

INCREASING GDP PRODUCTION IN THE RUSSIAN FEDERATION AND RAISING THE RETIREMENT AGE: IS THERE A CONNECTION?

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The study results obtained in the performance of the state task of Federal Research Centre "Kola Science Centre of the Russian Academy of Sciences" (in part of demographic forecast and method of constructing the model of GDP output) and RFBR project № 19-010-00022 (in part of problem statement, literature review, evaluation and discussion of the production of Russian GDP, taking into account the pension reform).

Abstract: This paper is devoted to assessing the impact of increasing the retirement age on GDP production in Russia. The research is grounded on the hypothesis that raising the retirement age is a significant factor that can significantly increase the rate of economic growth in Russia. Three objectives were solved for testing the hypothesis. The investigation of the models allowed us to establish a link between the increase in the retirement age and GDP production in Russia. The assessment showed that with the current economic model in Russia, the increase in the retirement age will lead to a slight increase in GDP relative to the old retirement scheme (on average, by 0.35 % per year). Investment in fixed capital and the number of working population were built in Russia.

Keywords: Russia, pension reform, raising the retirement age, modeling, economic growth, GDP production.

1 Introduction

The development of pension systems in almost all countries is at risk of population ageing, reinforced by the current global trends of declining productivity growth and increasing the risks of pension investments. The ways of solving the problem of population ageing from the perspective of the pension system are: raising the retirement age, reducing pension payments, increasing contributions to pension funds during working life. It is believed that raising the retirement age is the most preferred method. Therefore, raising the retirement age is a typical process in developed and developing countries.

The issues of connection between changes in the retirement age and the main macroeconomic indicators are relevant, both from a scientific and practical point of view. The importance of considering these issues from a scientific point of view is due to the fact that changes in the retirement age have different effects on the economic growth and social well-being of countries. The specificity caused by changes in pension systems affecting key macroeconomic indicators differs significantly from country to country. Therefore, the issues of determining the nature of interaction and changes in the main macroeconomic indicators in pension changes are relevant to clarify scientific ideas on the functioning of pension systems.

The practical significance of research on this topic is related not only to economic growth, but also to social stability and security. Thus, raising the retirement age, as a rule, is sharply and negatively perceived by the population. That is why, quite often, politicians are afraid to make decisions on raising the retirement age, despite the feasibility of making such decisions in accordance with the objective requirements of the economy. That is, the economic reasons for the need to solve the problem of population ageing, including the increase in the retirement age, are ignored. This pushes solving the problem into the future, shifting it to the next generation, which leads to aggravation of the problem and undermines the basis of well-being of future generations of pensioners.

In Russia, a new pension reform was approved in 2018 which gradually increases the retirement age of Russian citizens from 2019. Among the explanations for the need to increase the retirement age, the statements about the need to increase the number of the working population of Russia to ensure economic

growth prevailed. In this regard, independent assessments of the impact of pension reform on the economic development of Russia are relevant.

2 Literature Review

The issues of raising the retirement age are in the focus of world economic research. A huge number and variety of works generates many aspects and obtained results. Most of the studies consider the issues of retirement age from the perspective of filling the pension system of a certain country. The general tendency of ageing of the population of the developed countries of the world and the increase in life expectancy, including active life, causes an increase in the burden on the pension system. The resolution of this contradiction is either a reduction in pensions, or an increase in the retirement age, or an increase in pension contributions during employment (Orenstein, 2013).

According to Russian researchers, the Russian pension system and its development tendencies are completely within the framework of this paradigm of pension provision, which dominates in developed countries in the 20th-21st centuries (Sinyavskaya & Omelchuk, 2014; Sinyavskaya, 2017). It should be noted that Russian studies are generally consistent with the global research methodology and the basic conclusions (Baranov & Skufina, 2018; Solovyev, 2007, 2012). A certain specificity of Russian research is to consider pension benefits as factors of consolidation of the population in certain areas (Baranov et al., 2018; Samarina et al., 2018).

In world research, the risk of reduction in the amount of pension and the need to manage the problem of poverty with the help of minimum pensions is often noted (Chłoń-Domińczak & Strzelecki, 2013). Significant attention in the framework of these studies is given to the assessment of social consequences, consideration of the population's views on the planned pension changes, etc. (Adascalitei & Domonkos, 2015; Naczyk & Domonkos, 2016).

Returning to the problem of population ageing, we emphasize that the specifics of the functioning of the modern economy model of capitalism determines the popularity of the solutions to the problem of populating the pension system by increasing the retirement age (Barr & Diamond, 2009; Gurvich, 2011).

The objective possibility of increasing the period of working life of the population lies in a significant increase in the duration of active life in old age. This determined the relevance, scientific value and significant activity of the consideration of linkages between health issues and economic development (Acemoglu & Johnson, 2007; Weil, 2008). During considering these issues, the results of the studies were found to be diverse, often contradictory. Thus, it is generally recognized that there is a direct relationship between health and income of population (Preston, 2007). Communication occurs at both the intercountry and regional levels, as well as at the micro level (Andreev et al., 2002; Lorentzen et al., 2008; Regidor et al., 2003; Skufina et al., 2018). However, there is another fundamental dependence. Typical demographic features in developed countries, such as increasing life expectancy at low fertility, increase the tax burden on the working population due to the increase in budget spending on the maintenance of people of retirement age. A number of studies have shown that this has a negative impact on the economic growth of developed countries, but can have a positive impact on the economic development of poor countries (Bloom & Canning, 2000; Bloom et al., 2000). At the same time, studies show that the possibility of partial leveling of the problem by raising the retirement age is constrained for political reasons (Kalemli-Ozcan et al., 2000).

The diversity and some inconsistency of theoretical and methodological data on the possible impact on macroeconomic

indicators of the extension of the retirement age limits determine the importance of considering these issues in relation to Russia.

This paper contributes to the development of two areas of research. Firstly, there will be a contribution to scientific developments devoted to the search for links and patterns of interaction of the main macroeconomic factors in the context of the problem of raising the retirement age. Secondly, it continues a series of studies devoted to forecast of demographic development, in particular the number of the working population of Russia, taking into account the increase in the retirement age.

3 Research Methodological Framework

The objective of the research is to find out whether the increase in the retirement age affects the production of GDP in Russia.

Objectives:

1. to consider the current dynamics and make a forecast of a number of the working population of Russia, taking into account the increase in the retirement age (in three variants);
2. to build models of production in Russia, linking GDP, investment in fixed capital, the number of working population;
3. to quantify the impact of raising the retirement age on the production of GDP in Russia.

The research is based on the hypothesis that raising the retirement age is a significant factor that can significantly increase the rate of economic growth in Russia.

It was noted that issues that concern discussing any changes in the pension system of any country are closely related to policy. In order to level this subjective component, most of the scientific papers that address the problem of identifying the consequences of pension changes, their relationship and interdependence with macroeconomic indicators and economic growth determine the priority of quantitative assessments.

Requirements of reliability and availability of initial data defined the use of available official statistical data of Federal State Statistics Service of the Russian Federation (2019) presented on the website of this organization: demographic statistics, statistics of macroeconomic indicators, long-term macroeconomic forecast, long-term population forecast.

Achieving the objective of our research aimed at determining the impact of increasing the retirement age on GDP production in Russia requires the use of two approaches.

The first approach is to forecast the number of working population taking into account changes in the retirement age. Consideration of the forecast dynamics of the number of working population is determined by two circumstances: first, by the importance of this factor for social production, in particular, GDP production (Baranov et al., 2018; Baranov & Skufina, 2018); second, it allows us to consider the accumulated demographic problems in Russia (Vishnevsky et al., 2012).

The forecast calculations of the working population of Russia were made in three variants on the basis of demographic indicators by age groups, taking into account the new step-by-step scheme of raising the retirement age, the long-term macroeconomic forecast of the Ministry of Economic Development and the demographic forecast of the population presented on the website of the Federal State Statistics Service of the Russian Federation (2019).

The second approach is to model GDP production.

Pension reform directly regulates the number of working population. Therefore, in order to identify the impact of raising the retirement age on GDP production, it was necessary to find a link between these indicators. Relations were considered: between GDP and the working population and between

investment in fixed capital and the working population (period 1995-2017). Then, the ratio which essentially represents the production function of Cobb-Douglas (Cobb & Douglas, 1928; Felipe and Adams, 2005) was derived, and the calculation of the coefficient of elasticity, which allowed to quantify the impact of changes of the resource (in our case, the population of working age) on production (GDP production).

4 Findings and Discussion

4.1 Forecast of a Number of the Working Population

Consideration of the current dynamics of statistical indicators shows a steady decline tendency in the number of working population in the Russian Federation observed since 2006 (table 1).

Table 1 Number of working population of the Russian Federation (pers.)

Years	Number of working population (pers.)
1995	84331542
2000	87172272
2005	90098674
2010	88561160
2015	85414747
2017	83224418

Source: authors on the basis of the Federal State Statistics Service of the Russian Federation, 2019

The results of our calculations of the number of working population expected in the period up to 2036 are given in table 2.

Table 2 Forecast of the number of working population (pers.) of Russia for the old and new pension systems

Years	Forecast for the old pension system (55 years for women, 60 years for men)			Forecast for the new pension system (60 years for women, 65 for men)		
	Low	Medium	High	Low	Medium	High
2018	82186726	82239737	82274008	82186726	82239737	82274008
2023	78461732	79250407	79946885	82051969	82872363	83601680
2028	77072093	78958434	80561029	85396661	87484946	89278382
2029	77037558	79161414	80954711	85331000	87684703	89694809
2034	76117779	79480576	82130180	87789645	91656411	94795289
2036	75045715	79038856	82207835	87069960	91662393	95410391

Source: authors on the basis of the Federal State Statistics Service of the Russian Federation, 2019

While maintaining the working age of 16-54 years for women and 16-59 years for men (without raising the retirement age), further decline in the number of working population in all three options is forecasted.

The pension reform will slow down the decline in the number of working population in Russia. The value of 2006 with a high variant of the forecast will be achieved by 2029, with a medium variant – by 2032, with a low variant – the value of 2006 will not be achieved (table 2).

4.2 Modeling the Production of GDP of Russia

In order to establish the connection between the increase in the retirement age and the production of GDP in Russia, the ratio of GDP to the number of working population and the ratio of investments in fixed capital to the number of working population for 1995-2017 were calculated. The correlation coefficient between these values is 0.99. Consequently, there is a close linear relationship between these indicators. This means that there is a linear relationship between the logarithms of these relations. The link is of the following type:

$$\ln(Y/L) = p \cdot \ln(K/L) + a, \quad (1)$$

where Y is GDP; K is investment in fixed capital; L is the number of working population; p and a are regression parameters.

Expressing Y in terms of the ratio (1), we get

$$Y = AK^p L^q, p + q = 1 \quad (2)$$

Expression (2) is the production function (PF) of Cobb-Douglas (Cobb & Douglas, 1928; Felipe & Adams, 2005), where $A = \exp(a)$ is neutral technical progress, p is the elasticity coefficient for labor (a number of the working population), q is the coefficient of capital elasticity (investment in fixed capital).

The elasticity coefficient determines the impact of changes of the resource used in production on the production volume. For example, if labor (L) in (2) changes in x times, then GDP will change in x^p times. The logarithmization of the linear relationship of GDP values and fixed capital investments, which were scaled to the number of the working population, was performed for the transition to elasticities.

According to this pattern, we obtain the linear relationship between the logarithms of the ratios of GDP (Y) to the number of employees (E) and investments in fixed capital (K) to the number of employees (correlation coefficient is equal to 0.98): $\ln(Y/E) = p \cdot \ln(K/E) + a$. Expressing Y , we get:

$$Y = AK^p E^q, p + q = 1, \quad (3)$$

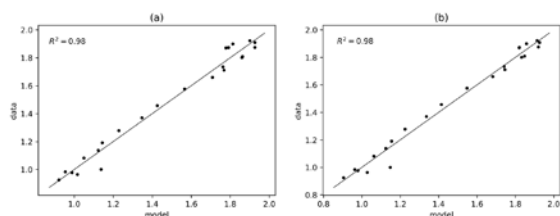
$A = \exp(a)$ is neutral technological progress, p is labor elasticity coefficient (number of employees), q is capital elasticity coefficient (investments in fixed capital). This expression is PF of Cobb-Douglas, which relates GDP, fixed capital investments and working population.

We will note that the values of the estimated parameters A , p , q are different in the expressions (2) and (3).

The estimation was carried out by the method of least squares according to the data for 1995-2018, the indicators were normalized to the volume indices with regard to 1995.

The models have a high coefficient of determination $R^2 = 0.98$, which indicates a good compliance of the models with the initial data (fig. 1). The estimated labor (p) and capital (q) elasticities for models (2) and (3) are within the range of 0 to 1 (table 3). This indicates the following: 1) GDP output grows with the increase in resources (capital and labor); 2) the output growth slows down with the growth of resources. The values of p and q show that GDP production is determined by the number of working population by 48.7% (42.8%) and by investments in fixed capital by 51.3% (57.2%).

Figure 1 Comparison of actual and model values of the GRP volume index for 1995-2018 with regard to 1995 (a) – model (2) was used, (b) – model (3) was used. R^2 is determination coefficient. The black line is the straight line of the best correlation



Source: authors

4.3 Evaluation of the GDP Production, Taking into Account the Pension Reform

We introduce the following notations. Let us assume that L_r is the ratio of forecast of the working population for the new and the old (women – 16-54 years, men – 16-59 years) retirement schemes; $q_2 = 0.428 \pm 0.041$, which is the elasticity estimate for the working population obtained by the model (2); $q_3 = 0.487 \pm 0.044$, which is the elasticity value estimated by the model (3) for the number of employed (table 3). Then, the expected change

in GDP as a result of the pension reform is $Y_r = L_r^{q_2}$, and the expected change in employment is $E_r = L_r^{q_2/q_3}$

Calculations show the following (table 3). The L_r ratios are the same for low, medium, and high forecast variants. By 2036, L_r will increase by 16% compared to 2018; the average growth rate of L_r will be 0.83% per year. By 2036, Y_r will increase by 6.5% compared to 2018; the average growth rate Y_r will be 0.35% per year. To ensure GDP growth by 2036, E_r will increase by 14% compared to 2018; the average growth rate of E_r will be 0.73% per year.

Table 3 The ratio of the working population (L_r), GDP (Y_r) and employment (E_r) which were calculated taking into account the increase in the retirement age in relation to the corresponding values under the old retirement scheme (women – 16-54 years, men 16-59 years).

Year	L_r	Y_r	E_r
2018	1	1	1
2023	1.046	1.019	1.040
2028	1.108	1.045	1.094
2033	1.138	1.057	1.121
2036	1.160	1.065	1.139

Source: authors

Thus, quantitative estimates show that an increase in the retirement age will lead to a slight increase in GDP (an average of 0.35% per year) relative to the old retirement scheme.

5 Conclusion

The calculations of the number of working population of Russia confirmed the importance of the problem of population aging. The steady decline tendency in the number of working population in Russia is observed since 2006. Our calculations show that the increase in the retirement age will not allow to break this tendency. Thus, according to the obtained estimates, further decline in the number of working population in all three variants of the forecast is predicted. Pension reform will only slow the speed of this decline. The greatest risks in the labor market are caused by the low variant of the forecast of Russian demographic development. It should be noted that in this scenario, the pension reform will not allow to reach the number of working population of 2006 (let us remind that 2006 is the beginning of the reduction). In the case of a high and medium variant of the forecast, the value of the working population of 2006 will be reached by 2029 and by 2032 (respectively).

The built models of GDP production in Russia demonstrate good compliance with the initial data (determination coefficient $R^2 = 0.98$). The investigation of the models showed that GDP production is determined by the number of working population by 48.7% (42.8%) and by investments in fixed capital by 51.3% (57.2%).

The built models allowed us to establish a link between the increase in the retirement age and GDP production in Russia. However, the quantitative estimates showed that with the current economic model in Russia, the increase in the retirement age will lead to a slight increase in GDP relative to the old retirement scheme (on average, by 0.35 % per year).

This disproved our hypothesis that raising the retirement age is a significant factor that can significantly increase the rate of economic growth in Russia.

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