

OPTIMIZING THE SPATIAL ORGANIZATION OF THE RUSSIAN ECONOMY

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Abstract

The spatial organization of Russian economic activity does not meet modern challenges: the territorial structure of production is not able to meet current needs. The article aims to determine the directions of optimizing the spatial organization of the Russian economy. The first part of the paper describes the methodology for assessing the spatial factors of economic development. The study involves measuring the saturation of space with objects (the density and weight of individual ranges), the uniformity of the distribution of objects in space (decile coefficient, the Gini coefficient), the connectedness of the individual components of space (spatial autocorrelation coefficients). The second part of the article contains an assessment of the spatial transformations of the Russian socio-economic complex. This part of the paper also provides an analysis of the spatial specificity for three Russian regions (Chelyabinsk Oblast, Ulyanovsk Oblast, and Krasnodar Krai). The trends in the transformation of the economic space of Russia at present are its centralization, narrowing, and fragmentation. The third part of the article provides guidelines for transforming the spatial structure of the Russian economy. The spatial framework of economic growth should be a hierarchically organized system of multiscale centers of development.

Keywords: spatial organization, optimization processes, economic development, Russian Federation

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Introduction

Economic activity, which is implemented on the territory, is highly dependent on the characteristics of its economic space. Spatial factors (the specifics of localization of resources and economic entities in space, the features of their movement; regional policy directions, including mechanisms and tools for the development of growth points; development vectors of local areas, their economic specialization, position in large-scale economic systems)

directly affect the possibility of developing an economic complex at any level. That is why the study of the spatial parameters of the transformation of the economy traditionally occupies an important place in the system of scientific research.

The issues of space exploration were raised by economists (A. Smith, D. Ricardo) long before the advent of the science of economic space, but the authors did not pay attention to the issues of space transformation, limiting themselves to studying the influence of the distribution of resources across the territory on its economic activity. At the beginning of the twentieth century, the interest in the economic space increased, however, the main theme of the work (I. Thunen, W. Launhardt, etc.) was the optimization of the localization of individual business entities. Over time, the focus of research shifted from finding solutions to micro-level problems to problems of optimizing the entire spatial organization of the economy (A. Losch, W. Isard) and identifying the mechanisms of this process (F. Perroux, H. Giersch, M. Porter, etc.). In modern research, all aspects of the spatial transformation of the economy are developed: optimization of the location of business structures (Cisse et al., 2020) and spatial organization of the economy of large territorial complexes associated with multidirectional but relevant in today's conditions integration (Cutrini, 2019) and disintegration (Schnabl & Muller, 2019) processes.

For Russia, which is characterized by a significant area and a high degree of diversity of economic conditions in various regions, issues of a reasonable spatial organization of the economy are of particular importance. The fact that the economic space of the country, whose features were largely shaped by the realities of the Soviet era, did not fully adapt to the specifics of the modern economy is a serious problem. Moreover, the current spatial transformations often only exacerbate the situation: they are not coordinated with each other and only strengthen further defragmentation of the country's economic framework. In this regard, the role of research focused on the search for directions of the transformation of the existing spatial organization of economic activity is growing: it is necessary to increase its connectivity, reduce its disintegration and change its characteristics by modern challenges.

1 The methodology for assessing the spatial factors of economic development

Before trying to determine possible ways to optimize the spatial organization of the economy of a territorial system, it is necessary to analyze its current state and evaluate the existing spatial factors of economic development. The basis of such an analysis may be the

characteristic of individual properties of the economic space (also, each of the considered properties can be estimated using a set of specific parameters).

The composition of the list of properties of the economic space is ambiguous. A. Granberg (2000) called density (calculated by estimating the population, the volume of natural resources, fixed capital per unit area), connectedness (the intensity of economic ties between the elements of space), the distance between the elements of the economic space (measured by transport and transaction costs to cover the physical distance). A. Khakimov (2017) in the study of the factors of spatial inequality of regions considered the following factors: density (features of population concentration and the presence of agglomeration effects), distance (economic distance due to underdeveloped infrastructure, remoteness from potential markets, transportation costs), borders (institutional barriers, national, regional, local borders that impede the penetration of goods and services). Specialists in the field of regional economics in their work often consider parameters like density, connectivity, and location: indicators of uniformity, differentiation, concentration, distribution of the population, and economic activity (Avramchikova & Chuvashova, 2015). Summarizing the indicated approaches, we attribute to the number of key characteristics of space its saturation with objects, the uniformity of their distribution, and the connectedness of the individual components of space.

Indicators of the degree of **saturation of space** (the presence on the territory of economic entities, elements of infrastructure, resources) can be density indicators, determined by the ratio of the number of objects under consideration per unit area, also indicators of the weight (significance) of individual areas (zones) of space.

The uniformity of the distribution of objects can be measured using coefficients that allow us to characterize the differentiation of the development of space elements (for example, decile coefficient, the Gini coefficient). The decile coefficient shows the relationship between the number of objects localized in space 10% of the most affluent territorial groups and 10% of the least affluent territories. The Gini coefficient allows to determine the degree of deviation of the actually existing distribution of objects in space from their theoretically possible uniform distribution (Litvinov, 1999, p. 229; Furman et al., 2019):

$$G = 1 - 2 \sum_{i=1}^n x_i \text{cum} y_i + \sum_{i=1}^n x_i y_i, \quad (1)$$

where **G** is the Gini coefficient, **n** is the number of territories, **x_i** is the share of the i-th territory, **y_i** is the share of the total resources falling in the i-th territory, **cumy_i** is the

accumulated share of the total resources falling in the i -th territory (territories are arranged in order of increasing number of objects belonging to them).

The connectedness of the individual components of space with each other can be estimated using the spatial autocorrelation coefficients, which is a measure of the extent to which objects located close to each other tend to have similar values for the considered indicator (Grigoriev, 2018). One of the most common parameters for assessing spatial autocorrelation is the Moran's index (Moran, 1948), which allows one to assess the extent of the influence of territories on each other (Zhan et al., 2018; Malkowska et al., 2018). The index is calculated based on a synthesis of data on the relative position of individual territorial units (for example, regions or cities) and the values of the analyzed parameter for each of them:

$$I = \frac{n \sum_{i=1}^n \sum_{j=1}^n w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{S_0 \sum_{i=1}^n (x_i - \bar{x})^2}, \quad (2)$$

where I is the global Moran's index, \mathbf{x} is the indicator under consideration, \mathbf{S}_0 is the set of all spatial weights ($S_0 = \sum_{i=1}^n \sum_{j=1}^n w_{ij}$), \mathbf{n} is the number of analyzed territories.

The interpretation of the index value can be carried out by comparing it with the mathematical expectation:

$$E(I) = \frac{-1}{n-1}, \quad (3)$$

where $E(I)$ is the mathematical expectation of the index, \mathbf{n} is the number of analyzed territories.

If the value of the Moran's index exceeds the mathematical expectation, a positive spatial autocorrelation is observed (the observation values for neighboring territories are close to each other). If the mathematical expectation is greater than the value of the Moran's index, we can conclude that there is a negative spatial autocorrelation (the values of the considered indicator of territories located near each other differ). If the Moran's index coincides with the mathematical expectation, spatial autocorrelation is absent (Balash, 2018).

2 Features of the spatial organization of the Russian economy

Russia ranks first in the world in terms of area, has a huge variety of resources, and it seems that its space is saturated with economic objects. But if we pay attention only to the absolute values, it is impossible to see the problems that are characteristic of the modern spatial organization of the country: it is necessary to determine the ratio of the elements of the spatial

complex to each other, and such an analysis must be carried out both at the local level (for example, by comparing the urban and rural development parameters territories), and at the scale of regions, macroregions. To identify the features of spatial transformations of the country's socio-economic complex, it makes sense to pay special attention to the specifics of placing in space one of the key resources of economic development - human resources. The distribution over the territory of the population determines the parameters of the localization of labor resources, as well as the final consumers of manufactured products, thereby determining the specifics of the distribution of economic activity.

The parameters of the density of residents throughout the country are very different: 75% of the population lives in the European part (occupies 25% of the area). This historically caused uneven distribution of human resources has only intensified over the past few decades: some eastern territories have lost about 20% of their population over the last 60 years. Another current trend in the movement of human resources in space is the contraction of the population in cities. Although the share of citizens in the population structure has not changed over the past two decades, there has been a rapid increase in the largest settlements. If in 1989 19.6% of the Russian population lived in the 15 largest cities of the country, then by 2019 this figure has become equal to 23%. At the same time, small municipalities lose their resources for further development and the ability to maintain economic activity; they cannot effectively participate in economic activity and drop out of the country's economic system (if in 2009 there were 24.2 thousand municipalities in Russia, by 2019 there would be only 21.9 thousand). Changes in the values of the differentiation indicators of the transformation of individual spatial elements are also clear evidence of the preservation (and some strengthening) of the uneven development of the economic space (Tab. 1).

Tab. 1: Statistical assessment of differentiation of regional development (Russian case)

	2000	2010	2018
Decile coefficient			
Population	23.47	24.94	24.67
Gross regional product	90.24	78.46	88.00
Gini coefficient			
Population	0.414	0.438	0.448
Gross regional product	0.607	0.615	0.625

Source: generated by the author according to Federal State Statistic Service (<https://www.gks.ru/>)

Estimation of the spatial autocorrelation (based on the analysis of population data in Russian regions) indicates that there is a direct correlation between the values of this indicator

in most territories located close to each other (the value of the Moran's index (0.02) exceeds its mathematical expectation). This means that the change in the value of the considered indicator during the transition from region to region occurs quite smoothly. However, there are two "leaders" (Moscow and Moscow oblast) that are not only characterized by high population size but also have a significant impact on the regions surrounding them (interconnections are reversed - building the potential of Moscow and Moscow oblast does not lead to an increase in the resources of neighboring territories). Spatial autocorrelation of regions by such an indicator as the gross regional product is negative (the value of the Moran index (-0.001) is less than its mathematical expectation) - the difference between the volumes of GRP of neighboring territories is quite significant: the proximity of regions to territories with high production volumes does not lead to an increase in their own economic activity.

Similar patterns are typical for the regional level (Tab. 2). An analysis of the spatial specifics of the economic development for three different Russian regions was made: Chelyabinsk oblast (the old industrial region), Ulyanovsk oblast (an important agricultural region of Russia with developed industry) and Krasnodar Krai (tourist region, which occupies an important place in the transport and logistics system of the country).

Tab. 2: The spatial specificity of three Russian regions (2019 year)

	Chelyabinsk oblast	Ulyanovsk oblast	Krasnodar Krai
Territory area, thousand km ²	88.5	36.8	75.5
Number of municipalities (enlarged)	43	24	44
Population density, people / km ²	39.21	33.54	75
Shipped products, thousand rub. (per 1 km ²)	203.08	110.34	268.86
Population concentration	46% of residents live in 2 municipalities	53% of residents live in 1 municipality	33% of residents live in 3 municipalities
Concentration of economic activity	72% of production is made in 2 municipalities	68% of production is made in 1 municipality	42% of production is made in 2 municipalities
Decile coefficient (Population)	36.20	39.81	14.82
Decile coefficient (Production)	930.09	664.06	101.03
Gini coefficient (Population)	0.61	0.63	0.42
Gini coefficient (Production)	0.82	0.85	0.66
Moran's index (Population)	-0.005	-0.070	-0.009
Spatial autocorrelation (Population)	positive	negative	positive
Moran's index (Production)	-0.024	-0.056	0.008
Spatial autocorrelation (Production)	absent	negative	positive

Source: generated by the author according to Federal State Statistic Service (<https://www.gks.ru/>)

The highest values of the saturation parameters of the economic space, the uniformity of its development, and the connectedness of its elements are characteristic of Krasnodar Krai, which has several centers for the economic development of the region (port, tourist, industrial zones). The economic space of Chelyabinsk oblast is less uniform: the main contribution to its development is provided by two large metallurgical centers - Chelyabinsk and Magnitogorsk. The space of Ulyanovsk oblast is the most polarized - economic activity is concentrated in the administrative center (Ulyanovsk), which negatively affects the connectedness of individual parts of space with each other.

We can conclude that the economic space of Russia cannot be called uniform: it is fragmented, there is a high level of differentiation of its areas, its level of centralization is growing, and the spatial framework of the country's economy is collapsing.

3 The transformation of the spatial organization of the Russian economy

Ineffective spatial organization of the economy and further deterioration of the situation contribute to the search for ways to reorganize the economic space of Russia. The emergence in 2019 of a new strategic document (The spatial development strategy of the Russian Federation for the period until 2025) was one of the expected steps on the way to managing optimization processes spatial organization of both economic activity and social transformations. Its main task is to show the best way of spatial transformations of the country, and the document focuses on the development of perspective centers of economic growth and their dispersal throughout the country. This approach can be very effective at the macro level: the emergence and development of large-scale growth poles (for example, agglomerations) can contribute to the development of the entire national economy.

However, the formation of a network of growth points only at the macro level will lead to further destruction of the regional economic framework. As the calculations showed, the territories of the local level (municipalities) are even more divided than the regions, and the regional economic space is characterized by the same problems as the economic space of the whole country. The appearance of a large-scale growth point in the region is most likely to lead to the fact that the less developed territories surrounding it will lose their resources, and inter-territorial differentiation will only increase (this will entail a weakening of the connectedness of the space). Consequently, the centers of economic development must be of different scales, and a system of local growth points must be formed in the regions. It is

important to ensure the interaction between development centers, their transformation into a comprehensive economic system.

Thus, the process of transforming the spatial structure of a country's economy should include several successive steps. Firstly, a detailed analysis of the situation in each region, the determination of the characteristics of the organization of the economic space are necessary. This will allow not only to recognize the existing problems of spatial development but also to identify the directions of the required transformations (consistent with the guidelines of macroeconomic transformations). Secondly, identification of areas that can become local growth points is required - unlike large high-performance economic complexes (macro-level growth centers), their potential may not be obvious. It is necessary to take into account their economic potential, location, prospects for the formation of clusters, industrial parks, and other forms of territorial development within their borders. Thirdly, it is important to develop and implement a competent economic policy based on the consideration of the different values of the elements of space and involving special support measures for strategically significant areas.

Conclusion

The study showed that the main trends in the spatial transformation of the Russian economy are the centralization of the economic space, its narrowing (accompanied by partial destruction of the spatial framework), and fragmentation, which manifests itself in significant imbalances in the development of territories. Similar processes are also characteristic of the development of the economic space of the Russian regions (and in some of them the scales of spatial disunity are even more significant).

The optimization of the country's spatial organization should not focus only on transformations of a national scale: changes in the regional space deserve special attention. The system of centers of economic growth should be multilevel, hierarchically organized, and the policy pursued should be based on the application of a different approach to the development of various elements of the economic space.

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