Influence of structural aspects of demography and employment on labor productivity: intraregional analysis

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Влияние структурных аспектов демографии и занятости на производительность труда: внутрирегиональный анализ

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Аннотация: Статья посвящена оценке влияния демографической структуры населения муниципальных образований на производительность труда в экономике Калужской области. Концентрация населения и экономической деятельности в отдельных муниципальных образованиях региона порождает дисбалансы пространственного развития. В данном контексте представляется актуальной оценка влияния демографической структуры и занятости на уровень производительности труда в муниципальных экономиках. Оценка этих условий дает возможность обоснования приоритетов политики пространственного развития региона, обеспечивающей баланс выравнивания и стимулирования.

Целью исследования является анализ влияния структуры демографии и занятости на производительность труда. Методическую основу исследования составили методы кластерного и структурного («сдвиг – доля») анализа. Проведенный анализ позволил выделить группы муниципальных образований региона, дифференцированных по демографическим показателям, представить оценку влияния структуры демографии и занятости на производительность труда внутри групп.

Показано, что рост производительности труда в выделенных группах муниципальных образований имеет специфику.

Обосновано, что «центрально-периферийная» модель развития региона имеет очевидные преимущества и недостатки. Периферийные территории испытывают дефицит социального капитала, что требует балансирования стимулирующей и выравнивающей политики регионального развития. Снижение отрицательных эффектов модели может быть обеспечено мерами сглаживающей политики региона, связанной с ростом доходов занятых в бюджетном секторе, диверсификацией экономики.

Ключевые слова: демографическая структура, структурные сдвиги, производительность труда, центрально-периферийная модель, Калужская область

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INFLUENCE OF STRUCTURAL ASPECTS OF DEMOGRAPHY AND EMPLOYMENT ON LABOR PRODUCTIVITY: INTRAREGIONAL ANALYSIS

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Abstract: The article is devoted to assessing the impact of the demographic structure of municipalities' population on labor productivity in the economic sphere of the Kaluga region. The concentration of population and economic activity in some municipalities of the region causes an imbalance in development across the region. In this context, the assessment of the impact of demographic structure and employment on the level of labor productivity in municipal economies becomes relevant. The assessment of these conditions makes it possible to substantiate the priorities of the region spatial development policy, which ensures a balance of equalization and stimulation.

This study aims to analyze the influence of the structure of demography and employment on labor productivity. The methodological basis of the research was formed by the methods of a cluster and structural ("shift – share") analysis. The analysis made it possible to identify groups of municipalities in the region with different demographic indicators and to provide an assessment of the impact of the structure of demography and employment on labor productivity within these groups.

We can see that the growth of labor productivity in these groups of municipalities is specific.

It can be assumed that the "central-peripheral" model of the region's development has both definite advantages and disadvantages. Peripheral territories are experiencing a deficit of human resources, and this requires finding a balance between stimulating and equalizing policies of the regions' development. This model can be improved through the specific policy of the region associated with increasing income for workers engaged in the public sector and diversifying the economy.

Keywords: demographic structure, structural changes, labor productivity, central-peripheral model, Kaluga region

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Introduction

Decree of the President of the Russian Federation on May 7, 2018, No. 204 "On national goals and strategic objectives for the development of the Russian Federation for the period until 2024"[1] sets the goals for scientific, technological, and socio-economic development of Russia up to 2024. The main directions of the socio-economic development of the Russian Federation are: ensuring sustainable natural growth of the population, increasing actual income of citizens, ensuring economic growth and increasing labor productivity, supporting employment.

In the situation of demographic restrictions, in which many Russian regions find themselves, the problem of ensuring economic growth is clearly visible. Low fertility and an increase in life expectancy have led to an aging population and a decrease in the proportion of the working-age population, which, in turn, poses the task for ensuring economic growth through increasing labor productivity.

For a long time, it was believed that economic growth is due to the improvement of the core components of the economy, such as capital or labor force. It was argued that for the economy to grow, it is required either to expand the labor market or to increase capital intensity. In 1957, the American economist Robert Solow demonstrated that economic growth largely depends not on an increase in capital and labor force but productivity growth – an increase in output per unit of input costs [Solow, 1957, P. 312].

In Paul Krugman's studies, development resources are divided into factors of the first and second orders. The factors of the first order include natural resources and population concentration, and as for the factors of the second order, they include the activities of the state, state policy and the policy of local authorities that ensure the status of the business environment, the possibility of mobilization and the effectiveness of factors of the first order [Krugman, 1991].

Looking at the importance of the combination of production factors – labor and capital, providing productivity in the economy, P. Krugman refers to the issues of economic efficiency. "Redistributive efficiency", the movement of labor and capital resources between territories in search of higher efficiency, becomes more important. At the same time, factors of the second order acquire the highest significance since they increase the competition between territories for efficient sources of growth.

Local governments want to ensure a high level of business activity, investment growth, and social development; therefore, they began to perform an expansive policy aimed at attracting the highest quality labor resources that should meet the needs of promising businesses. This predetermined the "central-peripheral" model of spatial development described in the works of J. Friedmann [Friedmann, 1966]. It turns out that by concentrating development resources on some territories of the region, the growth potential of others is limited. "Redistributive efficiency" means that the processes of socio-economic development of territories (municipalities) within the region are most influenced not by the available resources (factors of the first order), but by the policy of regional and municipal authorities, which determines the efficiency of using these resources (factors of the second order). Now we can note that the territories within one region demonstrate different possibilities for ensuring economic growth, increasing labor productivity, and the level of employment. The study of these processes makes it possible to formulate a regional policy aimed at ensuring a rational system of population resettlement and meeting the future needs of the territories in labor resources.

Research hypothesis. The formation of a "central-peripheral" redistribution system contributes to the concentration of labor resources in regional centers and outflow from other places. Intraregional economic centers have a more favorable demographic structure, as well as opportunities to increase labor productivity by attracting labor resources from other territories.

Methods and data. Labor productivity is one of the fundamental indicators characterizing the development of economic systems at various levels. Modern scientists thoroughly study issues of labor productivity [Rossiyskaya..., 2019; Akindinova, 2019]. The issues of the level of intercountry labor productivity are also being studied [Masich, 2017]. Scientists research socio-economic development and labor productivity in the constituent entities of the Russian Federation [Mikheeva, 2015; Balatsky, 2019]. However, the intraregional aspect is not widely represented in the studies. The influence of intraregional migration of the population on the level of labor productivity in the municipal economy is also insufficiently studied.

In a post-industrial society, people and human capital are the principal development resource. The mobile part of the population, being important carriers of labor competencies, easily moves through the territories to those places that provide more comfortable conditions for life. This leads to the concentration of inhabitants and competencies in some territories and their outflow from others. Thus, in some territories, there is a shortage of labor resources, stagnation of industries and business activities, and indicators of socio-economic development decrease. In this regard, studying the impact of structural-demographic changes on the economic development of municipalities should begin with a detailed classification of municipalities according to indicators characterizing the demographic structure and its impact on economic development.

1 Decree of the President of the Russian Federation of 05.07.2018 N 204 (as amended on 07.19.2018) "On national goals and strategic objectives for the development of the Russian Federation for the period until 2024". URL: http://www.consultant.ru/document/cons_doc_LAW_297432/

Modern studies of structural changes in the regional economy are based on the "shift-share" analysis, but the possibilities for its application to the analysis of structural changes at the level of municipalities are significantly limited by the indicators of municipal statistics. As Mikheeva N. N. notes, "in reality, the choice of factors that determine the quantitative measure of their influence on regional dynamics are limited by the available statistical base, the number of statistical indicators included in the analysis and their set is determined not only by the substantive premises of the study but also by the presence of the initial information" [Mikheeva, 2013, P. 12].

The research methodology involves two stages. At the first stage, a multivariate classification of municipalities is carried out; the result is the formation of groups of municipalities with similar demographic indicators. The second stage includes a structural analysis of the influence of the territories' demographic characteristics on labor productivity in municipal economies.

Stage 1. To carry out a multivariate classification of municipalities, scientists use methods of cluster analysis by demographic indicators [Mirkin, 2011]. Within the framework of cluster analysis, a grouping of urban and municipal districts (hereinafter – municipalities) was carried out according to the following indicators:

- var 1 – population size of the municipality, people;
- var 2 – the share of the population under working-age, %;
- var 3 – the share of the population of working-age, %;
- var 4 – coefficient of natural increase, ‰;
- var 5 – coefficient of migration growth, ‰;
- var 6 – population density, people / sq. km.

Multivariate classification was performed using "Statistika 13" program. Using the method of hierarchical cluster analysis, scientists distinguish groups of municipalities (clusters), characterized by the similarity of indicators of demographic development. The multivariate classification was carried out in 26 municipalities of the Kaluga region: 2 urban districts and 24 municipal districts. Based on the presented variables (var 1 – var 6), characterizing the demographic situation for the municipalities of the Kaluga region, a matrix of 6 features was obtained, and then it was transformed into a matrix of distances between observations. Each municipality is represented by a vector in a 6-dimensional space of factors and is characterized by quantitative indicators – points of space. Comparison of the distances between these points demonstrates the degree of proximity of the studied municipalities, their similarity in terms of the proposed features. The smaller the distance between the indicators, the more similar the territories are. Thus, the formation of a cluster is performed through the comparison of the most similar features of municipalities.

The multivariate classification was carried out according to Ward's method, where the criterion for combining is the minimum increment of the intragroup sum-of-squares of deviations, which allows to form typical object groups approximately of the same size. Manhattan distance (the distance of city blocks) is taken as a metric (distance function). Unlike the Euclidean metric, the Manhattan distance decreases the effect of individual large differences between the variables of the same name. The advantage of this metric is especially relevant when analyzing the indicators of municipalities in the Kaluga region, which have a significant difference in the analyzed aspects of development.

The generalized results of clustering can be represented in the form of a similarity tree – a dendrogram, reflecting the relative proximity of all 26 municipalities that took part in the analysis. A dendrogram can be defined as a graphical representation of the results of the sequential clustering process, which was carried out in terms of a distance matrix. According to the number of objects, this tree has 26 levels. The first (lower) level contains points corresponding to each municipality. The connection of these two points on the second level shows the pair of the closest municipalities. At the third level, the following pair of similar points is noted. This is done upwards to the last level, at which all the studied municipalities act as a single set. The results were drawn on the map of the Kaluga region; therefore, to represent graphically the concentration of residents and labor resources in the municipalities of the region.

Stage 2. In economic theory, the indicator of labor productivity refers to microeconomic analysis. To analyze macroeconomic systems, we use the indicator of the social productivity of labor, which is determined by the value of the gross product per employee [Zolotov, 2002; Didyk, 2008]. Since Rosstat does not form indicators of the gross municipal product in the system of indicators of municipal statistics, the author assessed the indicator of the conditional gross municipal product of municipalities in the Kaluga region. The methodology for calculating the conditional gross municipal product by the resulting method, taking into account the available composition of indicators of municipal statistics, was described in the works of Kolechkov and Baburin [Kolechkov, 2012, P. 50; Baburin, 2015, P. 9]. But this method also has limitations connected with the presence of a repeated score, based on the information of the "Indicators of municipalities" Database; the conditional gross municipal product is calculated by the formula (1):

$$\boldsymbol{GMP = IP + AP + PS + RT,} \quad (1)$$

where GMP – the conditional gross municipal product;
IP – the number of delivered products, works and services performed by the municipality itself;
AP – the volume of agricultural products;
PS – the volume of paid services to the population;
RT – retail and catering turnover;

Mironov V. V. and Konovalova L. D. note that an increase in the social labor productivity can be ensured by a direct increase in the productivity of actors within the sectors of the economy and through the redistribution of labor resources from sectors with low productivity to

more productive sectors [Mironov, 2019, P. 54]. An increase in the productivity of actors within a particular sector of the economy provides an "effect within", and an increase in productivity due to redistribution – an "effect between" [Solow, 1987]. Such logic of structural analysis is used for the cross-sectoral analysis of labor redistribution, but Balatsky E. V. and Ekimova N. A. applied it to study the processes of intraregional redistribution [Balatsky, 2019]. Using this approach, we applied an algorithm for structural analysis of labor productivity in the municipalities of the Kaluga region. At the regional level, the indicator of the social productivity of labor can be represented by the aggregate of the social labor productivity of its constituent municipalities:

$$P = \sum_{j=1}^{N} P_j D_j, \quad (2)$$

where P is the indicator of the social productivity of labor in the t period;
P_j – the indicator of social labor productivity of the j-th municipality in the t period;
D_j – the share of the employed in the j-th municipality in the total number of employed in the t period;
N – the number of municipalities in the region.

The dynamic expansion of formula (1) has the form:

$$P = \sum_{j=1}^{N} \Delta P_j D_j + \sum_{j=1}^{N} P_j \Delta D_j + \sum_{j=1}^{N} \Delta P_j \Delta D_j. \quad (3)$$

The growth rate of the social productivity of labor in the region is determined by, and the growth rate of social labor productivity of the j-th municipal formation is. The growth rate of the share of the employed in the j-th municipality is determined by . The relative social productivity of labor of the j-th municipal formation: $G_j = P_j / P$.

Through the obtained notation, equation (3) can be shown as:

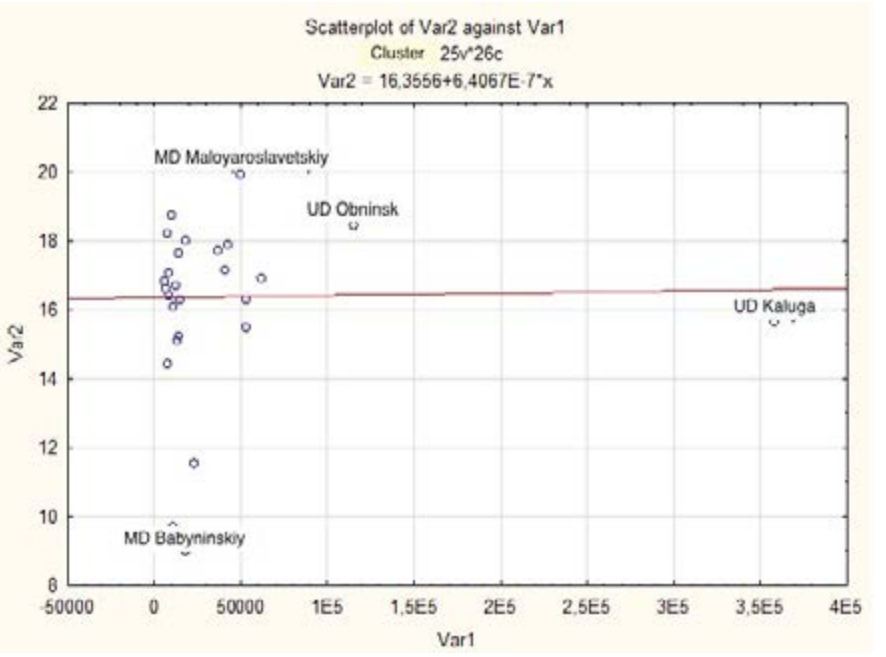
$$P^* = \sum_{j=1}^{N} P_j^* G_j D_j + \sum_{j=1}^{N} D_j^* G_j D_j + \sum_{j=1}^{N} P_j^* D_j^* G_j D_j. \quad (4)$$

The first summand in equation (3) reflects the impact on the social productivity of labor on changes within the municipal economy ("effect within"), the second summand reflects the impact on labor productivity on the processes of redistribution of labor resources between municipalities in the region ("effect between"), and the third summand – mutual action of these effects ("emergence effect").Taking into account the influence of the effects, Balatsky E. V., Ekimova N. A. presented equation (4) in the form of a structural balance:

$$100\% = \sum_{j=1}^{N} (P_j^*/P^*) G_j D_j + \sum_{j=1}^{N} (D_j^*/P^*) G_j D_j +$$

$$+ \sum_{j=1}^{N} (P_j^* D_j^*/P^*) G_j D_j. \quad (5)$$

Figure 1. Diagram of the scattering of municipalities by the variables "Population of municipalities" (var 1) and "Share of the population under working-age" (var 2)



As a result of Stage 1 of the analysis, an assessment can be made of the existing settlement system in the region and the concentration of the population in the formed agglomerations. At Stage 2, a structural analysis of labor productivity in municipal economies carried out, taking into account the redistribution of labor resources between the territories of the region ("effect between") and their own growth potential ("effect within").

Discussion. At Stage 1, having demographic indicators of municipalities of the Kaluga region in 2018 (var 1 – var 5), a scatter diagram was built, reflecting the proximity of municipalities by individual indicators of demographic development. Var 1, the population of the municipality, was taken as the base variable X, and the other four features were taken as the variable Y (var 2, var 3, var 4, var 5). The results of assessing the scattering of municipalities by the variables "Population of municipalities" (var 1) and "Share of the population under working-age" (var 2) are shown in **Figure 1**.

When considering this array of objects, we can distinguish municipalities that are remote from the statistical summation; they are represented by a graphic line. In particular, in the share of the population under working-age the Maloyaroslavets district and the city of Obninsk are characterized by good indicators, while the lower indicators refer to the Babyninsky district. Against the background of the regional average values, these municipalities stand out with positive indicators, which show good long-term demographic prospects for these territories. For the municipal authorities of these territories, the main task will be to create conditions aimed at retaining the population and promising labor resources.

Figure 2. Diagram of the scattering of municipalities by the variables "Population of the municipalities" (var 1) and "Share of the population of working-age" (var 3)

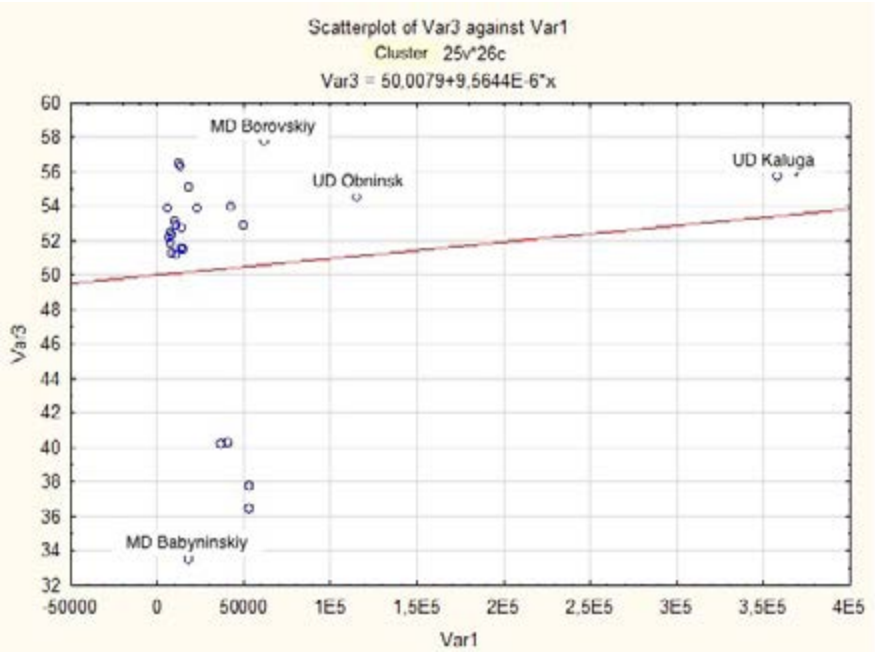
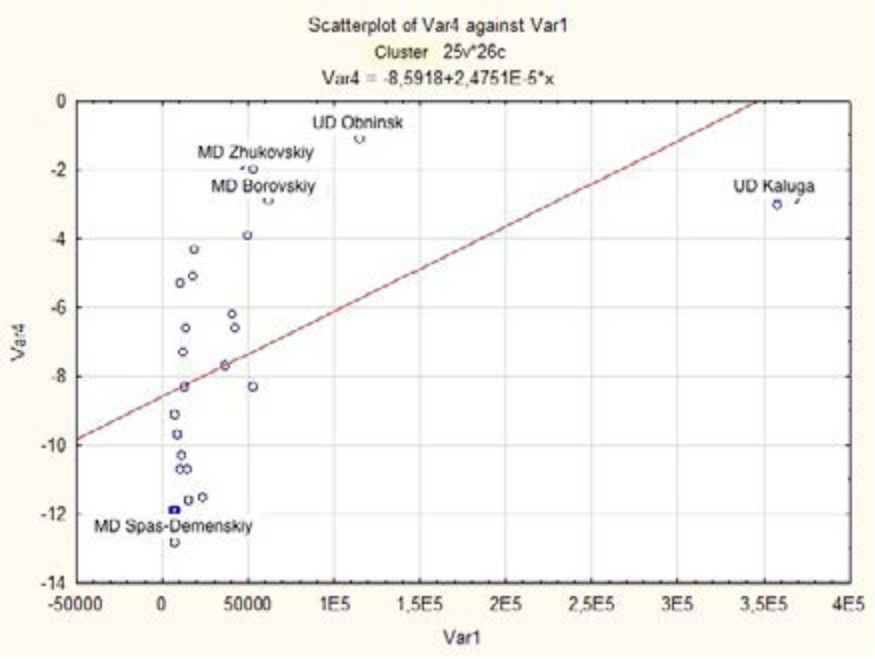


Figure 3. Diagram of the scattering of municipalities by the variables "Population of the municipalities" (var 1) and "Coefficient of natural increase" (var 4)



The scattering of municipalities based on the variables "Population of municipalities" (var 1) and "Share of the working-age population" (var 3) reflects not the perspective but the current situation with the labor supply of the municipalities' economy (**Figure 2**).

The slope of the middle line shows that with an increase in the population of the municipality, the share of the working-age population increases. According to the presented data, we see the predominance of a significant part of municipalities over the line; this indicates that these territories have a high percentage of the employable population. The best indicators are demonstrated by the urban districts of Kaluga, Obninsk, and the Borovsk municipal district.

In fact, this means that in the medium term, these municipalities may not experience serious problems with the provision of labor resources, but in the long term, the situation will be determined by the processes of natural and migration growth/loss of population.

The scattering of municipalities in the Kaluga region based on natural growth rates is shown in **Figure 3**.

According to the figure, all municipalities of the Kaluga region have negative indicators of natural population growth. The slope of the middle line indicates that in terms of population growth/decline, the largest municipalities have lower rates of natural population decline. The lowest figures of natural population decline are seen in the municipalities of the northern part of the Kaluga region – the so-called "Moscow wedge": Borovsky, Zhukovsky municipal districts, and Obninsk urban district. These territories are included in the Moscow agglomeration zone and receive major investment projects, and in recent years, the demographic situation in these territories has improved. The scattering result obtained for the variables "Population of the municipality" (var 1) and "Share of the population under working-age" (var 2) (**Figure 1**) shows the similarity of the estimates. Territories with a positive state of labor resources are characterized by the lowest rates of natural decline, and, on the contrary, municipalities with a negative state in the field of the population under the working-age have high rates of natural decline. It can be noted that in 2018, the indicator of the natural decline in the Obninsk and Kaluga urban districts was amounted to 1.1 ‰ and 3 ‰, in Zhukovsky and Borovsky municipal districts – 2 ‰ and 2.9 ‰, while in Spas-Demensky and Baryatinsky municipal districts, this indicator was 12.8 ‰ and 11.9 ‰.

The situation related to natural population decline in the Kaluga region in 2018 was partially improved due to migration processes in certain territories. With a natural decline of 1.1 ‰, the City of Obninsk shows 25.3 ‰ of the migration increase. On the contrary, in Kaluga, in 2018, the natural decline of 3 ‰ was aggravated by 8.7 ‰ of the migration outflow. In previous years, the situation in the municipality was more favorable, thus ensured a high concentration of inhabitants in the city. The slope of the middle line (**Figure 4**) indicates that large municipalities are characterized by lower rates of migration growth; this may be explained by the high cost of housing and other household expenditures.

The data in Figures 1-4 show the unevenness of the population settlement system in the municipalities of the Kaluga region. Kaluga and Obninsk urban districts are located along the line to the right, farther than other municipalities; this makes them the most populated municipalities of the Kaluga region. The total population of the region is 1 million 10 thousand inhabitants, 358 thousand residents (35%) live in the urban district of Kaluga, and 115 thousand residents (11%) in the urban district of Obninsk. The named urban settlements of the Kaluga region account for more than 46% of the region's inhabitants, and this indicates the unevenness of the settlement system.

Variables of the demographic block (var 1 – var 6) of the Kaluga region municipalities clustering are shown in **Figure 5**.

According to the indicators characterizing demographic development, municipalities have 4 clusters. The scattering of municipalities across clusters is uneven. Separate clusters have formed regional capitals – Kaluga and Obninsk urban districts. As we noted earlier, these territories have more than 46% of the region's residents and are characterized by the most positive demographic processes.

Cluster 3 was partially formed by municipalities in the northern part of the region, which are located in the Moscow agglomeration zone (Borovsky, Zhukovsky, Maloyaroslavetsky districts) and demonstrate the best indicators of socio-economic development in the region, which contributed to the stabilization of the demographic situation, as well as the growth and preservation of residents. The Moscow agglomeration is characterized by large production facilities with macro-regional specialization, effective logistics, and developed infrastructure. In other municipalities (not influenced by the Moscow agglomeration) included in this cluster, in recent years, the authorities implemented large infrastructure projects

Figure 4. Diagram of the scattering of municipalities by the variables "Population of the municipalities" (var 1) and "Coefficient of migration growth" (var 5)

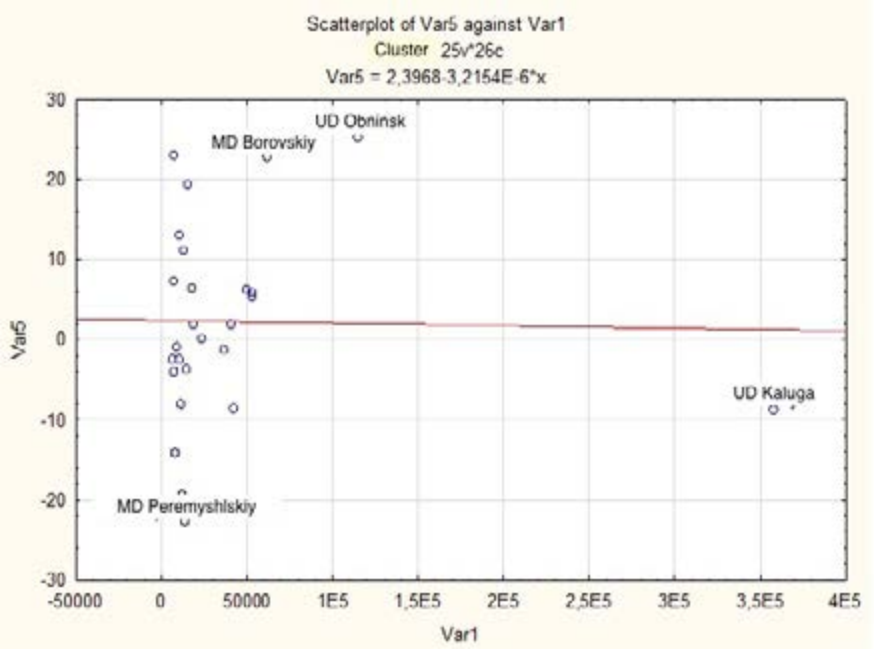


Figure 5. Results of municipalities clustering based on demographic indicators

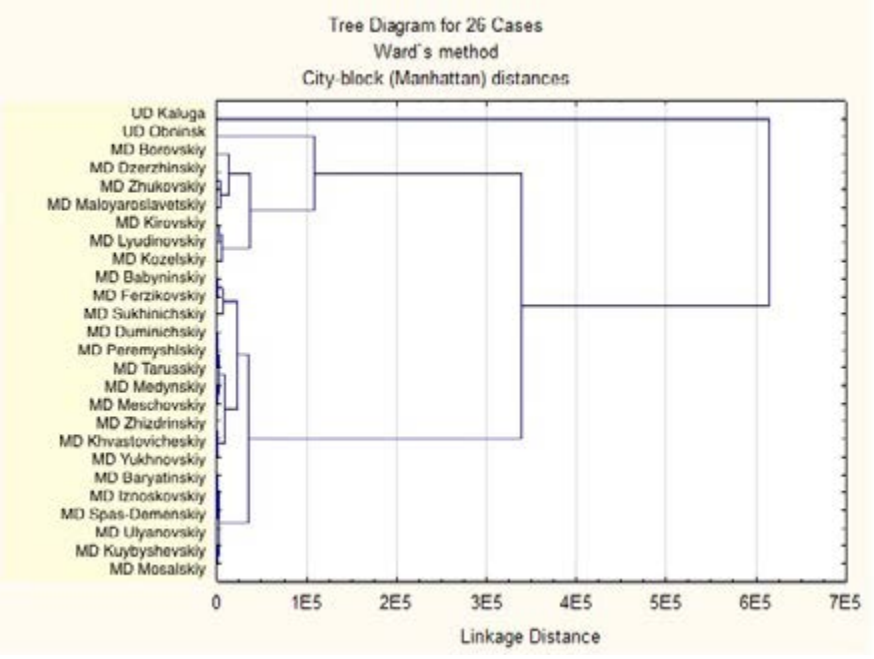
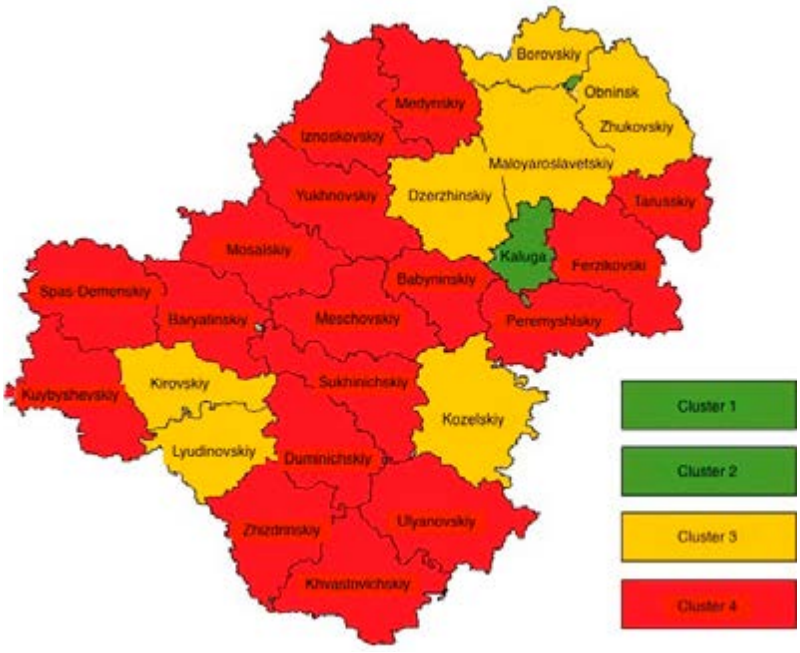


Table 1. Average values of intra-cluster variables by demographic indicators

Variable	Cluster Means			
	Cluster No. 1	Cluster No. 2	Cluster No. 3	Cluster No. 4
Var1	357700,0	115029,0	48094,43	11927,41
Var2	15,6	18,5	17,34	15,51
Var3	55,8	54,5	45,64	51,93
Var4	-3,0	-1,1	-5,37	-9,35
Var5	-8,7	25,3	4,69	0,29
Var6	653,5	2293,7	42,26	10,00

Figure 6. The result of clustering of the Kaluga region municipalities by demographic indicators



aimed at ensuring economic development. For example, in the territories of the Lyudinovsky and Borovsky districts, there are special economic zones of the industrial production "Kaluga", and in the Dzerzhinsky district, there is a territory of advanced socio-economic development. The implementation of these projects contributed to the creation of job positions (including high productive ones) and created conditions for improving the demographic situation.

Cluster 4 is the largest group of municipalities. It was formed by the territories with the greatest depopulation, characterized by a low number and density of the residents, as well as negative indicators of natural and migration growth.

The average values of intra-cluster variables (**Table 1**) allow us to note that the selected clusters demonstrate significant demographic differences in terms of population size (var 1), total natural growth rate (var 4), migration growth rate (var 5), and population density (var 6).

To visually represent the results of clustering, let us show the localization of clusters geographically (**Figure 6**): municipalities demonstrating favorable development indicators are marked in green, medium in yellow, and low in red.

At Stage 2, we analyzed the impact of structural changes in the economy on labor productivity ("effect within") and employment ("effect between") for the period 2012-2018. The data in **Table 2** show that the Kaluga region is characterized by an increase in labor productivity by 13.2% due to changes in the structure of the economy and by 45.9% through the changes in the structure of employment and the redistribution of labor resources between territories.

Municipalities with a positive demographic situation – the urban districts of Kaluga and Obninsk, ensured growth in labor productivity through the intraregional overflow of labor resources. Kaluga's contribution to the growth of the social productivity of labor in the region is 79.5%, and Obninsk – 11.6%. Considering that about 35% of the region's residents live in Kaluga and 11% in Obninsk, these cities have the best infrastructures in terms of quality (intraregional comparisons), and the growth in labor productivity in these economies was largely ensured by the influx of residents. In the last decade, the authorities have implemented large investment projects in the economy of these municipalities, and this also contributed to the inflow of new inhabitants and labor resource; thus, we may speak of the "emergence effect".

From a demographic point of view, municipalities in Cluster 3, in comparison with the city of Kaluga and Obninsk, have lower indicators in terms of the share of the working-age population, and a higher natural population decline. These territories ensured an increase in the social productivity of labor in the Kaluga region by 11.6%. Changes in the economy's structure ("effect within") play a significant role in the dynamics of labor productivity in these territories. The change in the economy's structure of these territories was partially influenced by the Moscow agglomeration. Also, large investment projects of the Kaluga region have been implemented in the municipalities of this cluster, which ensured the restructuring of the economy and the growth of labor productivity.

Municipalities in Cluster 4 are rural areas and their overall contribution to the growth of labor productivity for the period 2012-2018 was less than 1.5%. We cannot give unambiguous assessments of the reasons for the growth of labor productivity ("effect within" or "effect between") due to the similarity of indicators. These are territories with the most difficult demographic situation due to low population size and high rates of natural decline.

Results. The results of the study showed significant influence of the structural aspects of demography and employment on labor productivity in the region. The hypothesis of the study was confirmed: in the Kaluga region, there is a working "central-peripheral" system of settlement and spatial distribution of economic activity.

Table 2. The influence of economy and employment's structural changes on the social productivity of labor in the economy of the Kaluga region and its municipalities

	Changes in the structure of the economy ("effect within")	Changes in the structure of employment ("effect between")	"Emergence effect"	The sum of the effects
Kaluga region	13,19987	45,91333	40,88680	100,0
Cluster 1	0,81636	44,32381	34,40650	79,54667
Kaluga urban district	0,81636	44,32381	34,40650	79,54667
Cluster 2	0,42986	5,09242	1,82556	7,34783
Obninsk urban district	1,82556	0,42986	5,09242	7,34783
Cluster 3	9,70476	1,05376	0,86614	11,62465
Borovsky municipal district	5,95040	-0,26755	-3,93378	1,74907
Dzerzhinsky municipal district	2,98577	0,08374	2,50274	5,57225
Zhukovsky municipal district	0,10831	0,44884	1,00064	1,55779
Kirovsky municipal district	0,02400	0,21507	0,26242	0,50149
Kozelsky municipal district	0,03403	0,21769	0,42317	0,67488
Lyudinovsky municipal district	0,04143	0,32399	0,34383	0,70925
Maloyaroslavetsky municipal district	0,56082	0,03198	0,26712	0,85992
Cluster 4	0,8532	0,1059	0,52177	1,48086
Babyninsky municipal district	0,01233	0,03309	0,02849	0,07391
Baryatinsky municipal district	0,00507	-0,00075	-0,00233	0,00198
Duminichsky municipal district	0,00269	0,00381	0,00297	0,00947
Iznoskovsky municipal district	0,00594	-0,00102	-0,00316	0,00176
Zhizdrinsky municipal district	0,00975	0,00308	0,00801	0,02084
Kuibyshevsky municipal district	0,00168	0,00149	0,00174	0,00491
Medynsky municipal district	0,10561	0,00036	0,00506	0,11104
Meschovsky municipal district	0,00282	0,00084	0,00091	0,00457
Mosalsky municipal district	0,00622	-0,00011	-0,00031	0,00580
Peremyshlskiy municipal district	0,08495	-0,00316	-0,02669	0,05509
Spas-Demensky municipal district	0,00558	0,00285	0,00474	0,01318
Sukhinichsky municipal district	0,13426	0,01749	0,24088	0,39263
Taruskiy municipal district	0,00800	0,01720	0,02423	0,04943
Ulyanovskiy municipal district	0,00552	-0,00045	-0,00169	0,00338
Ferzikovsky municipal district	0,40811	0,00546	0,10629	0,51986
Khvastovichsky municipal district	0,01295	-0,00056	-0,00222	0,01016
Yukhnovsky municipal district	0,04172	0,02628	0,13485	0,20285

In the region, there are groups of municipalities differentiated by demographic indicators. Municipalities with a positive demographic situation are Kaluga and Obninsk cities. These urban districts have 46% of the region's residents and are characterized by the best indicators of the share of the working-age population. For the period 2012-2018, the growth of labor productivity in the economy of the Kaluga region was provided by the increase of productivity in the economy of the city of Kaluga by 79.5% and 11.6% in Obninsk. Growth in the economy of these municipalities is largely due to the influx of labor resources, and to a lesser extent to economic restructuring.

Another group of municipalities, industrial and industrial-agricultural areas, are characterized by lower demographic indicators. These municipalities are characterized by a lower share of the working-age population and a higher natural decline. The government of the Kaluga region has implemented large investment projects on the territory of these municipalities; restructuring of the economy ensured the growth of labor productivity. The reallocation of labor resources had a little effect on productivity growth in these territories. Besides, some municipalities of this group have a border (or are nearby) with the Moscow region, which obviously excludes the possibility of competition for labor resources with the metropolis but contributes to the restructuring of the economy.

The third group of municipalities is rural areas. This is the most numerous group of territories; however, their total contribution to the growth of labor productivity in the economy of the Kaluga region is less than 1.5%. The demographic situation in these municipalities is the most difficult since, in recent years, it was from these territories that the outflow of labor resources to economic centers of the region took place. Agriculture is the main branch of the economy of the municipalities of this group. The lack of large investment projects providing high productive jobs in the core industry and the lack of policy measures to restructure and diversify the economy are significant limiting factors for productivity growth in these municipalities.

Conclusion. The analysis of the study allows us to present the following outcomes. In the spatial development of the Kaluga region, a "central-peripheral" trend is clearly visible. According to this economic model, the main activity is concentrated in several regional centers that have significantly different demographic and productive potential. But we cannot give unambiguous

assessment conclusions about the advantages and disadvantages of the social labor center-periphery" model for the development of the region.

The concentration of economic activity and the redistribution of labor resources to regional centers contribute to a significant increase in labor productivity. Examples of such development are the urban districts of Kaluga and Obninsk, which ensured an increase in labor productivity due to the influx of labor resources ("effect between").

Territories with high productive jobs in the economy and infrastructural constraints cannot provide an inflow of labor resources but try to more actively implement projects for restructuring the economy and increase labor productivity by creating more high productive jobs ("effect within").

Municipalities with negative indicators are characterized by stagnation in core industries, low labor productivity, and an unsatisfactory demographic structure. For these territories, the priority should be given to a smoothing regional policy associated with an increase of workers' incomes engaged in the public sector, as well as the implementation of agro-food industry, environmental, and recreational potential of municipalities. In the development of existing potentials, the decisive role belongs to resource provision and not to administrative decisions, according to which the promising profile of the municipal economy is determined.

Dispersion of settlements slows down the processes of spatial development due to limited resources, problems of distances, demographic, and infrastructural constraints. In order to correct the existing shortage of social capital in the peripheral territories, it is necessary to carry out balancing adjustments in the stimulating and equalizing policy in the regional development of the Kaluga region. To avoid risks for the regional budget system and strengthen the equalizing component of regional policy, the regional authorities must increase revenue sources.

The depopulation of territories and the formation of a settlement system in large intraregional agglomerations have a detrimental effect on the state of the entire region. To support sparsely populated areas, it is necessary to apply local projects that increase labor productivity and the dynamics of economic growth, which, in turn, will enhance the economic and geographical situation of the territories through infrastructure projects. The implementation of these projects requires public investment.

The fight against social inequality, caused by differences in the territory of residence, should be carried out through regional policies aimed at increasing the availability of social services and public goods. In the short term, to achieve social development goals, transfers to municipalities should be provided from the regional budget, and this, in turn, may reduce the depopulation of territories.

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