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"Global Challenges and Prospects of the Modern Economic Development"****INFLUENCE OF THE STATE REGULATION FACTOR ON  
POPULATION PROCESSES IN RUSSIA**

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***Abstract***

At present, the population is a key issue, because without human resources, it is difficult to imagine the planned development of any society. Demographic challenges require careful monitoring and changes in many economic, political, cultural, and social institutions that were formed in the past and remain adapted to the realities that no longer exist today. To understand the nature of population processes and forecast them, it is necessary to have a clear comprehension of the state role in regulating the fertility and mortality processes. In this regard, the subject of the study was the quantitative assessment of the influence of the state regulation on population processes in Russia. The study object was population processes. At the moment, there is no common methodology for such an assessment. Therefore, the authors propose to use statistical tools as the most adequate to solve the application task. The aim of the study is to form a quantitative assessment of the government regulation influence on population processes in Russia. To achieve this goal, a list of Federal legislative acts in the field of demographic development was compiled, and the analysis of their influence on the birth and death rate was carried out. The authors used general scientific and statistical methods in this study, in particular, the analysis of dynamics and time series modeling.

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## 1. Introduction

At present, the population is a key issue, because without human resources, it is difficult to imagine the planned development of any society. Demographic challenges are initially caused by enormous changes in a number of social processes that can be unified with the concept of demographic transition. These changes do not occur quickly, but lead to a large number of regular consequences. Therefore, demographic challenges require careful monitoring and changes in many economic, political, cultural, and social institutions that were formed in the past and remain adapted to the realities that no longer exist today.

In Russia, demographic policy is an integral part of the entire state governance. It requires the same regulatory measures as other spheres of society, such as economy, labour market or education. Despite this, the possibility to develop other sectors of life depends on the development of the state demographic policy. For example, Russia has developed a national women strategy for 2017-2022 that focuses on the involvement of women in decision-making in various spheres of society, namely economic, political, and public sectors. Another major project to maintain the demographic situation in the country is the Concept of Demographic Policy up to 2025 (Government Resolution of the Russian Federation No 669-R "On approval of the roadmap for the implementation of the III stage of the Concept of Demographic Policy", 2016). Its peculiarity is that different stages affect all population processes and in general, there is a stabilization process in such areas as natural increase and migration gain, and maintenance and improvement of health and living standards of the Russian population. Within the framework of fertility stimulation, the Federal Law "On additional measures of social support for families with children", which entered into force on 29 December 2006, plays an important role. It involves additional financial incentives for families in the form of maternity funds at the birth of the second (or subsequent) child (Federal Law No 256-FZ "On additional measures of social support for families with children", 2006). Under these conditions, the role of statistics is to evaluate the impact of the state regulation factor on population processes (to start with the fertility).

## 2. Problem Statement

The influence of the state regulation measures on population processes is a research issue that has become particularly relevant in recent years. First of all, it affected the countries from the top 10 in terms of population, where birth control has become the main demographic concept. We can mention studies on the state role to solve demographic problems in China (Cheng et al., 2019), Indonesia (Agustina et al., 2019), and India (Radkar, 2018). Many researchers studied the effectiveness of government measures in demography. For example, Novignon, Djossou, and Enemark (2019) conducted a study in Ghana that showed the need and, at the same time, low effectiveness of public campaigns to raise awareness about the high fertility dangers and contraceptive use on the example of developing countries. Sanz, Gandasegui, and Miguel (2019), based on a stochastic dynamic mathematical model, in which the family policy coefficient was included, compared 2 different models to provide resources to support families with children aged 0 to 3 years in Spain and Norway. The results showed that these services can actually affect birth rates if they are widely developed. U.N. Jindal offers a specific list of measures that the state

should take to increase "Mid-life fertility", for example, the elaboration of laws to treat infertility in the middle of life (Jindal, 2018).

Russian researchers have become interested in these scientific problems only in recent years. It is possible to mention the research devoted to criticism in regulating the housing services and utilities, pension reform, etc., because they lead to the aggravation of the demographic situation (Kudryashov & Sankova, 2019). A number of researchers examine the statistical data in the first decade of the maternity capital introduction and propose to extend the operation of this law, emphasizing its effectiveness (Kurdova & Efimova, 2018). Some papers deal with the issues of financial support for young families and families with children in the country (Elizarov, 2016).

At the same time, the authors of this study can mention the absence of scientific researches with the quantitative (statistical) assessment of the specific measures impact of state demographic policy on certain population processes (especially, on fertility and mortality), as the subject of the study.

### **3. Research Questions**

Demographic challenges are among the most important social challenges in the 21st century. To understand their nature and forecast them, it is necessary to have a clear comprehension of the state role in regulating the fertility and mortality processes. In this regard, the subject of the study was the quantitative assessment of the state regulation impact on population processes in Russia. The study object was population processes. At the moment, there is no common methodology for such an assessment. Therefore, the authors propose to use statistical tools as the most adequate to solve the application task.

### **4. Purpose of the Study**

The aim of the study is to form a quantitative assessment of the government regulation influence on population processes in Russia. To achieve this goal, a list of Federal legislative acts in the field of demographic development was compiled, and the analysis of their influence on the birth and death rate was carried out. The calculated forecast values were compared with the target indicators of demographic policy up to 2020.

### **5. Research Methods**

The authors used general scientific and statistical methods in this study. In particular, the analysis of dynamics and time series modeling. Forecasting on key indicators of demographic development is executed.

### **6. Findings**

A time series model was set up to identify the legislation impact on the birth rate in the Russian Federation. A parabolical trend was chosen with a binary variable X (legislative component), which reflects the presence of a legislative act in the field of infant natality from year to year. In the final model, the law on maternity funds (adopted in 2006, entered into force in 2007) and the increase in the maximum

size of prenatal allowance and maternity-leave provision due to the abolition of the unified social tax (adopted in 2009, entered into force in 2010) had a significant impact on fertility.

The authors note that binary variables were taken for each period lagged for 1 year due to the fact that after the law entered into force, its influence can be monitored in about a year (the fact of birth after conceiving can be observed only after 9 months). The determination coefficient, equal to 0.952, indicates a significant correlation between the factors. Upon Fisher-Snedecor's F-test, the overall model is significant, and the coefficient estimates are significant upon Student's t-test with 95% confidence. The time series model is as follows:

$$\hat{Y} = 8,00 + 0,61 * t - 0,03 * t^2 + 1,36 * x_{2008} + 1,51 * x_{2011}.$$

In this analysis the question is only about legal acts to support motherhood and childhood but not about living standards of the population, as a whole.

Thus, the legislative act on maternity funds, approved in 2006 and entered into force in 2007, had a positive impact on the fertility. After entering into force, the birth rate increased by an average of 1.36 births per 1,000 persons. The increase in the maximum amount of prenatal allowance and maternity-leave provision in 2010 had a similar positive effect. The birth rate increased by an average of 1.52 births per 1,000 persons.

Since 2000, the death rate in Russia has steadily increased until 2004 and amounted to 16.4 ‰. Since 2006, the systematic death rate reduction has begun, which indicates a reasonable demographic policy and a well-developed concept, but the decline is not equable. In 2009, the death rate was 14.1‰. In 2010, there was a slight increase in mortality to 14.2 ‰, but then there was a decrease. After that in 2018, there was again a slight increase in the death rate to 12.5 ‰.

Legislation in the field of mortality is also developing. In 2010, the Federal Law No 323-FZ "On health care of citizens in the Russian Federation" (2011) was adopted. In 2013, the Federal Law No 15-FZ "On health care protecting from the effects of tobacco smoke and tobacco use" (2013), the Decree of the President of the Russian Federation on 7 May 2012 No 598 "On improvement of the state policy in public health" (2012) and the Government Decree on 20 October 2016 № 2203-p "On the State strategy to prevent the proliferation of HIV infection in the Russian Federation for the period up to 2020 and beyond" (2016) were passed. Also the Strategy of road-traffic safety in the Russian Federation in 2018-2024 was developed and approved.

To identify the dependence of legislative acts influence on the death rate, a time series model was developed in a similar way. The only factor that has a significant impact on the death rate is the Federal Law No 323-FZ "On health care of citizens in the Russian Federation" (2011). The determination coefficient in the model is 0.914. The model is statistically significant upon Fisher-Snedecor's F-test, and the parameters are significant upon Student's t-test. Time series model is as follows:

$$\hat{Y} = 16,48 - 0,169 * t - 0,772 * x_{2010}.$$

Thus, at the 95% credible level, it can be said that with the implementation of this law, the death rate in the country decreased by 0.772 persons per 1000 persons of population on average.

For a comprehensive analysis of the government regulation influence on demographic policy in Russia, forecast models were built. The modeling was based on the key indicators of the Concept of Demographic Policy in Russia up to 2025. Forecasting provides a more complete picture on the implementation of the plan, including the physical progress of the demographic policy concept.

The following indicators were selected for modeling and forecasting:

- cumulative fertility rate,
- death rate.

The best model for predicting the cumulative fertility rate was the MA (1) model. As a result of point forecasting, the cumulative fertility rate in 2019 will be equal to 1.84 births per woman on average, and in 2020 to 1.87 at the 95% credible level. The interval forecast up to 2020 is presented in table 01. The time series formula is as follows:

$$\hat{Y}=1,17+0,03*t+0,61*e_{t-1}$$

**Table 01.** Point and interval forecast of the cumulative fertility rate in Russia from 2018 to 2020

Year	Point forecast	Constant error	Lower boundary	Upper boundary
2018	1.713	0.052	1.612	1.814
2019	1.841	0.060	1.723	1.959
2020	1.874	0.060	1.756	1.993

Thus, the increase of cumulative fertility rate is expected due to the planned reforms up to 2020. For example, a significant indexation of the amount of maternity funds, which was not in recent years due to the crisis situation in the country.

The Government Resolution of the Russian Federation No 669-R on 14 April 2016 "On approval of the roadmap for the implementation of the III stage of the Concept of Demographic Policy" includes the key goals of demographic policy up to 2020 (Government Resolution of the Russian Federation No 669-R "On approval of the roadmap for the implementation of the III stage of the Concept of Demographic Policy", 2016). These values were recognized by the authors as indicators to assess the purpose achievement in this paper.

According to the above-mentioned Government Resolution of the Russian Federation No 669-R on 14 April 2016, the goal in 2020 is to increase the cumulative fertility rate to the level of 1.87. In the constructed forecast model, this value will be reached in 2020.

On that ground, we can draw conclusion about the successful state policy in the fertility and systematic achievement of the goals, which favorably affects the natural reproduction of the population, as a whole. Similarly, the modeling of the death rate in Russia was carried out. The time series from 2000 to 2018 was analyzed, and forecasts up to 2020 based on ARIMA model AR (1) were made. The formula of the time series model is as follows:  $\hat{Y}=16,12-0,20*t+0,66*y_{t-1}$

According to the interval forecast at 95% credible level, in 2019 the death rate in Russia will range from 11.6 to 13.0 deaths per 1,000 persons, and in 2020 from 11.3 deaths to 12.9 deaths per 1,000 persons. Point predictions and constant errors of the model are presented in table 02.

**Table 02.** Point and interval forecast of the death rate in Russia from 2018 to 2020

Year	Point forecast	Constant error	Lower boundary class	Upper boundary class
2019	12.292	0.354	11.598	12.987
2020	12.089	0.424	11.258	12.920

As the result of the second concept phase was to achieve 10.1 % death rate, and the result of the third stage was to reduce it to 6.0 persons per 1,000 persons of population, the projected values at the level of 12.1 cannot be considered as an implemented plan. Despite this, the overall mortality rate continues to decrease, but at a different pace than the Concept of Demographic Policy up to 2025 forecasted. Perhaps, additional measures will lead to its rapid decline.

Thus, at the current development stage, the Russian Federation does not fully achieve the goals, and the situation requires additional support measures in the demography. This is essential to stabilize and establish at least a minimum positive natural population growth. Today, even at the expense of migration gain, the total growth of Russian population is negative. Consequently, the population is gradually declining, and the excess of the death over the birth rate in the country aggravates the situation.

## 7. Conclusion

Population processes, being externally spontaneous and autonomous, can be regulated. Despite the planned decline in the birth rate due to the demographic pitfall, the Russian state stimulates the birth rate of second and subsequent children and therefore, it resolves the problem in some ways. By improving the population health and environmental conditions, it is possible to reduce the mortality that results from not only internal but also external causes. Among other things, regional payments and subsidies are also possible. They do not depend on state legislation but in general, are also aimed at improving the demographic situation in a particular region.

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