

Prediction of the Demographic Indicators for the Agricultural Sector in the Region (For Example, the Volgograd Region, Russia)

¹Valery A. Kamaev, ²Olga A. Astafurova, ²Natalia A. Salnikova and ¹Marina S. Lapina

¹Volgograd State Technical University, Russia

²Volgograd Branch of the Russian Presidential Academy of National Economy and Public Administration, Russia

Abstract: The study presents data on the Volgograd region which is one of the largest agricultural producers in the Russian Federation. One of the most critical factors in the development of agriculture in the Volgograd region was the outflow of young people from rural areas and as a consequence, the aging staff. However, the Volgograd region has been and remains an attractive subject of the Russian Federation for migration because of its favorable geographical position and at present, labor migration predominates in the region. Predicting the dynamics of the working population in view of migration processes discussed in the study is one of the main objectives of management of social and economic development of the region. The analysis and the forecast of the real dynamics of the working population, taking into account internal and external migration are presented in the study. Data processing was performed with the help of the software (STATISTICA 6.0).

Key words: External and internal migration, management of labor streams, social and economic development, Volgograd region, forecast

INTRODUCTION

Volgograd region has a strong climatic potential which allows it to have a developed agricultural production. The region not only meets domestic needs in the field of agricultural products but also has a strong influence on the formation of the Russian food market. According to the Investment Portal Volgograd region in terms of agricultural production Volgograd region ranks 10th in the country, the proportion of it in the gross agricultural production is 2.6%. Agriculture employs <15% of the population employed in the economy of the region, created >11% of the gross regional product.

However, there are problems hindering the development of agriculture in the Volgograd region. The most critical factors are significant wear of the equipment, insufficient qualified personnel, the low share of irrigated land, the high share of private subsidiary and farms, lack of science-based forms of economic conduct.

The low level of economic literacy of agricultural producers leads to miscalculations in the choice of crops produced and restricts access to credit due to the low validity of credit requests. Low level of use of advanced agricultural technologies due to the low level of professional knowledge. The outflow of young people from rural areas continues and as a consequence, the aging of the staff takes place.

In addition, since 1991, Europe has experienced an unfortunate trend of natural reproduction processes:

natural increase has replaced by natural decrease. A characteristic feature of the demographic situation at the moment is the low birth rate and high mortality. The number of children and working-age population decreases, along with a simultaneous increase of pensioners and disabled people in particular. In such a situation, migration is particularly important.

Movement of the labor force in particular, the migration one is one of the most important aspects of the functioning of the labor market. The scale of migration and its structure facilitates redistribution of labor and employment potential of forming a specific territory.

Research which are the basis of this study is the result of the increased migration processes in Russia and of the intensified the migration policy of the Russian Federation.

Under these circumstances, evaluation of the specificity of the relationship of the Volgograd region population to legal and illegal migration in the Volgograd region as well as econometric analysis and forecasting of the dynamics of migration processes in the Volgograd region are relevant for research purposes. The objectives of the study are:

- Study of the current state of migration processes and the revealing of the trends in its dynamics
- Development of econometric models of demographic processes in the Volgograd region in the short term on the basis of the analytical method

LABOUR MIGRATION IN THE VOLGOGRAD REGION

Assessment of the prospects of migration movements in the Volgograd region: There are about 25,000 migrants in the region every year. However if before 1995 migration growth fully compensated the loss of population due to natural wastage in 1996 the reduced migration gain no longer fulfilled this role, the population of the area began to decline. This trend continues to grow today. In general, the demographic situation in the Volgograd region unfavorable there is a natural decline in population. Outflow of young people to the regional center as well as to other regions on the one hand and the increase in migratory flows from the republics of the Caucasus and Central Asia on the other hand, lead to the replacement of the native population of the region.

Volgograd region has been and remains the subject of migration attractiveness of the Russian Federation, especially for the citizens of the CIS member states due to its favorable geographical position, stability, socio-economic status, the availability of land, the similarity of climatic conditions and farming. If in 1990s migration in the Volgograd region had mainly forced character (we took the refugees and internally displaced persons) at the present time of course, the labor migration dominates.

Statistical data characterizing the dynamics of entry and exit of foreign nationals (hereinafter IG) and stateless persons (hereinafter referred to stateless persons) in the Volgograd region in the comparable period of 2011 and 2010 show a steady nature of migration processes in the region. So, during the 11 months of 2011, the office delivered the migration registration 95680 foreign citizens and stateless persons including 20,362 people arrived in the Volgograd region for the purpose of employment and mostly citizens of Uzbekistan and Tajikistan.

Reforming immigration legislation in terms of simplification of registration (migration registration) of foreign citizens, order processing and work permits brought a positive effect. So for example in 2005, foreign nationals were issued 4,081 work permits in 2006-4169 in 2010-17,327 and in 2011-18,030.

In addition, up to 1 July 2010 outside the legal field there were foreign nationals who were engaged in labor activity of citizens of the Russian Federation for their personal needs (housewives, workers cottages). Thus, foreign nationals have not been able to legalize their research.

By the end of 2011 to 18,030 foreign citizens who have a work permit added 11,033 foreign nationals who got patents (from 1 July 2010 in the migration legislation, the notion of "patentnikov").

In assessing, the prospects of migration movements in the Volgograd region negative factors must be considered: increase of the load on the labor market and housing as well as on the social sphere area:

- An increase in the cost of housing
- An increase in crime
- Destruction of the existing way of local life
- Aggressive behavior against the local population
- An increase in prices for food and essential commodities
- Reduced access to social services

To overcome these negative phenomena a comprehensive policy integration and adaptation of migrants are needed and this work in progress today.

So in December 12, 2014 a meeting of the interdepartmental commission on the implementation of the unified state migration policy in the Volgograd region was held. At the meeting the issues on the organization of the transition to a new mechanism for attracting and using foreign labor in the Volgograd region were discussed.

As stated earlier the production logistics in the region is heavily influenced by the volume of material and labor resources (Astafurova *et al.*, 2014). Therefore in the analysis of socio-economic development of the region, it is important to take into account the proportion of the working population in the migration growth.

Considering the demographic situation in the Volgograd region, it can be argued that migration is a factor shaping the size and quality of the region's population. Processing of statistical data and forecasting of labor migration in the Volgograd region. Based on the statistical data for the period from 1993-2009 the models that show the number of arrivals and the retired population at the end of the year were built.

The study of time series formed by the population and the number of arriving calculations of parameters trends of different shapes (linear, polynomial, exponential, exponential, hyperbolic, logistic, Gompertz trend) was carried out in the Statistica 6.0. The selection of the best form of trend to describe this process as a basis for estimating the approximation error was made. The Gompertz trend which is described by the equation:

$$y = 13756.77 + 100704 \times 0.86^t \quad (1)$$

Where:

y = The number of the population arrived

t = Time parameter was the best one

This type of model can not be reduced to a linear form and its parameters are determined by numerical

methods. Hooke-Jeeves and Quasi-Newton Method gives more accurate estimation of the parameters of this trend because it has a small value of the loss function (Final loss which corresponds to the standard method of least squares) as compared with other methods ($0 < r < 1$). The coefficient of determination $R^2 \approx 98\%$ which indicates the high quality of the model. With the package (MS Excel) the average error of approximation was calculated. In this case, $A \approx 7\%$. Therefore, the model is of good quality.

Similar actions aimed at time series formed by the retired population and the number of calculations of the parameters of trends of different shapes gave the following results. The best form of the model is also a Gompertz trend which is described by the equation:

$$y = 10216.65 + 60171.2 \times 0.92^t \quad (2)$$

Where:

y = The number of the population arrived

t = Time parameter

This type of model can not be reduced to a linear form and its parameters are determined by numerical methods as well as for time series formed by the population number arrived at the end of the year for the period from 1993-2009. The coefficient of determination $R^2 \approx 98\%$ and average error of approximation $A = 4.27\%$ confirms the good quality of the model.

After completing the point forecast of the changes in the number of the retired population in the Volgograd region until 2014 based on this form; it is clear that in the coming years there has been a negative migration growth. On average, the proportion of the working population in the migration gain is 64% (Maksjuta, 2008).

Next, the values of indicators for profits and the retired population of the Volgograd region in the 2010-2014 were determined as well as migration increase/decrease of the proportion of the working population attributable to migration growth based on Gompertz trend. The results of the forecasts models, described by the above regression equations show that in the coming years we should expect the migration of population decline (Table 1). These calculations are based on the data from using the package MS Excel.

In Column A of Table 1 the data on the number of arrived population (number of people) are contained; Column B; the number of the retired population (number of people); C; Migration growth/loss (persons); D; the proportion of the working population, attributable to migration growth (number of people).

Table 1: Changes in the number of arrivals and the retired population of the Volgograd region in 1993-2014 years

Years	A	B	C	D
1993	87932	60933	23699	17191
1994	97256	60929	36327	23131
1995	87632	62564	25068	15962
1996	73507	57935	15572	9915
1997	65041	51343	13698	8722
1998	56123	46543	9580	6100
1999	49390	45611	3779	2406
2000	42236	41197	1039	662
2001	34876	37210	-2334	-1486
2002	30961	33279	-2318	-1476
2003	29804	33299	-3495	-2225
2004	29406	32320	-2914	-1855
2005	27545	30515	-2970	-1891
2006	28119	29568	-1449	-923
2007	29276	30286	-1010	-643
2008	27698	29168	-1470	-936
2009	24447	25330	-883	-562
Forecasts				
2010	21041	23631	-2590	-1649
2011	20052	22558	-2506	-1595
2012	19198	21571	-2373	-1511
2013	18459	20662	-2203	-1403
2014	17821	19827	-2006	-1278

On the average, the proportion of the working population in migration growth -64% as reflected in the research (Maksjuta, 2008).

With the advent of the official statistics (the website of the Federal State Statistics Service) the test on the adequacy of the results obtained by comparing the forecast data constructed by the proposed model and the official statistics was conducted. The discrepancy of the data was 1% which corresponds to permissible errors, hence, this model can be used for further studies.

CONCLUSION

Volgograd region has a strong climatic potential for agricultural development. One of the problems which constraints the development of agriculture in the Volgograd region is the lack of able-bodied population. The outflow of the young people from rural areas continues. After analyzing the development trends of the demographic situation, we can say that the region has a low birth rate and high mortality. The labor migration becomes of particular importance in these conditions.

Historically, South Russia is the most multinational regions of Russia. The use of the migrant workers, especially from the subjects of the Russian Federation and the countries of the Common wealth of Independent States (CIS) is one of the areas of migration policy in the region. The study discusses the advantages and disadvantages of the process.

In addition, with the help of the econometric modeling and multivariate statistical methods economic and mathematical models and the forecast of changes in the

number of arrivals and the retired population are built. The results can be used in the regional administration in management decisions in order to improve the quality of life in the Volgograd region.

Migration is not a problem to be solved, it is the process to be controlled. And as for the Russian migration, it is not just the process but the resource without the skillful use of which the demographic and economic development of the country may come under question.

REFERENCES

- Astafurova, O.A., N.A. Salnikova and N.V. Lopukhov, 2014. Imitation modeling of city logistics. *Int. J. Collection Scient. Works SWorld*, 6: 77-81.
- Maksjuta, N.K., 2008. [On the strategy of socio-economic development of the Volgograd region until 2025]. The Law of the Volgograd Region (Appendix) on November 21, 2008, No. 1778-OD. <http://docs.cntd.ru/document/819076044>.