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Assessment of the Direct Economic Effect of Increasing the Retirement Age in Russia

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***Abstract*—The article is devoted to the assessment of direct economic effect of gradual increase of the retirement age in Russia from 2019 to 2028 by 5 years for men and women. The importance of obtaining such a quantitative assessment is substantiated and the methodology is validated. The methodology includes: 1) a three-variant forecast of the working-age population, taking into account the shift in the size of working-age population starting 2019 due to an increase in the retirement age;2) economic and mathematical models based on production functions that allow to reliably assess the impact of the increase in the retirement age on the production of Russian GDP. Based on real statistical data, a three-variant forecast of the working-age population in Russia has been compiled, taking into account the increase in the retirement age. Analysis of the results of three variants of our prognosis showed that the increase in the retirement age not only halted the steady downward trend in the size of working-age population, but also broke the trend, indicating an increase in the size of working-age population in Russia. A study of the constructed economic and mathematical models has shown that raising the retirement age will lead to a slight increase in Russian GDP (by about 0.35% annually). Thus, without significant structural changes in the economy, the direct effect of raising the retirement age in Russia is hardly noticeable in the GDP production.**

Keywords—Russia, increasing retirement age, modeling, working-age population, GDP

I. Introduction

In Russia, on October 3, 2018, the Federal Law No. 350-Fz "On amending certain legislation of the Russian Federation on the awarding and payment of pensions" was adopted, according to which starting 2019 began a gradual (from 2019 to 2028) increase in the retirement age by 5 years for men and 5 years for women. In 2028, the transition period will end and the retirement age in Russia will be set at 65 years for men and 60 years for women. As noted by us and other researchers, the characteristic feature of the adoption of this law is the lack of public discussion, including practical lack of assessments of the necessity and consequences of increasing the retirement age in Russia by the scientific community [1, 2]. This aspect has given rise to a multitude of differing opinions about the consequences of the adoption of the law increasing the retirement age. We need to note that various kinds of dramatically negative assessments began to appear, which in a number of cases were based just on the opinions of authors themselves, supported by the results of population surveys. At the same time, it is obvious that in no country in the world will the population ever support raising the retirement age. Raising the retirement age is always a forced response to the well-known global problem of population ageing [1, 3]. The above defines the methodological feature of our study, using the official statistics data of Russia as its basis and applying economic and mathematical methods. This will allow us to present objective assessments of the impact of the change in the retirement age on the economic processes in Russia.

The goal of the article is to provide the author's estimates of the impact of the change in retirement age on the size of working-age population in Russia and the production of Russian GDP based on the results of economic and mathematical modeling.

II. Results and Discussion

A. Forecast of the working-age population in Russia

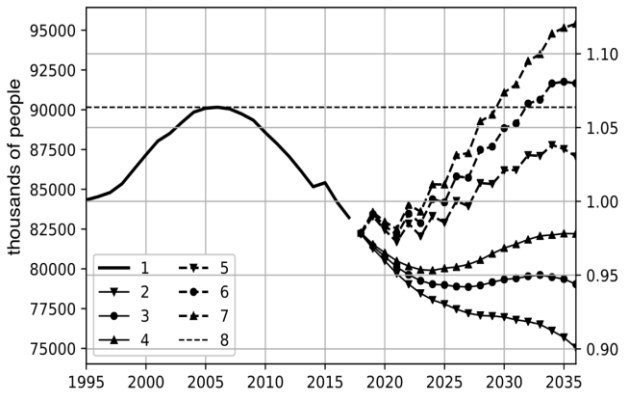
In order to assess the direct effect of the increase in the retirement age on the Russian economy, first of all, it is necessary to estimate the shift in the size of working-age population in the country, caused by the increase in the number of years of labor force participation of the population.

The need for such an assessment is dictated by the use of classical [4, 5] and modern [2, 6, 7] notions of the fact that it is labor and capital that are essential elements of the country's production processes that determine the production of GDP. At the same time, numerous, including authors' own, studies claim that specific economies are characterized by certain parameters and ratios of factors of production, which are relatively constant [4-7]. As part of this approach, we will be decomposing the output of Russian GDP while reviewing the link between GDP production and the growth of the working-age population.

We need to note the key importance of the working-age population size to increasing public production, GDP production in particular. The importance of considering the dynamics of the working-age population is also determined by its reflection of accumulated demographic problems [1, 2, 8].

The calculations use data of the Federal State Statistics Service; Russia's demographic forecast until 2036 in three variants [9], and a scheme of gradual raising of the retirement age in Russia. Specifics of the forecasting are detailed in the paper [10].

Based on these data, we calculated the size of working-age population in 2019-2036 compared to 1995 (Fig. 1). The forecast is made in three variants, as three variants of the population forecast of Russia lie at the heart of our prediction.



Source: Authors' calculations

(1) Data for 1995-2018 according to the previous retirement age (55 for women and 60 for men): low (2), average (3), high (4) variants of the forecast. Forecast values for 2019-2036 under the new retirement scheme (60 for women and 65 for men): low (5), average (6), high (7) variants of the forecast. (8) the line indicating the maximum size of working-age population. On the right axis, the values of the indicator are marked relative to 1995

Fig. 1. Dynamics of the working-age population (thousands people) for 1995-2036

A review of the dynamics of the size of working-age population shows that since 2006, there has been a steady downward trend in the size of working-age population in Russia. If the old retirement age was to be maintained, this trend would continue.

Increasing the retirement age has not just increased the size of working-age population. The pension reform broke the steady downward trend in the working-age population, changing it to the opposite trend of growth (Fig. 1).

Thus, the increase in the retirement age in Russia has boosted one of the main factors of national production, the working-age population, breaking the steady trend of reducing this indicator.

B. Model of GDP production

The increase in retirement age boosts the size of the working-age population. The economic effect of increasing the main factor of production should be displayed in GDP growth. It is clear that in order to assess the impact of higher retirement age on GDP production, a link must be found between the size of working-age population and GDP. We need to note that our research has proved that for Russia, the main factor of capital in the models of production functions, describing the production of GDP, is the investment in fixed capital [2, 11].

We will consider the ratio of GDP to the size of working-age population and the ratio of fixed capital investment to the size of working-age population for 1995–2018. Calculations have shown that the correlation between these ratios is 0.99. This indicates a high probability of a linear relationship between these ratios.

However, in order to determine the impact of the change in the resource used in production on the volume of output, we need to transition to the logarithms. This will allow us to calculate the elasticity factor. Since there is a logarithmic relationship between the ratios, the linear relationship is also present between the logarithms of this relationship (1):

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

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

Expressing Y from the ratio (1), we get:

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

Expression (2) is a Cobb-Douglas production function (PF), where $A = \exp(a)$ is a neutral technological progress, p is labor elasticity coefficient (the number of working-age population), q is capital elasticity coefficient (investment in fixed capital).

In a similar way to the above, we can obtain a linear relationship between logarithms of ratios of GDP (Y) to the number of employed(E)and fixed capital investment (K) to the number of employed (3). Calculation of the correlation coefficient has shown that it equals 0.98.

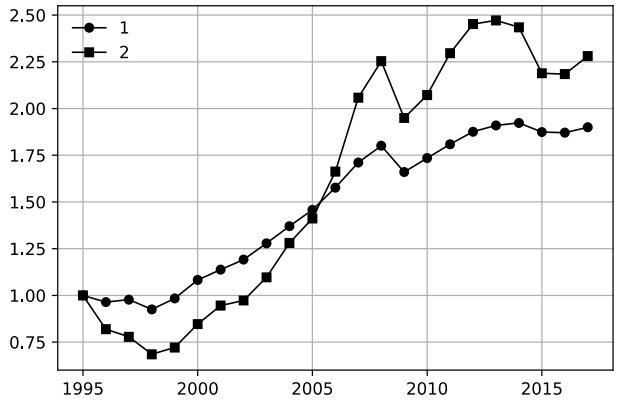
$\ln(Y/E) = p \cdot \ln(K/E) + a$. Expressing Y, we will get:

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

$A = \exp(a)$ denotesa neutral technological progress, p is the labor elasticity coefficient (number of employed), q is the capital elasticity coefficient (investment in fixed capital).

This expression is the Cobb-Douglas PF, linking GDP, fixed investment and the working population.

Parameters of this model were evaluated using the least squares method. Its indicators were related to the physical volume indices relative to 1995 (Fig. 2).



Source: Authors' calculations

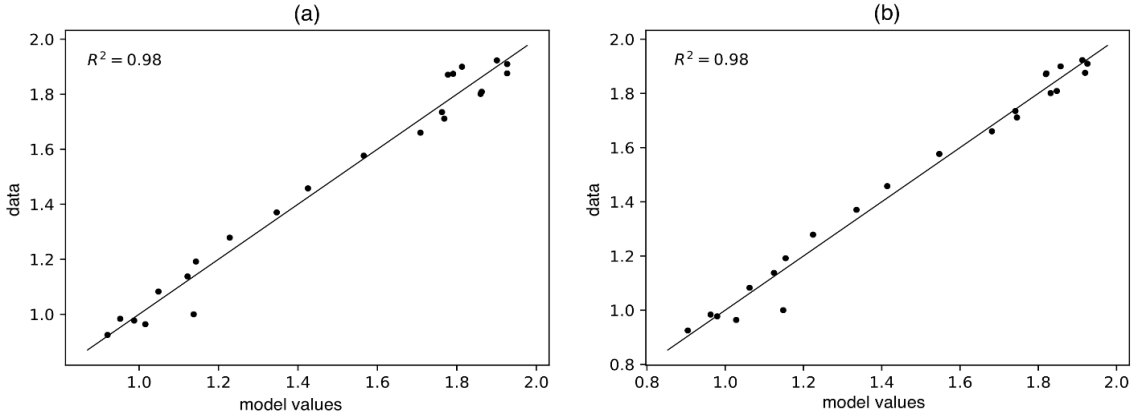
Fig. 2. Dynamics of GDP volume (1) and fixed capital investment (2) indices, cited relative to 1995

Models have a coefficient of determination of $R^2 = 0.98$, which indicates a good match between the models and the source data (Fig. 3).

Estimated values of elasticity of labor(*p*)and capital(*q*)for models (2) and (3) lie within the range of 0 to 1. Our calculation of the values of *p* and *q* showed that GDP production is approximately equally determined by the labor factor and the capital factor (49% is determined by the size of the working-age population and 51% is determined by investments in fixed capital).

C. Estimating GDP production based on the increase in the retirement age

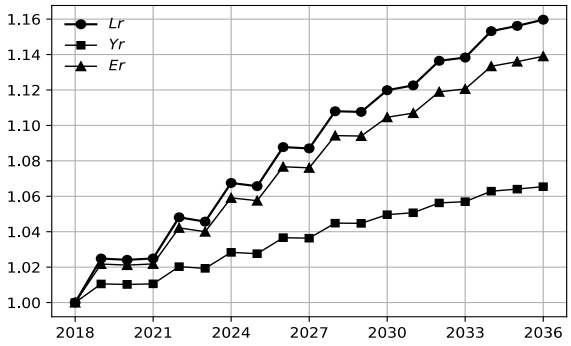
The established link between GDP and the size of working-age population allows us to estimate the direct economic effect of the increase in the retirement age on Russian GDP production.



Source: Authors' calculations

Fig. 3. Comparison of actual and model values of the volume GDP index relative to 1995. (a) model (2), (b) model (3) was used. R^2 is the determination factor. Black line is the best fit straight line

Let *Lr* be the ratio of the projections of the size of working-age population under the new and old retirement schemes; $q_2 = 0.428 \pm 0.041$is model (2) elasticity estimate by the size of working-age population; $q_3 = 0.487 \pm 0.044$ is model (3) elasticity estimate by the number of people employed. Then, the expected change in GDP as a result of the pension reform is $Yr = Lr^{q_2}$, and the expected change in the number of people employed$Er = Lr^{\frac{q_2}{q_3}}$ (Fig. 4).



Source: Authors' calculations

Fig. 4. Relationship of the working-age population (*Lr*), GDP (*Yr*) and the number of employed (*Er*), calculated on the basis of the increase in the retirement age to the corresponding values calculated under the old scheme of retirement

The calculations demonstrate that by 2036, *Yr* will increase by 6.5% compared to 2018. That is, the average growth rate of *Yr* will be 0.35% per year. This indicates that the increase in the retirement age will lead to a slight increase in Russian GDP.

III. Conclusion

As a result of this research, quantitative assessments have been obtained, which allowed us to draw important conclusions.

Firstly, the increase in the retirement age has had a positive impact on the growth of the working-age population in Russia. In all three versions of our forecast of the working-age population, taking into account the effect of increasing the retirement age, the negative trend of decrease of this indicator has been broken.

Secondly, economic and mathematical modeling has made it possible to establish a link between the production of Russian GDP and the number of people of working age. It has been established that the production of Russian GDP will increase due to the increase in the size of working-age population due to the increase in the retirement age.

However, the forecast calculations made until 2036 indicated that in the current Russian economy, this increase

will be very small, 0.35% per year on average. This allows us to draw the third important conclusion.

Thirdly, a more pronounced effect from an increase in the size of working-age population in Russia can be obtained only by changing the current model of the economy, which determines the specifics of the interaction of the labor factor and the capital factor.

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