their settlement network.

At the same time, the analysis shows that in 2010–2022 the *number of residential population* increased only in four agglomerations (Khanty-Mansiysk agglomerations – by 28.6%, Surgut agglomeration – by 18.1%, Kaluga agglomeration – by 3.2%, Vologda agglomeration – by 0.1%; *Tab. 3*). However, even in the "shrinking" agglomerations the population reduction was noticeably lower than in the corresponding constituent entities of the Russian Federation as a whole. As a result, all of them strengthened their positions as centers of concentration of the population of their constituent entities of the Russian Federation (in 2022, 59% of the region's population lived in

the South Sakhalin agglomeration, 54% in the Arkhangelsk agglomeration, and 50% in the Tambov agglomeration).

Another key trend in the transformation of the settlement system within all the studied agglomerations is the ongoing processes of population concentration in the core: in Khanty-Mansiysk agglomeration 85% of the population already lives here (5 p.p. growth in 2010–2022), in Norilsk agglomeration – 85% (2 p.p. growth), in Surgut agglomeration – 55% (6 p.p. growth), in Arkhangelsk agglomeration – 58% (0.4 p.p. growth). According to P. Polyan, the core weight of 66% is already quite impressive and its further growth may lead to the degradation of the satellite zone of the agglomeration[10] (Polyan, 2014).

These processes lead to the emergence of *imbalances in the development of the core and satellite zone*. In particular, in 2010–2022 the differences in the rate of change in the population of the core city and satellite zone municipalities were maximum in the Tambov agglomeration (104% in the city of Tambov and 72% in Tambov District, which exceeds the conventional 15 p.p., Tab. 3), Sakhalin agglomeration (119% in Anievsk Urban District and 86% in Dolinsk Urban District), Khanty-Mansiysk agglomeration (136% in Khanty-Mansiysk and

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[10] In many developed urban agglomerations of foreign countries, on the contrary, there is a long-term decrease in the population of the centers with constant growth in the satellite zone.

Table 3. Dynamics of residential population of urban agglomerations, thousand people

Agglomeration and municipalities, constituent municipalities	2010	2015	2021	2022	2022 to 2010, %
Vologda Region	1201.2	1187.7	1139.5	1128.8	94.0
Vologda agglomeration	447.4	455.5	443.0	448.1	100.1
UO city of Vologda	310.0	320.6	313.4	318.1	102.6
Vologodsky MD	50.5	52.4	51.8	52.7	104.5
Gryazovetsky MD	35.6	33.1	31.2	32.1	90.0
Sokolsky MD	51.3	49.4	46.6	45.1	88.0
Share of agglomeration*, %	*37.2*	*38.4*	*38.9*	*39.7*	*+2.4 p.p.*
Share of core**, %	*69.3*	*70.4*	*70.7*	*71.0*	*+1.7 p.p.*
Arkhangelsk Region	1182.8	1130.2	1069.8	964.3	81.5
Arkhangelsk agglomeration	615.6	609.1	591.6	521.7	84.7
UO city of Arkhangelsk	355.6	358.3	349.2	303.4	85.3
UO city of Novodvinsk	40.6	38.9	36.8	32.8	80.9
UO city of Severodvinsk	193.1	186.1	180.7	156.7	81.2
Primorsky MD	26.3	25.8	24.9	28.8	109.6
Share of agglomeration, %	*52.0*	*53.9*	*55.3*	*54.1*	*+2.1 p.p.*
Share of core, %	*57.8*	*58.8*	*59.0*	*58.1*	*+0.4 p.p.*
Tambov Region	1089.7	1050.3	981.0	966.3	88.7
Tambov agglomeration	515.5	518.1	502.7	485.4	94.2
UO city of Tambov	280.1	288.4	287.4	291.5	104.0
UO city of Kotovsk	31.8	30.7	28.3	26.3	82.8
UO city of Rasskazovo	45.4	44.2	41.8	47.0	103.5
Tambovsky MD	102.8	103.4	99.8	74.5	72.4
Rasskazovsky MD	22.9	21.8	19.4	20.5	89.2
Znamensky MD	18.3	17.1	14.7	14.0	76.1
Samporsky MD	14.1	12.6	11.2	11.8	83.3
Share of agglomeration, %	*47.3*	*49.3*	*51.2*	*50.2*	*+2.9 p.p.*
Share of core, %	*54.3*	*55.7*	*57.2*	*60.0*	*+5.7 p.p.*
Kaluga Region	1009.2	1009.8	1012.8	1070.9	106.1
Kaluga agglomeration	450.4	461.6	452.9	465.0	103.2
UO city of Kaluga	339.3	358.4	350.7	355.5	104.8
Babynsky MD	21.0	18.7	18.0	20.7	98.6
Dzerzhynsky MD	60.2	53.6	52.6	56.6	94.0
Peremyshlsky MD	14.0	13.7	13.3	14.4	102.3
Ferzikovsky MD	15.8	17.3	18.3	17.8	112.6
Share of agglomeration, %	*44.6*	*45.7*	*44.7*	*43.4*	*-1.2 p.p.*
Share of core, %	*75.3*	*77.6*	*77.4*	*76.5*	*+1.1 p.p.*
Sakhalin Region	496.7	487.3	484.2	460.5	92.7
Yuzhno-Sakhalinsk agglomeration	273.6	284.1	292.3	270.4	98.8
UO city of Yuzhno-Sakhalinsk	188.9	200.7	208.7	187.4	99.2
UO Korsakovsky	41.3	40.2	40.0	39.9	96.6
UO Anivsky	17.6	18.9	19.7	20.9	119.2
UO Dolinsky	25.8	24.3	23.9	22.2	85.9
Share of agglomeration, %	*55.1*	*58.3*	*60.4*	*58.7*	*+3.6 p.p.*
Share of core, %	*69.1*	*70.7*	*71.4*	*69.3*	*+0.2 p.p.*
Khanty-Mansi Autonomous Area – Yugra	1537.1	1626.8	1702.2	1730.4	112.6
Khanty-Mansi agglomeration	100.0	116.6	125.3	128.6	128.6
UO city of Khanty-Mansiysk	80.5	96.9	106.0	109.7	136.2
Khanty-Mansiysky MD	19.4	19.6	19.3	18.9	97.1
Share of agglomeration, %	*6.5*	*7.2*	*7.4*	*7.4*	*+0.9 p.p.*
Share of core, %	*80.6*	*83.2*	*84.6*	*85.3*	*+4.8 p.p.*

End of Table 3

Surgut agglomeration	632.1	682.9	736.0	746.8	118.1
UO city of Surgut	308.5	348.6	395.9	406.9	131.9
UO city of Nefteyugansk	123.3	125.4	128.7	125.0	101.4
UO city of Pyt Yach	41.5	40.9	39.3	40.3	96.9
Surgutsky MD	114.1	123.0	126.9	127.6	111.9
Nefteyugansky MD	44.7	45.0	45.2	47.0	105.1
Share of agglomeration, %	*41.1*	*42.0*	*43.2*	*43.2*	*+2.0 p.p.*
Share of core, %	*48.8*	*51.1*	*53.8*	*54.5*	*+5.7 p.p.*
Krasnoyarsk Territory	2829.1	2866.5	2849.2	2845.5	100.6
Norilsk agglomeration	210.4	211.0	215.9	205.4	97.6
UO city of Norilsk	176.1	178.1	184.6	175.5	99.6
Taimyrsky Dolgano-Nenets MD	34.4	32.9	31.3	29.9	87.0
Share of agglomeration, %	*7.4*	*7.4*	*7.6*	*7.2*	*-0.2 p.p.*
Share of core, %	*83.7*	*84.4*	*85.5*	*85.4*	*+1.8 p.p.*

Note: hereinafter in the tables: UO – urban okrug, MD – municipal district.
* Share of agglomeration in the regional value of the indicator.
** Share of the core city in the value of the indicator for the agglomeration as a whole.
Source: own compilation.

97.1% in Khanty-Mansiysk District). At the same time, agglomerations with a fairly developed satellite zone (except for Tambov), as a rule, do not observe significant differences in the rate of population change in the core and immediately adjacent municipalities. *All this testifies to the prevalence of agglomeration processes actually only on the territory adjacent to the central city and their weak influence on the periphery of the satellite zone.*

Characterizing the demographic processes observed within each agglomeration, we *note certain transformations in the settlement system, including the development of rural settlement network as one of the manifestations of agglomeration processes.* For instance, the analysis of the results of the All-Russian population censuses of 2010 and 2020 allows drawing a conclusion about the growth of the share of rural settlements with more than 10 inhabitants during the intercensal period. In the Vologda agglomeration, it was from 21.5 to 24.5% (by 3.0 p.p.; in the region as a whole it decreased by 2.8 p.p.); in the Tambov agglomeration – from 83.5 to 86.2% (by 2.7 p.p.; in the region as a whole it decreased by 3.7 p.p.); in the Kaluga agglome-ration – from 54.2 to 58.6% (by 4.4 p.p.; in the region as a whole it increased by 2.5 p.p.).

At the same time, the data on the commuting scale on the materials of the Vologda and Tambov agglomerations indicate a noticeable spread of this phenomenon to only one municipal district adjacent to the core city (Vologda and Tambov, 16 and 18% of the employed population of which, respectively, regularly travel to the city for work; *Tab. 4*). In the next largest districts of the commuting share, it is only 6%. At the same time, only one-way direction of this migration is actually recorded: the share of residents of the core cities of agglomeration working in the districts does not exceed 0.3%. All this also indicates a low level of labor and business ties between the municipalities of agglomerations and, in general, the weak development of the core zone of the agglomerations under consideration.

In terms of economic gravity indicator[11], the Surgut agglomeration is the leader (164 billion rubles/km), which is due to the high density of economic activity due to the specialization of this agglomeration in the fuel and energy complex

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[11] When calculating the indicator, the cost data were brought to comparable between the constituent entities of the RF, taking into account their adjustment for the index of deviation from the average Russian level of the cost of a fixed set of goods and services in the corresponding constituent entity of the Russian Federation.

Table 4. Commuting of the Vologda and Tambov agglomerations, % of the total employed population

Territory	Share of the employed population of the Urban Orkug city of Vologda traveling to work daily or several times a week to the agglomeration districts	Share of the employed population of the agglomeration districts who commute daily or several times a week to Urban Okrug city of Vologda for work
Vologodsky MD	0.32	16.47
Gryazovetsky MD	0.10	5.99
Sokolsky MD	0.10	2.43
Territory	Share of the employed population of the Urban Okrug city of Tambov traveling to work daily or several times a week to districts/okrugs of agglomeration	Share of the employed population of the districts/ okrugs of the agglomeration traveling to work daily or several times a week in the Urban Okrug city of Tambov
Tambovsky MD	0.27	18.29
Sampursky MD	0.01	6.00
UO city of Kotovsk	0.10	4.75
Znamensky MD	0.04	4.13
Rasskazovsky MD	0.01	3.10
UO city of Rasskazovo	0.03	1.73
Source: own compilation based on data on the results of the All-Russian population census in 2020 (conducted in October–November 2021), provided by the Territorial Bodies of Rosstat in the Vologda Region and the Tambov Region in the context of municipalities at the request of the authors of this article.		

with very high production volumes. The minimum values of this indicator were recorded in the Norilsk agglomeration (4.2 billion rubles/km), which is explained by significant undeveloped space even within the agglomeration boundaries and the actual presence of only two relatively large settlements within it – Norilsk and Dudinka (which is a port and has a number of branches of PJSC "MMC "Norilsk Nickel"); the Kaluga agglomeration (2.4 billion rubles), where there are no urban settlements other than Kaluga. In this regard, low density of economic activity and significant distances between key population centers, in our opinion, act as key barriers to the development of such agglomerations.

At the same time, all the agglomerations under consideration saw growth in the volume of products shipped per 1 inhabitant in both current and comparable prices in the period under study. The highest values were observed in the Yuzhno-Sakhalinsk agglomeration (3.0 times growth even in comparable prices; this is largely due to the implementation of major projects, opening and expansion of production facilities in the field of mineral extraction in these territories).

There are significant differences in production growth rates between the municipalities of each agglomeration, mainly due to the different structure of the economy, as well as the degree of economic specialization and diversification. In many municipalities of the satellite zone, the values of the indicator of average per capita shipment of goods and services significantly exceed the values in the core city because some of the latter perform mainly the functions of administrative, financial, cultural, transport and logistics center, and large industrial production (including mining) is located in the agglomeration zone. Multidirectional trends are also noted in intra-agglomeration differences by this indicator: in 2015–2022, the differentiation in terms of per capita shipment of products between municipalities of the Vologda (from 2.3 to 4.2 times), Tambov (from 11.4 to 15.0 times), and Yuzhno-Sakhalinsk (from 17.8 to 113.0 times) agglomerations increased; differences in the Kaluga (from 9.0 to 3.2 times) and Norilsk (from 6.1 to 1.3 times) agglomerations decreased; differences in the Khanty-Mansiysk, Surgut and Arkhangelsk agglomerations remained at approximately the same level.

We should say that the agglomerations in question continue to be *centers of concentration not only of human resources, but also of economic activity.* For instance, the Arkhangelsk agglomeration in 2022 accounted for 2/3 of the volume of regional shipment of goods and investment in fixed assets, the Yuzhno-Sakhalinsk agglomeration – 55 and 77% respectively, the Kaluga agglomera-

tion – 42 and 39%, the Norilsk agglomeration – 34 and 50%, the Surgut agglomeration – 48 and 46%, the Tambov agglomeration – 56 and 50% *(Tab. 5)*. However, over the period under consideration, the share of four out of nine agglomerations in the total volume of the region's products shipment decreased, and the share of five agglomerations in the core agglomeration in this indicator decreased.

Table 5. Share of agglomerations in the regional volume of goods shipment and investment in fixed capital, number of organizations and individual entrepreneurs, %

Agglo-meration	Indicator	Goods shipped*			Volume of investments in fixed capital**			Total number of organizations			Number of individual entrepreneurs		
		2010	2022	2022 to 2010, p.p.	2010	2022	2022 to 2010, p.p.	2019	2023	2023 to 2019, p.p.	2019	2023	2023 to 2019, p.p.
Arkhangelsk	Share of agglo-meration***	48.3	65.7	17.4	57.1	66.4	9.3	68.1	67.4	-0.7	58.1	57.5	-0.6
	Core share****	64.4	40.5	-23.9	74.6	67.2	-7.4	75.0	74.8	-0.2	65.9	65.7	-0.2
Vologda	Share of agglomeration	13.2	16.1	2.9	38.6	30.0	-8.6	50.6	52.3	1.7	39.2	43.1	3.9
	Core share	82.5	73.6	-8.9	78.0	69.4	-8.5	88.9	89.2	0.3	74.7	76.7	2.0
Kaluga	Share of agglomeration	61.5	41.9	-19.6	69.3	39.2	-30.0	49.8	49.9	0.1	46.1	46.6	0.5
	Core share	93.5	74.7	-18.8	96.5	85.6	-10.9	87.2	86.9	-0.3	80.5	82.1	1.5
Norilsk	Share of agglomeration	38.3	34.4	-3.9	13.6	49.6	36.0	4.0	4.6	0.6	7.8	8.0	0.2
	Core share	98.6	88.2	-10.4	73.1	66.0	-7.1	79.8	78.7	-1.1	87.9	89.1	1.3
Surgut	Share of agglomeration	52.9	48.3	-4.6	58.4	45.6	-12.8	44.0	42.9	-1.1	43.5	46.2	2.7
	Core share	9.9	29.1	19.2	13.9	7.3	-6.6	69.8	68.7	-1.1	61.7	64.2	2.4
Tambov	Share of agglomeration	71.4	56.5	-14.9	50.5	49.6	-1.0	69.5	69.6	0.1	54.9	56.2	1.4
	Core share	78.6	57.3	-21.3	47.1	67.1	20.1	81.9	82.9	1.0	64.8	69.1	4.2
Khanty-Mansiysk	Share of agglomeration	7.9	10.5	2.6	11.1	21.1	10.0	8.8	9.8	1.0	7.1	7.1	0.0
	Core share	2.4	9.7	7.3	26.4	13.2	-13.2	91.0	91.3	0.2	86.6	89.2	2.6
Yuzhno-Sakhalinsk	Share of agglomeration	-	55.0	-	12.5	76.7	64.3	77.5	76.3	-1.2	67.3	69.8	2.5
	Core share	-	27.2	-	80.5	95.7	15.3	85.4	84.5	-0.9	79.9	80.8	0.9

* Indicator "Own-produced goods shipped, works and services performed by own forces (without small business entities)" (in 2010, it was shipments by types of economic activities in the sphere of industrial production); no calculation was made for the South Sakhalin agglomeration in 2010 due to the lack of information on the majority of municipalities in this region.
** Indicator "Volume of investments in fixed capital, carried out by organizations located in the territory of the municipality (without small businesses)".
*** Share of agglomeration in the value of the indicator for the RF constituent entity as a whole.
**** Share of the agglomeration core city in the value of the indicator for the agglomeration as a whole.
Source: own compilation based on information from the Municipal Indicators Database (https://rosstat.gov.ru/dbscripts/munst/) and information resource SPERK (https://spark-interfax.ru/statistics).

In addition, we noted an increase and maintenance of a high share of agglomerations in the total number of organizations (in 2019−2023, growth in 5 agglomerations out of 8) and the number of individual entrepreneurs (growth in 7 out of 8) of the corresponding constituent entities of the RF. In 2023, the municipalities of the Arkhangelsk agglomeration accounted for 67 and 58% of the total number of organizations and individual entrepreneurs of the region, respectively, in the Yuzhno-Sakhalinsk agglomeration − 76 and 70%, the Tambov agglomeration − 70 and 56%.

The share of agglomeration in the total volume of investment in fixed capital in 2010−2022 decreased in four agglomerations (Vologda, Kaluga, Surgut and Tambov agglomerations), the share of the core in agglomeration decreased in six agglomerations (except for the Tambov and Yuzhno-Sakhalinsk agglomerations). To a large extent, these trends can be attributed to the fact that all constituent entities of the RF have set and are currently facing strategic tasks to diversify the regional economy to prevent excessive concentration of production and investment in urban agglomerations. To a certain extent, these

tasks can be solved. In addition, the reduction in the growth rates of shipments and investments in agglomerations in 2020−2022 could be caused by a stronger impact of the consequences of the introduction of restrictive measures due to the spread of the coronavirus pandemic in 2020−2021 and the economic difficulties associated with the introduction of large-scale sanctions against Russia by Western countries in 2022.

One of the key areas of agglomeration processes is the development of the road transport network, which leads to a reduction in the time costs of the population to move between settlements of the agglomeration and increased accessibility of various institutions and organizations. In 2010−2022, in most of the agglomerations under consideration (except for Arkhangelsk and Norilsk) the share of residents living in settlements not covered by transportation services decreased (from 0.4 to 5.2 p.p.); while the value of this indicator in agglomerations is noticeably lower than in the corresponding constituent entity of the Russian Federation as a whole. Northern agglomerations (Arkhangelsk, Khanty-Mansiysk and Norilsk) are characterized by a rather high share of the

Table 6. Share of population living in settlements with no regular bus/rail connections to the administrative center of a municipal district/okrug, urban okrug, % of the total population

Territory	2010	2015	2021	2022	2022 to 2010 (+/-), p.p.
Vologda Region	**5.7**	**12.6**	**6.5**	**4.7**	**-1.0**
Vologda agglomeration	3.6	2.9	2.1	1.4	-2.3
Arkhangelsk Region (without Nenets Autonomous Area)	**17.8**	**18.1**	**21.1**	**20.7**	**2.9**
Arkhangelsk agglomeration	17.3	17.0	17.2	20.8	3.5
Tambov Region	**3.4**	**0.7**	**0.8**	**0.7**	**-2.6**
Tambov agglomeration	0.5	0.1	0.1	0.1	-0.4
Kaluga Region	**8.4**	**6.4**	**5.1**	**4.8**	**-3.6**
Kaluga agglomeration	5.5	3.7	3.4	3.2	-2.3
Sakhalin Region	**1.5**	**0.2**	**0.3**	**0.3**	**-1.2**
Yuzhno-Sakhalinsk agglomeration	1.3	0.0	0.0	0.0	-1.3
Khanty-Mansi Autonomous Area – Yugra	**44.2**	**42.2**	**40.6**	**39.0**	**-5.1**
Khanty-Mansiysk agglomeration	31.9	32.7	31.0	26.7	-5.2
Surgut agglomeration	3.4	2.5	0.6	0.5	-2.9
Krasnoyarsk Territory	**10.3**	**9.3**	**9.2**	**9.2**	**-1.1**
Norilsk agglomeration	50.0	50.0	50.0	50.0	0.0
Source: own compilation based on information from the Municipal Indicators Database (https://rosstat.gov.ru/dbscripts/munst/).					

population without transport services (21, 27 and 50%, respectively), which is due to the peculiarities of settlement and organization of transport services in the North and the Arctic *(Tab. 6)*.

The results of the analysis of the registers of inter-municipal bus routes for regular transportation of passengers and luggage (available on the official websites of public authorities of the respective constituent entities of the Russian Federation) for the end of 2023 — beginning of 2024 allow concluding that the network of inter-municipal routes is more developed than in the region as a whole within the boundaries of agglomerations (mainly along the line "city-core — large settlements of agglomeration"): the Arkhangelsk agglomeration (15.4% of the total number of all districts/okrugs of the region) accounts for 42.7% of all inter-municipal routes in the region; the Yuzhno-Sakhalinsk agglomeration (22.2% of districts/okrugs) — 40.0% of routes; the Tambov agglomeration (23.3% of districts/okrugs) — 35.7%; Kaluga (19.2% of districts/okrugs) — 33.3%; Vologda (14.3% of districts/okrugs) — 32.1%; Surgut (22.7% of districts/okrugs) — 19.7%; Khanty-Mansiysk (9.1% of districts/okrugs) — 12.5%; Norilsk (3.3% of districts/okrugs) — 1.4% of routes.

The study of dependencies between the values of socio-economic development indicators in the agglomeration core and satellite zone territories in 2010—2022 using correlation analysis allowed drawing the following conclusions:

— *high direct correlation in the population dynamics is observed only in a small number of "core — agglomeration municipality" pairs* (4 out of 25, as a rule, with the municipality close to the core: Vologda and Vologdsky District; Surgut and Surgutsky District; Arkhangelsk and Novodvinsk; Arkhangelsk and Severodvinsk; *Tab. 7*);

— *in terms of the dynamics of the natural population growth rate, a high direct relationship is observed in the vast majority of pairs of munici-palities* (23 out of 25); this is due to the fact that the processes of natural population repro-duction are sustainable in most municipalities of the region; at the same time, agglomerations attract young population, which causes similar reproductive demographic processes in these territories;

— *the dynamics of the coefficient of migration population growth* does not show a noticeable relationship between the municipalities of agglo-merations, since migration processes are influ-enced by many different factors for different municipalities; in addition, this may indicate that the territory of the satellite zone, unlike the core, is not attractive for migration;

— *high close and direct connection of territories by the dynamics of product shipment per 1 inhabitant is observed in less than half of pairs of municipalities* (10 out of 25; all 3 pairs of the Vologda agglomeration, 1 out of 3 pairs of the Arkhangelsk agglomeration, 3 out of 6 pairs of the Tambov agglomeration, 2 out of 3 pairs of the Yuzhno-Sakhalinsk agglomeration, and the only pair of the Norilsk agglomeration), which indicates low production connectivity and the presence of spatial imbalances in the economic development of the agglomeration;

— *in terms of the dynamics of average per capita investment in fixed capital, a high direct relationship is observed only in four pairs of municipalities* (Vologda and Gryazovetsky District, Vologda and Sokolsky District, Khanty-Mansiysk and Khanty-Mansiysky District, Norilsk and Taimyrsky District), which, in our opinion, is due to the weak complementarity of their economies and conjugation of reproduction processes between the agglomeration municipalities;

— *in terms of local budget revenues per inha-bitant, a high direct correlation is observed in the overwhelming majority of pairs* (19 out of 25), which is explained by the presence in the system of

Table 7. Correlation coefficients of indicators of socio-economic development of
the core city and satellite municipalities for the period 2010–2022

Pairs of municipalities of urban agglomerations	RP	C_{ng}	C_{mg}	Shipment	IV	LB revenues	Salary
UO city of Vologda – Vologodsky MD	**0.872**	**0.750**	0.230	**0.931**	0.628	**0.892**	**0.992**
UO city of Vologda – Gryazovetsky MD	-0.487	**0.769**	-0.192	**0.930**	**0.843**	**0.862**	**0.988**
UO city of Vologda – Sokolsky MD	-0.300	**0.876**	-0.170	**0.938**	**0.901**	**0.896**	**0.998**
UO city of Arkhangelsk – UO city of Novodvinsk	**0.882**	**0.962**	-0.180	**0.894**	0.169	**0.906**	**0.998**
UO city of Arkhangelsk – UO city of Severodvinsk	**0.938**	**0.961**	-0.407	0.559	0.424	**0.912**	**0.983**
UO city of Arkhangelsk – Primorsky MD	-0.803	**0.987**	-0.123	0.556	0.353	**0.765**	**0.982**
UO city of Tambov – UO city of Kotovsk	-0.649	**0.959**	0.131	0.586	0.292	**0.742**	**0.990**
UO city of Tambov – UO city of Rasskazovo	-0.413	**0.933**	0.324	**0.798**	0.194	**0.763**	**0.995**
UO city of Tambov – Tambovsky MD	-0.309	**0.948**	0.636	**0.813**	0.002	0.429	**0.997**
UO city of Tambov – Rasskazovsky MD	-0.733	**0.836**	-0.107	0.605	-0.226	**0.891**	**0.994**
UO city of Tambov – Znamensky MD	-0.702	**0.768**	0.325	**0.797**	0.276	0.332	**0.995**
UO city of Tambov – Sampursky MD	-0.839	**0.782**	-0.450	-0.592	0.066	0.666	**0.974**
UO city of Tambov – Babynsky MD	-0.472	**0.769**	-0.584	0.584	0.587	**0.872**	**0.995**
UO city of Kaluga – Dzerzhinsky MD	-0.628	**0.798**	-0.297	0.486	0.340	**0.964**	**0.990**
UO city of Kaluga – Peremyshlsky MD	0.083	0.698	0.245	0.507	0.034	**0.959**	**0.966**
UO city of Kaluga – Ferzikovsky MD	0.549	**0.839**	-0.063	0.438	0.324	-0.100	**0.987**
UO city of Yuzhno-Sakhalinsk – UO Korsakovsky	-0.134	0.687	0.085	**0.759**	0.358	**0.964**	**0.980**
UO city of Yuzhno-Sakhalinsk – UO Anivsky	0.327	0.592	-0.051	**0.783**	0.402	**0.979**	**0.988**
UO city of Yuzhno-Sakhalinsk – UO Dolinsky	-0.146	0.540	-0.565	-0.650	0.275	**0.822**	**0.978**
UO city of Khanty-Mansiysk – Khanty-Mansiysky MD	-0.497	**0.934**	0.100	0.567	**0.734**	0.446	**0.984**
UO city of Surgut – UO city of Nefteyugansk	0.669	**0.952**	0.243	0.534	0.143	**0.709**	**0.984**
UO city of Surgut – UO city of Pyt-Yakh	-0.862	**0.945**	0.065	0.576	0.103	0.513	**0.980**
UO city of Surgut – Surgutsky MD	**0.950**	**0.958**	-0.212	0.442	0.646	**0.836**	**0.997**
UO city of Surgut – Nefteyugansky MD	0.656	**0.863**	0.284	0.503	0.510	**0.725**	**0.992**
UO city of Norilsk – Taimyrsky Dolgano-Nenetsky MD	-0.434	**0.802**	0.404	**0.861**	**0.980**	**0.827**	**0.997**

Designations: RP – resident population at the end of the year; C_{ng} – natural population growth rate; C_{mg} – migration growth rate; Shipment – shipped goods of own production, works and services performed by own forces (without small businesses); IV – investments volume in fixed capital (without small business entities) per 1 inhabitant; LB revenues – local budget revenues per 1 inhabitant; Salary – average monthly salary of employees of organizations (without small businesses).
Source: own compilation.

intergovernmental fiscal relations of the principle of equalization of fiscal capacity of municipalities in the region by transferring subsidies to municipalities from the budget of constituent entities of the RF; at the same time, the lack of correlation for this indicator in 6 pairs is due to the use of different approaches in the regions to the organization of intergovernmental fiscal relations and redistribution of powers between the region and municipalities.

— *in terms of the dynamics of average monthly wages, a high direct correlation is observed in all pairs of agglomeration municipalities,* which is due to the focus of the federal regional and intra-regional policy of the constituent entities of the Russian Federation primarily on reducing the differences between the territories in the level of wages of social (budgetary) sector employees and increasing the value of their wages.

Conclusions

We draw the following summarizing conclusions based on the results of the conducted work.

1. The studied agglomerations of the "second tier" are rather underdeveloped in terms of the presence of an established system of urban settlements in each of them; at the same time, the share of the core city in the total population is further increasing to an extremely high level. All this indicates the growth of centripetal tendencies and strengthening of the position of the central city at the expense of the satellite zone resources, which in the future may act as a factor limiting the development of such agglomerations as integrated socio-economic systems. At the same time, the rural settlement network of agglomerations, unlike the regions where they are based, does not degrade due to active intraregional migration.

2. Another key manifestation of agglomeration processes is the concentration of a significant share of regional production, investment and economic entities in the "second tier" agglomerations; however, these processes often become factors contributing to the growth of intra-agglomeration socio-economic differentiation. At the same time, in recent years, a significant part of the studied agglomerations (especially their cores) have somewhat lost their positions as centers of concentration of regional production and investment.

3. Within the agglomerations under consideration (except for a number of northern ones), a network of inter-municipal bus routes is currently being actively developed, which makes it possible to increase the transport accessibility of residents of satellite zone municipalities to the core city and is a positive factor for further activation of agglomeration processes.

4. Agglomeration processes from the core spread mainly only to the territory closest to it, which is manifested in the presence of a high commuting level only along this line, in the convergence and certain synchronization of their development in terms of key socio-economic indicators. The other municipalities either do not experience agglomeration processes due to weak integration with the core or have to put up with the negative effects associated with the "pumping out" of resources by the central city.

5. The shrinking differences between agglomeration municipalities in key social and a number of other indicators (average monthly wages, volume of local budget revenues per inhabitant) are primarily related to the equalizing priorities of federal and regional policy, rather than due to market integration and positive effects spreading to the periphery from the core.

6. Paradoxically, among the "second tier" agglomerations in Russia, it is a number of northern and arctic agglomerations (e.g. Surgut, Khanty-Mansiysk) that have greater potential for development due to the relatively high development of their satellite zone, the location of large industrial production facilities with effective specialization complementary to the economy of their core; at the same time, these agglomerations are embedded in national and global value chains.

Thus, we have proved the hypothesis that weak internal integration is one of the key problems in the development of Russian "second tier" urban agglomerations and limits the potential of their transformation into macro- and regional-level growth points.

In such a situation, we suppose that it is important to implement a set of the following priorities aimed at ensuring the internal integration of agglomerations space:

– development of unified documents on strategic socio-economic (strategy, program, master plan) and territorial planning, integrated zoning of the agglomeration territory, taking into account the interests of all participating municipalities, business structures and population;

— initiation and implementation of joint intra-agglomeration projects in the field of economy and infrastructure development (including in the format of public-private partnership), which helps to integrate all municipalities of the agglomeration into the system of its territorial division of labor;

— promoting the formation of territorial clusters, industrial parks for the emergence of innovative activities with significant positive effects not only for agglomeration stakeholders, but also for the entire region;

— promoting the formation of a single agglomeration market (labor, housing) by unifying legislation and eliminating administrative barriers.

The contribution of this study to the development of science is seen in the development of methodological approaches and tools for assessing agglomeration processes, identifying their specifics in Russian agglomerations of the "second tier"; the practical significance is that the results can be used in the practice of management at the regional and municipal levels in the process of agglomeration construction.

We see the prospects for the development of the study in the working out and testing of methodological tools for assessing agglomeration effects (at the meso- and micro-levels) on the materials of these agglomerations; their presence is a fact indicating that the current processes of concentration of human, industrial and other resources in a limited number of centers are really agglomeration, not enclavization (compression) of the developed space, and these centers have the potential to generate positive socio-economic effects for the entire region.

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