Analysis of interrelations of demographic and socio-economic parameters of rural development

N N Balashova¹, S A Popova¹, D A Korobeynikov¹, E A Tarasova² and K E Tokarev¹,³,⋆

¹Volgograd State Agricultural University, 26, Universitetskiy Avenue, Volgograd, 400002, Russia
²Committee of agriculture of the Volgograd region, 19 Kommunisticheskaya str., Volgograd, 400005, Russia
³Volgograd State Technical University, 28, Lenina Avenue, Volgograd, 400005, Russia

⋆E-mail: tke.vgsha@mail.ru

Abstract. The article offers an algorithm for evaluating the relationship between demographic and economic parameters of rural development, which assumes the classification and paired comparisons of regions based on the studied characteristics. The demographic matrix represents a multi level grouping of rural territories in Russia based on three subordinated characteristics: natural reproduction, internal migration, demographic burden. For a matrix grouping of regions by the level of economic well-being of rural territories, an integral index is proposed, structured according to indicators of employment, rural income and budgets of rural settlements. According to demographic characteristics, rural territories are divided into four typological groups – well-off, relatively well-off, not well-off, and depressive regions- whose superimposition on the matrix of economic development of territories showed the existence of an incomplete correlation of the studied parameters. The most significant relationship was found for the third and fourth quartiles of the matrices, which indicates a fairly significant relationship between the unfavorable demographic situation in the region and ego-economic problems. At the same time, the presence of distorting factors requires the addition of a cluster approach to formal assessments, in which it is possible to take into account the individual characteristics of each territory.

1. Introduction

Rural territories have extensive natural, demographic, economic, historical and cultural potential, the rational use of which can ensure sustainable development, a stable level and quality of life of the rural population [1]. At the same time, rural territories of Russia are characterized by a high degree of socio-ethnic differences that affect the demographic behavior of the multi-ethnic population of Russia and significant differentiation of demographic processes [2].

Demographic dynamics is mainly studied at the level of individual regions, while revealing their individual demographic problems and ignoring typological features. In fact, these studies do not form a complete, modern picture of the demographic development of rural territories in Russia. While the level and trends of fertility determine not only the nature of reproduction, the dynamics of the rural population and labor resources, but also the degree of development of productive forces in the region
[3, 4].

2. Materials and methods
The study hypothesizes that there is a close correlation between the indicators of demographic well-being of rural territories and the level of their socio-economic development. To test the hypothesis, we propose a mutual overlap of the results of the typological grouping of Russian regions by the studied features.

To construct the demographic matrix of rural territories, a multi-level grouping was used based on three subordinated characteristics: natural decline (growth) of the population, balance of migration processes and demographic load [5]. For the matrix grouping of regions by the level of economic well-being of rural territories, an integral index was used, based on a standardized system of economic indicators that reflect the level of employment and income of the rural population, as well as the level of budget revenues of rural settlements per 1 resident.

3. Results
The study of demographic dynamics and regional differences in rural areas in demographic structures and processes has shown that the main trend in recent decades is the decline of the rural population, which is associated with serious violations of the production processes. At the end of the 1980s, there was a collapse in the birth rate with a significant increase in mortality, which led to a sharp reduction in the natural growth of the population and an increase in the negative balance [6].

The highest total birth rate is currently observed in the North Caucasus Federal district (15.3%) and in the far Eastern Federal district (12.7%). The average for the Russian Federation is this indicator at the beginning of 2019 it was at the level of 10.7% (table 1).

Table 1. Demographic processes in rural areas by Federal districts of the Russian Federation, 2018.

| Federal district         | Births per 1000 population, people | Deaths per 1000 population, people | Percentage of the rural population of working age, % | Percentage of the rural population over the age of working age, % | Migration growth of the rural population per 10,000 people |
|--------------------------|------------------------------------|------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------|
| Russian Federation       | 10.7                               | 13.6                               | 53.1                                                | 26.8                                                            | -27.1                                                    |
| Central district         | 8.3                                | 15.9                               | 53.3                                                | 30.7                                                            | 17.3                                                     |
| Northwest district       | 8.2                                | 15.0                               | 53.0                                                | 29.7                                                            | 100.3                                                    |
| South district district  | 9.6                                | 12.8                               | 53.6                                                | 27.3                                                            | -10.2                                                    |
| North Caucasus           | 15.3                               | 7.4                                | 56.2                                                | 17.3                                                            | -49.3                                                    |
| Privolzhsky district     | 10.0                               | 15.3                               | 52.3                                                | 29.1                                                            | -55.1                                                    |
| Ural district            | 11.3                               | 14.3                               | 51.2                                                | 27.3                                                            | -59.0                                                    |
| Siberian district        | 11.8                               | 14.5                               | 51.1                                                | 25.9                                                            | -50.3                                                    |
| Far-East district        | 12.7                               | 12.9                               | 54.1                                                | 23.4                                                            | -134.1                                                   |

The highest fertility rates are recorded in national-territorial subjects of the Russian Federation (in 2018, the leader of the Chechen Republic birth rate of 19.5%), which is explained not only by ethnic and mental characteristics of the population and favourable age structure related to the higher proportion of women of reproductive age than in other rural areas of the European part of Russia.

No less acute is the problem of high mortality of the rural population, the indicator of which at the beginning of 2019 was 13.6%. The most disadvantaged regions by this indicator are the republics of Tyva (23.1%) and Karelia (20.2%), Pskov (20.4%) and Tver (19.1%) regions. The ratio of birth and death rates led to the fact that in 2018, the natural growth of the rural population was observed only in 14 regions, and in the whole of the Russian Federation, the natural decline was 2.9%.

One of the important characteristics of the age structure of the population is the indicator of demographic load – the ratio of the number of people of working and non-working age [7]. The analysis of the actual structure of the rural population allowed us to establish a threshold limit at the level of 55% of the working-age population. According to our calculations, only in 16 regions the number of able-bodied people exceeds the level of other dependent groups of the population.
Migration processes actively influence the demographic situation [8]. Migration growth of the population of rural territories takes place in the Moscow, Belgorod, Leningrad, Nizhny Novgorod, and Samara regions, as well as in the Krasnodar territory, the Republic of Tatarstan, and Adygea. The remaining regions are characterized by a negative balance of internal migration flows, especially significant in the republics of Karelia, Komi, Kalmykia, Kabardino-Balkaria, Karachay-Cherkessia, Bashkortostan, and Chuvashia.

**Table 2. Demographic matrix of rural territories of the Russian Federation**

| Natural increase | Migration decline | Natural loss | Migration growth | Migration decline |
|------------------|-------------------|-------------|------------------|------------------|
| More than 55% of the working-age population | Murmansk region; republics of Dagestan, Kabardino-Balkaria, Karachay-Cherkess, North Ossetia-Alania, Autonomous districts of Khanty-Mansi and Yamalo-Nenets | Belgorod, Kaluga, Nizhny Novgorod, Samara, Novosibirsk regions; the republics of Adygea and Tatarstan; Krasnodar territory. | Smolensk and Kaliningrad regions; Republic of Kalmykia; Kamchatka and Khabarovsk Territories; Jewish Autonomous region. | Regions Bryansk, Vladimir, Voronezh, Ivanovo, Kostroma, Kursk, Lipetsk, Oryol, Ryazan, Tambov, Tver, Tula, Yaroslavl, Arkhangelsk, Vologda, Novgorod, Pskov, Astrakhan, Volgograd, Rostov, Kirov, Orenburg, Penza, Saratov, Ulyanovsk, Kurgan, Sverdlovsk, Tyumen, Chelyabinsk, Keremovo, Omsk, Tomsk, Amur, Magadan, Sakhalin; Republic Of Karelia, Komi, Crimea, Bashkortostan, Mari El, Mordovia, Udmurtia, Chuvashia, Jewish Autonomous region, Chukotka Autonomous Okrug. |
| Less than 55% of the working-age population | Irkutsk region; republics of Chechnya, Altai, Buryatia, Tuva, Sakha (Yakutia); Nenets auth. district. | Belgorod, Kaluga, Nizhny Novgorod, Samara, Novosibirsk regions; the republics of Adygea and Tatarstan; Krasnodar territory. | Smolensk and Kaliningrad regions; Republic of Kalmykia; Kamchatka and Khabarovsk Territories; Jewish Autonomous region. | Regions Bryansk, Vladimir, Voronezh, Ivanovo, Kostroma, Kursk, Lipetsk, Oryol, Ryazan, Tambov, Tver, Tula, Yaroslavl, Arkhangelsk, Vologda, Novgorod, Pskov, Astrakhan, Volgograd, Rostov, Kirov, Orenburg, Penza, Saratov, Ulyanovsk, Kurgan, Sverdlovsk, Tyumen, Chelyabinsk, Keremovo, Omsk, Tomsk, Amur, Magadan, Sakhalin; Republic Of Karelia, Komi, Crimea, Bashkortostan, Mari El, Mordovia, Udmurtia, Chuvashia, Jewish Autonomous region, Chukotka Autonomous Okrug. |

To test the hypothesis that there is a close correlation between the indicators of demographic well-being of regions and the level of their socio-economic development, we have proposed an index of economic well-being of rural territories, which includes four indicators: the unemployment rate, the level of employment of the rural population, household income on average per household member per month, and budget revenues of rural settlements per 1 resident. The calculation of the index values for 2018 allowed us to group regions by the level of economic well-being of rural territories (table 3).

**Table 3. Economic matrix of rural territories of the Russian Federation**

| 1 quartile (index ≥ 0.600) | 2 quartile (index 0.451-0.600) | 3 quartile (index 0.301-0.450) | 4 quartile (index < 0.300) |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Murmansk region, Nenets, Khanty-Mansi and Yamalo-Nenets auth. district, Republic of Sakha (Yakutia), Kamchatka territory, Chukotka Autonomous district | Belgorod, Ivanovo, Kaluga, Lipetsk, Moscow, Tula, Leningrad regions, Krasnodar territory, Republic of Tatarstan, Kirov, Nizhny Novgorod, Orenburg, Chelyabinsk regions, Krasnoyarsk territory, Omsk region, Khabarovsk territory, Amur, Magadan and Sakhalin regions | Bryansk, Vladimir, Voronezh, Kostrma, Kursk, Oryol, Smolensk, Tambov, Tver, Yaroslavl regions, the Republic of Karelia and Komi, Arkhangelsk, Vologda, Kaliningrad, Novgorod regions, the Republic of Adygea, Kalmukia, Crimea, Astrakhan, Volgograd, Rostov regions, the Republic of Dagestan, Kabardino-Balkaria, North Ossetia-Alania, Stavropol territory, the Republic of Bashkortostan, Mari El, Mordovia, Udmurtia, Chuvashia, Perm Krai, Penza, Samara, Sverdlovsk, Tyumen regions, Altai Republic, Khakassia, Irkutsk, Keremovo, Novosibirsk, Tomsk region, Primorye territory, Jewish Autonomous region. | Ryazan, Pskov regions, Karachay-Cherkess and Chechen republics, Saratov, Ulyanovsk, Kurgan regions, Altai Krai, Republic of Buryatia, Zabaykalsky Krai, republics of Ingushetia and Tyva |


The ratio of indicators of movement of the rural population and demographic load can be the basis for a multi-level typology of rural areas of the country. Theoretically, based on three subordinated criteria, it is possible to allocate 8 types of territories, but based on the actual data, it is sufficient to allocate six (table 2).

The overlapping of the results of assessing the demographic and economic well-being of regions using cluster analysis methods [9] revealed an incomplete correlation of the studied parameters of socio-economic development of rural territories in Russian conditions.

4. Discussion

The first two groups of regions with natural population growth are classified as demographically safe territories. This is the majority of the North Caucasus republics with the highest density of rural inhabitants and part of the regions of the far North with the traditional way of life of the indigenous population. However, according to the level of economic development, only the territories of the Extreme North (Murmansk region, Nenets, Khanty-Mansi and Yamalo-Nenets Autonomous districts) were included in the first quartile of districts group, Republic of Yakutia), which is explained by the high level of their budget subsidization. Of the 9 remaining regions in this group, 5 are in the third quartile of the economic matrix, and 4 regions are in the fourth quartile, which indicates a low or extremely low level of their economic development.

Regions from the third and fourth groups of the demographic matrix can be considered relatively well-off in demographic terms, where the natural decline of the population is partially compensated by internal migration [10]. Of the 10 regions in this group, 7 were placed in the 2 quartile of the economic matrix, and 3 regions were placed in the third quartile. A closer correlation between demographic and economic parameters of rural development in this group is due to the fact that these regions share a strong industrial or recreational potential, which determines their attractiveness for intra-Russian migration.

Regions from the fifth group of the demographic matrix, which, despite the natural and migration decline of the population, still have a high percentage of the working-age population, can be considered to be not well-off in demographic terms. According to the level of economic development, only four of the six regions of this group can be described as weak (3 quartile), while the Kamchatka and Khabarovsk territories fell into the 1 and 2 quartile, respectively.

The zone of absolute demographic depression can include regions from the sixth group of the demographic matrix, which are characterized by both natural and migration decline of the population, and excessive demographic burden on able-bodied villagers. Of the 51 regions (more than half of the total number of subjects of the Russian Federation) of this demographic group, 1 region (1.96%) fell into the 1 quartile of the economic matrix, 11 (21.57%) into the 2 quartile, 32 (62.75%) into the 3 quartile, and 7 (13.73%) into the 4 quartile. In other words, for this group, there is a noticeable correlation between the complex demographic situation and the low (extremely low) level of economic development.

5. Conclusion

The study revealed that the relationship between the level of demographic and economic well-being of rural areas, although there is, but is incomplete. To confounding factors include:

- influence of national and socio-cultural traditions that favorably affect the demographic situation in the regions of the North Caucasus and Siberia;
- state subsidization of Northern territories with unfavorable living conditions that increase the income of the rural population and local budgets;
- influence on the processes of internal migration of rural population of the General level of development of industrial and recreational potential of territories, the General level of their socio-economic development;
- significant differentiation of the country's territory by the level of natural rent, and, consequently, by the scale and efficiency of agriculture, which is the main type of economic activity of the rural population.

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