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# Russian Rural Population Development in Relation to Agricultural Sector Transformation

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**Abstract:** The main aim of this study is to identify the impact of agricultural sector's transformation process on rural population in Russia and to specify the key factors affecting the process of rural population development and rural population transfer into urban areas. In this case, the study is identifying the main differences existing between Russian rural sector development and other countries and regions development. The mentioned ambitions/aims are realized through hypothesis testing. The results coming from the analyses are as follow. The basic trends influencing Russian rural population trend development is very similar to trend existing in developed countries. However, Russia is considered to be transitional economy. There was not discovered any correlation existing between the absolute value of agricultural production performance and rural populations. The decline of the rural population is the result of agricultural sector's transformation and the significant impact on rural population development has also the decline of agricultural sector's importance within the national economy. There was confirmed a direct relationship and high correlation between employment in agriculture and rural population, despite the fact that the decline in employment in agriculture occurred much faster than the decrease in the rural population. Among the reasons which can explain differences in the development of Russian rural population from the global trends are administrative reorganizations, development of household plots instead of big collective farms, differences in the development of particular regions and migration between regions, natural decline in the urban population, migration from the former Soviet republics and blurred boundaries between rural and urban populations.

**Key words:** Agriculture, rural population, collective farms, Russia, regions, urbanization, employment

## INTRODUCTION

Over the last 20 years many urban areas have experienced dramatic growth as the world economy has been transformed by a combination of rapid technological and political change. Rural-urban migration and the transformation of rural settlements into towns and cities have been important determinants of rapid urban growth (Cohen, 2004).

For the period from 1980-2012, the average world rural population decreased from 60.6-47.5% of all population. Employment in agriculture decreased from 48.5-33.2%. Share of agriculture in GDP decreased from 7.5-3.1%.

Thus, the global trend is expressed in the reduction of the role of agriculture in the global economy and was followed by a decline in the number of jobs in the agricultural sector and reduction of the rural population.

However if we look at the statistics of the rural population of Russia for the same period, we can see significant differences. In 1980, the share of rural population was 30% by 1990 it dropped to 27% and until 2013 remained almost unchanged, ranging between 26-27%. Thus, the overall decline was <4% while the world average decline was 13.1% (RFSSS, 2014a, b).

What can explain such a significant deviation from the global trends? Experts in the field of demography and economic geography called some of the possible reasons for this phenomenon. Among such reasons are growth of large cities due to reduction of small towns (Lexin, 2006, 2009) migration to the rural areas of Russia from neighboring countries, mainly from the former Soviet republics, etc. (Nefedova and Treivish, 2010).

In addition, there are other distinctive features of the Russian rural development. Firstly, it is significant decline in the share of agriculture in country's GDP. For the period 1990-1992, it decreased from 16.6-7.7% of total GDP due to the collapse of Soviet Union and the process of

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economic transformation (World Bank, 2014). The decline in the share of employment in agriculture is also noticeable. If in the beginning of 90s the share of employed in agriculture was 14% in 2012 it was two times smaller (only 7.3%).

Therefore, we can observe that a significant decline in the share of agriculture in GDP and employment in agriculture were followed by a relatively small decrease in the rural population (Lindner, 2007). This may suggest that rural development in Russia is specific case compared to the rest of the world. There is a disproportion between the development of agriculture and the rural population.

This study is trying to explain these trends through the analysis of the relationship between the development of agriculture and rural populations in the Russian Federation to find possible explanation of this phenomenon.

## MATERIALS AND METHODS

The objective of the study is to determine the influence of agricultural sector's development and employment in agriculture on rural population in Russian Federation and to identify the factors which reduced the rate of urbanization in the country compared with the global trends. This objective is realized through hypothesis testing. These hypotheses are as follows:

- $H_1$: the volume of agricultural production affects the rural population
- $H_2$: the share of agriculture in GDP affects the rural population
- $H_3$: there is a relationship between the rural population and share of people employed in agriculture

The analyzed period is 23 years (from 1990-2012). Thus, it covers the whole period of transformation of the Russian economy since the collapse of the Soviet Union. As sources of statistical data, we used Russian Federal Statistical Service database, World Bank database and FAOSTAT.

In this study, we performed a regression analysis using the classical least squares method. There were calculated a regression equation, coefficients of correlation and coefficients elasticity, coefficient of determination ($R^2$). To test a significance of the hypotheses there were used the classical p-value, F-statistic and t-statistic. To test for the presence of heteroscedasticity, we used the Spearman's rank correlation coefficient and Goldfeld-Quandt test.

## RESULTS AND DISCUSSION

The analysis starts with the formulation of hypotheses:

- $H_1$: the volume of agricultural production affects the rural population

Agriculture and the rural population are narrowly interrelated. Agriculture has historically developed in rural areas, far from urban settlements. Development of agriculture would create new jobs and thus attract new residents to the rural areas.

- $H_2$: the share of agriculture in GDP affects the rural population

The analysis should consider not only the impact of agricultural growth in absolute terms but its share in the GDP of the country. Globally, there is a decline in agriculture not in absolute terms but relative to other, more rapidly growing industries. We expect the positive correlation between the share of agriculture in GDP and rural population in Russia.

- $H_3$: there is a relationship between the rural population and share of people employed in agriculture

Historically, most of the people living in rural areas are involved in agricultural production. Alternative employment in rural areas is characteristic of developed countries while in Russia it is not significant. Therefore, we expect the positive correlation between rural population and employment in agriculture.

Data set was prepared for a regression analysis. It should be noted that the data on the number of rural and urban population according to statistics are strongly distorted due to administrative reforms which resulted in a formal change in the categories of settlements without any qualitative changes. So, we have adjusted the rural population to eliminate the changes of settlements category to exclude the possible distortion of Russian statistics from the changes due to administrative and bureaucratic reasons and to be closer to an understanding of the economic nature of the phenomenon (Table 1).

After the calculation of all three hypotheses, test of significance and tests of autocorrelation and homoscadasticitty, we obtained the following results (Table 2).

- $H_1$: gross agricultural production value and rural population

Table 1: Input data for the regression analysis

| Years | Agriculture, value added (GDP %) | Employment in agriculture (%) | Gross agricultural production (in constant prices 2004-2006) | Rural population (thousand people) | Rural population after elimination of changes in settlements categories (thousand people) |
|---|---|---|---|---|---|
| 1990 | 16.6 | 13.9 | 68003 | 39455 | 38943 |
| 1991 | 14.3 | 14.2 | 65283 | 39549 | 39048 |
| 1992 | 7.4 | 15.4 | 59163 | 39573 | 39323 |
| 1993 | 8.3 | 15.5 | 55966 | 39535 | 39411 |
| 1994 | 6.6 | 16.1 | 49545 | 39492 | 39478 |
| 1995 | 7.2 | 15.7 | 46921 | 39447 | 39319 |
| 1996 | 7.2 | 15.3 | 44750 | 39459 | 39121 |
| 1997 | 6.4 | 12.2 | 44785 | 39400 | 38928 |
| 1998 | 5.6 | 11.7 | 38868 | 39341 | 38755 |
| 1999 | 7.3 | 15.0 | 38984 | 39226 | 38540 |
| 2000 | 6.4 | 14.5 | 41628 | 39068 | 38263 |
| 2001 | 6.6 | 12.0 | 43916 | 39025 | 37939 |
| 2002 | 6.3 | 11.3 | 44904 | 38996 | 37631 |
| 2003 | 6.3 | 10.9 | 44988 | 38918 | 37259 |
| 2004 | 5.6 | 10.2 | 46075 | 38812 | 36890 |
| 2005 | 5.0 | 10.2 | 46601 | 38741 | 36485 |
| 2006 | 4.5 | 10.0 | 47821 | 38366 | 36145 |
| 2007 | 4.4 | 9.0 | 47781 | 38060 | 35949 |
| 2008 | 4.4 | 8.6 | 50083 | 37813 | 35775 |
| 2009 | 4.7 | 9.7 | 50339 | 37595 | 35638 |
| 2010 | 3.9 | 7.7 | 44947 | 37516 | 35328 |
| 2011 | 4.3 | 7.7 | 53957 | 37420 | 35135 |
| 2012 | 3.9 | 7.3 | 52097 | 37231 | 34962 |

World Bank, FAOSTAT, RFSSS (2014a, b)

Table 2: Results of regression analysis and hypotheses testing

| Analysis | $H_1$ | $H_2$ | $H_3$ | Critical values |
|---|---|---|---|---|
| Correlation coefficient | 0.12 | 0.62 | 0.95 | . |
| Coefficient of elasticity | 0.03 | 0.0568 | 0.16 | . |
| $R^2$ | 0.0142 | 0.3807 | 0.8986 | . |
| P-value | 0.5882 | 0.0017 | 0.00 | 0.05 |
| Standard error | 1614 | 1280 | 518 | . |
| F-statistics | 0.3 | 12.91 | 186.14 | >4.35 |
| Student's t-test | 0.58 | 3.59 | 13.64 | >2.08 |
| Approximation error | 3.75 | 2.94 | 0.97 | <7 |
| Spearman's coefficient | 0.37 | 0.0631 | 0.0771 | <0.45 |
| Goldfeld-Quandt test | 1.36 | 2.72 | 1.15 | <4.35 |

Own processing

Considering the results of testing of the hypothesis 1, we can observe a low correlation between the gross value of agricultural production and rural population. Correlation coefficient is 0.12, indicating a very weak relationship between the studied variables.

According to $R^2$, only 1.42% of the variation in rural population is explained by variations in gross agricultural production value. Tests of statistical significance showed that the regression gave negative results. The F = 0.3 that is less than the critical value (4.35) at a given level of significance. The t-statistics = 0.58 is also less than critical value $t_{crit}$ = 2.08. The p = 0.58 is more than the common alpha level of 0.05 which indicates that it is statistically insignificant. There is no homoscedasticity in the regression model.

Hence, we will accept the null hypothesis which states that the volume of agricultural production does not affect a rural population. The hypothesis 1 can be rejected. There was not a close correlation between the increase in agricultural production and rural populations.

- $H_2$: share of agriculture in GDP and rural population

In the first hypothesis we observe a correlation between the share of agriculture in GDP and rural population. Correlation coefficient is equal 0.62, indicating a not very high but still a significant relationship between the studied variables.

$R^2$ tells us that 38.07% of the variation was explained by variations in the independent variable. Tests showed that the regression is deemed significant. The F = 12.91 that is more than the critical value at a given level of significance. The t-statistics = 3.59 is more than critical value $t_{crit}$ = 2.08. The p = 0.0017 is less than the common alpha level of 0.05 which indicates that it is statistically significant. Hence, we will reject the null hypothesis. There is homoscedasticity in the regression model.

Therefore, the empirical results of the directly support the hypothesis 2. The share of agriculture in GDP has an impact on rural population. The hypothesis 2 can be accepted.

Therefore, we can see that despite the fact that the absolute value of agricultural production does not affect rural population, decline in the share of agriculture relative to other sectors of the economy.

The correlation is not very high. Decline in agriculture is much faster than the decline in the rural population. There may be a number of explanations for this phenomenon.

One of these factors is lack of a clear division between population of urban and rural areas. Russian official statistics considers it as a part of the urban areas, though often they have all signs of rural settlements. It can introduce distortions in the official data.

In addition in the early 90s there was a trend to a sharp decline in the share of agriculture in the economy as a result of the transformation process and the simultaneous growth of the rural population as a result of the crisis and the decline in living standards in the big cities and as a result of migration from the former Soviet republics.

- $H_3$: rural population and share of people employed in agriculture

Testing the hypothesis about the relationship between employment in agriculture and rural population showed the following results. Correlation coefficient is equal 0.95, indicating a high relationship between the share of people employed in agriculture and rural population.

Coefficient of elasticity shows that 1% increase in gross agricultural production value entail a 0.16% change in the rural population $R^2 = 0.8986$. It means that 89.9% of the variation was explained by the regression.

The p-value (0.00) is less than the alpha level of 0.05 which indicates that the regression is statistically significant. The F = 186.14 is more than the critical value ($F_{cnt} = 4.35$) at a given level of significance, the value of t = 13.64 is more than critical (2.08). It means that the null hypothesis can be rejected.

There is evidence the strong relationship between the employment in agriculture and rural population. The hypothesis 3 can be accepted. Thus, there was confirmed a direct relationship and high correlation of these parameters.

In 1990-1994, the share of employed in agriculture increased from 13.9-16.1%. But then it began to fall. For the period 1994-2012 it declined from 16.1-7.3%. (Sutherland, 2008).

One of the possible reasons that can explain this difference is development of agriculture in Russia in form of household plots instead of big collective farms (Kurganova *et al*., 2014). So, it turns out that people continue to live in rural areas, breed cattle and grow vegetables for their own consumption which is not taken into account either in the calculation of the total value of agricultural production nor in the calculation of employment in agriculture. If you take into account the significant proportion of household plots in Russian agriculture, this may well explain the deviation from the global trends (Ioffe *et al*., 2006).

There is another feature of Russia's development which distinguishes it from many other countries. Russian is the biggest country in the world. Its size is equal to about 17 million $km^2$. But only about 143 million people live in this vast territory. It means it is not possible to apply traditional approaches typical for the European Union to understand the problem of rural areas development. The giant territory of the Russian Federation stipulates significant differences in the economic and demographic processes, depending on the region.

The population of Russia taken on its territory is extremely uneven. This is a reflection of both natural conditions and features of the economic development of the territory in the last 2-3 centuries. Figure 1 shows the classification of areas of Russia by the specifics of the development of urban and rural population in 1990-2013. The map shows the four types of regions:

- The growth of both rural and urban populations
- The growth of the rural population, the decline of the urban population
- The growth of the urban population, the decline of the rural population
- Reduction in both rural and urban populations

The first type of regions is the areas where both urban and rural population increased. This can be explained by high birth rates as well as by migration from other regions of Russia or former Soviet republics.

Territory assigned to the second type is characterized by increase of the rural population and decrease of urban population. This trend can be explained by two factors. The first one is the decline of industrial production which was accompanied by job losses and a sharp drop in the standard of living of the urban population so significant part of population moved from the cities to the countryside (Gerry *et al*., 2008). The second reason is development of agriculture that attracts people to rural areas.

The third type is the area in which the urban population has increased over the period while the rural population has decreased. This is mainly the territory of Central Russia and the Western Siberia.

The 4th/last type includes designated areas with a negative population growth both in rural and urban areas. It covers most of the country. Particularly noticeable decrease in the number of both urban and rural populations was observed in areas with extreme weather

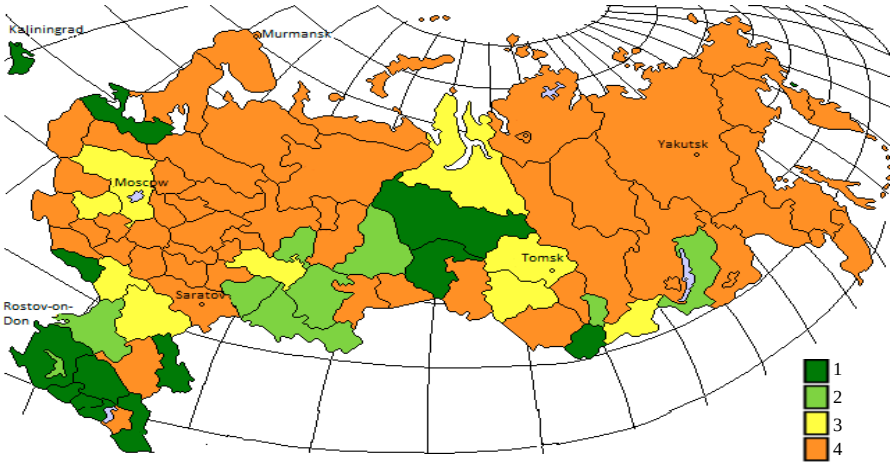


Fig. 1: Regions of Russia by the nature of the changes in the rural and urban population (RFSSS, 2014a, b)

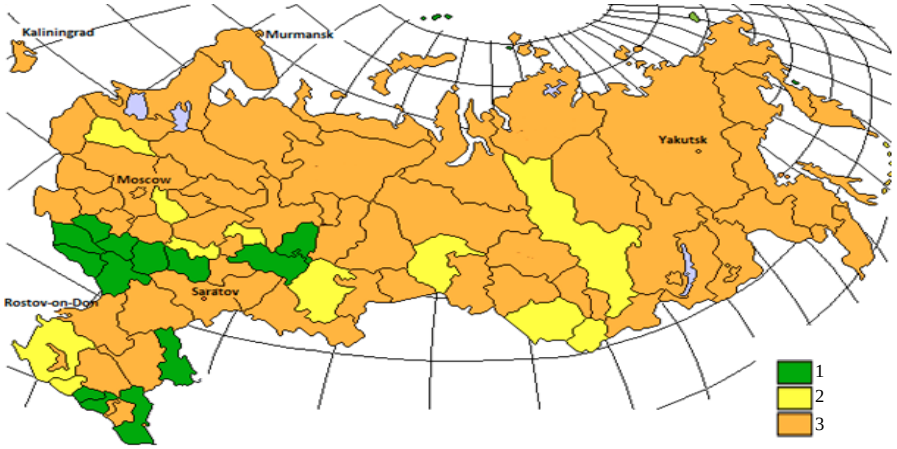


Fig. 2: Regions of Russia by the nature of the changes in agricultural production (RFSSS, 2014a, b)

conditions and areas where the considerable distance from the central areas is existing: Magadan (the urban population decreased by 29.6% and rural population by 52.4%) and Sakhalin (urban population decreased by 7.5 and rural by 22.2%) (Nefedova and Treivish, 2003).

To be able to compare rural population development in individual Russian regions Fig. 2 provides a brief overview related to agricultural production development in individual Russian Federation's regions. The map identifies the three different types of regions:

- Agricultural production increased
- Agricultural production decreased but less than country's average
- Agricultural production decreased but more than country's average

Comparing regions with the increased number of the rural population and the regions with the increased volume of agricultural products, we can see that these are not always the same regions.

Development of agriculture and the rural population in particular regions do not always accompany each other. An increase in the rural population often occurred in regions with declining agriculture. So in some regions in the period of economic transformation there was a decline in a quality of living in the big cities which caused the outflow of population to the countryside where the effects of the crisis were not so pronounced. In other areas, the rural population increased due to the growth of agriculture (Kabardino-Balkaria, Karachay-Cherkessia, Republic of Altai, etc.). However, the vast majority of Russian regions experienced a decline both in agriculture and the rural population.

## CONCLUSION

Based on the regression analysis as well as statistical data processing the following conclusions can be made. There was not discovered any correlation between the absolute value of agricultural production and rural populations. This is typical for developed countries but it is not typical for transitional countries and it is not typical also for developing countries. But we can say that the decline of the rural population was not caused by the decline in agriculture but fall of its importance in relation to other sectors of the economy. The economy performance and value growth generated by other sectors of national economy is much higher in comparison to agricultural sector. There was confirmed a direct relationship and high correlation between employment in agriculture and rural population, despite the fact that the decline in employment in agriculture occurred much faster than the decrease in the rural population. During the last two decades many people left agricultural sector and they found their new job positions in industrial and services sectors. Those sectors' ability to generate new working positions is much higher in comparison to agricultural sector.

Among the reasons which can explain differences in the development of Russian rural population from the global trends are administrative reforms and changes in settlements category, migration between regions, migration from the former Soviet republics, differences in the development of individual regions, blurred boundaries between rural and urban populations and natural decline in the urban population. It is also necessary to highlight the fact that the development of agriculture in Russia in form of household plots instead of big collective farms played an important role in this process.

On the basis of these facts, we can conclude that the transformation processes in the economy of Russia is not yet over and demographic processes continue to evolve. From the statistics of recent years can be seen that after considerable disturbance at the beginning of the transformation period in the last decade, Russia goes to the European way of urbanization, accompanied by a gradual but steady decline in the rural population as well as decline in the importance of agriculture in the economy.

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