Forecasting the Effects of Raising the Retirement Age on Russia's Demographic Structure*

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Abstract. The paper assesses the possibility of raising the retirement age to mitigate the effects of ageing on the pension system of Russia. The authors make demographic forecasts based on hypotheses about the presence of global demographic trends in population reproduction and manifestations of development features specific for Russia. The demographic forecast is based on the age shifting method according to three scenarios. The forecast takes into account the provisions of a draft law that has already been approved and that provides for a gradual increase in age limit for civil servants, both men and women, to 65 years (by six months each year). The following assumption is made for the purpose of studying the effects of raising the retirement age to 65 years for all categories of Russian citizens. The increase in the retirement age begins in 2016 at the rate of 6 months per year, and it will end for men in 2026 and for women – in 2036. Thus, by

2036, the official retirement age will be 65 years for both sexes. The resulting forecasts show that population ageing in Russia is an inevitable process. Depending on whether demographic processes are in line with global trends or whether certain specific Russian features of development are revealed, ageing process will occur in the first case – "from above", in the second case – "from below". The forecast has confirmed a well-known paradox that if the situation regarding the decline in mortality is improved further, as has happened in recent years, then the pace of ageing that negatively affects the balance of the pension system will be even higher, at least in the medium term. Forecast calculations have shown that, first, demographic burden on the working population will continue to increase under any demographic development scenario implemented in Russia, and most significantly, under a scenario that describes a successful demographic policy. Second, the number of retirement age women is a significant potential reserve for decreasing the demographic burden on able-bodied population. It appears that raising the retirement age is feasible but it should be carefully prepared so as to be implemented gradually and accompanied by several additional measures.

Key words: pension system, retirement age, demographic forecast, population ageing, global demographic trends and Russian peculiarities.

Introduction

Population ageing is a major challenge of modern pension insurance. This phenomenon has become a universal trend, and it is observed in Russia as well. *Table 1* presents dynamics of change in the share of elderly persons in various countries. According to international criteria, population is considered old if the share of people aged 65 years and over exceeds 7% in it [12]. According to this indicator in 2015, Russia ranked 47th (13.4%) [3].

However, unlike developed countries, the main demographic cause of population ageing in Russia is decline in fertility, rather than increase in life expectancy, i.e. ageing occurs "from below". As a result, currently, the age structure of Russian population is relatively younger than that in developed countries. Nevertheless, in the course of 25 years the proportion of people of

pension age increased from 18.5 to 24.0%; in 2015, there were 41 people over working age per 100 people of working age. These age proportions not only remain, but also increase, which leads to an increase in the demographic burden on the economy and to the growth of imbalances in the pension system budget.

Raising the retirement age seems to be the easiest way to reduce the number of pensioners and the volume of expenditures of the pension system and to increase insurance payments by increasing the number of their payers. In Russia, the statutory retirement age is the lowest among all countries that have a nationwide system for compulsory pension insurance [35]. Retirement age for men is 60 years for women – 55 years. It was established back in 1932 on the basis of examination of workers who retired due to disability, and

Table 1. Proportion of persons aged 65 and over in total population, %

Countries	1981	1991	2001	2011	2015
Argentina	8.3	9.2	10.0	10.5	10.9
Brazil	3.8	4.1	5.2	6.9	7.8
India	3.7	3.9	4.5	5.2	5.6
China	4.6	5.4	6.8	8.4	9.6
Mexico	3.9	4.3	5.1	6.0	6.5
United States of America	11.5	12.6	12.3	13.3	14.8
South Africa	3.1	3.2	4.1	5.0	5.0
Japan	9.3	12.4	17.7	23.6	26.3
Eastern Europe, including	*10.9*	*11.4*	*13.4*	*14.7*	*15.5*
Russian Federation	10.3	10.6	12.7	13.1	13.4
Ukraine	11.8	12.4	14.2	15.8	15.3
Czech Republic	13.3	12.8	13.8	15.9	18.1
Northern Europe, including	*13.2*	*13.7*	*14.6*	*16.3*	*17.7*
UK	15.1	15.8	15.9	16.4	17.8
Finland	12.1	13.6	15.1	17.6	20.5
Southern Europe, including	*9.7*	*10.7*	*13.8*	*16.1*	*17.5*
Italy	13.3	15.2	18.4	20.8	22.4
Spain	11.2	13.7	16.7	17.4	18.8
Western Europe, including	*14.0*	*14.4*	*15.5*	*17.2*	*18.2*
Germany	15.5	15.0	16.6	20.8	21.2
France	13.8	14.3	16.2	17.3	19.1

Source: World Bank Data [3].
Note. Grouping of European countries according to the UN [1].

since then it has not been raised, although the nature and conditions of work have changed markedly [34]. But in developed countries, retirement age for men is 65 and for women – the same or close to it. Raising the retirement age is a common response to population ageing [14]. It is necessary to note two main points in the international experience of raising the retirement age. First, gender differences in the age of retirement are not taken into consideration at all or they are reduced. Second, raising the retirement age is a long-term process, it is carried out gradually and has a transition period.

In order to find out whether raising the retirement age is able to mitigate the effects of ageing on Russian pension system, a study was carried out, which consists in constructing forecasts based on hypotheses that global demographic trends and specific Russian features can be distinguished in population reproduction processes.
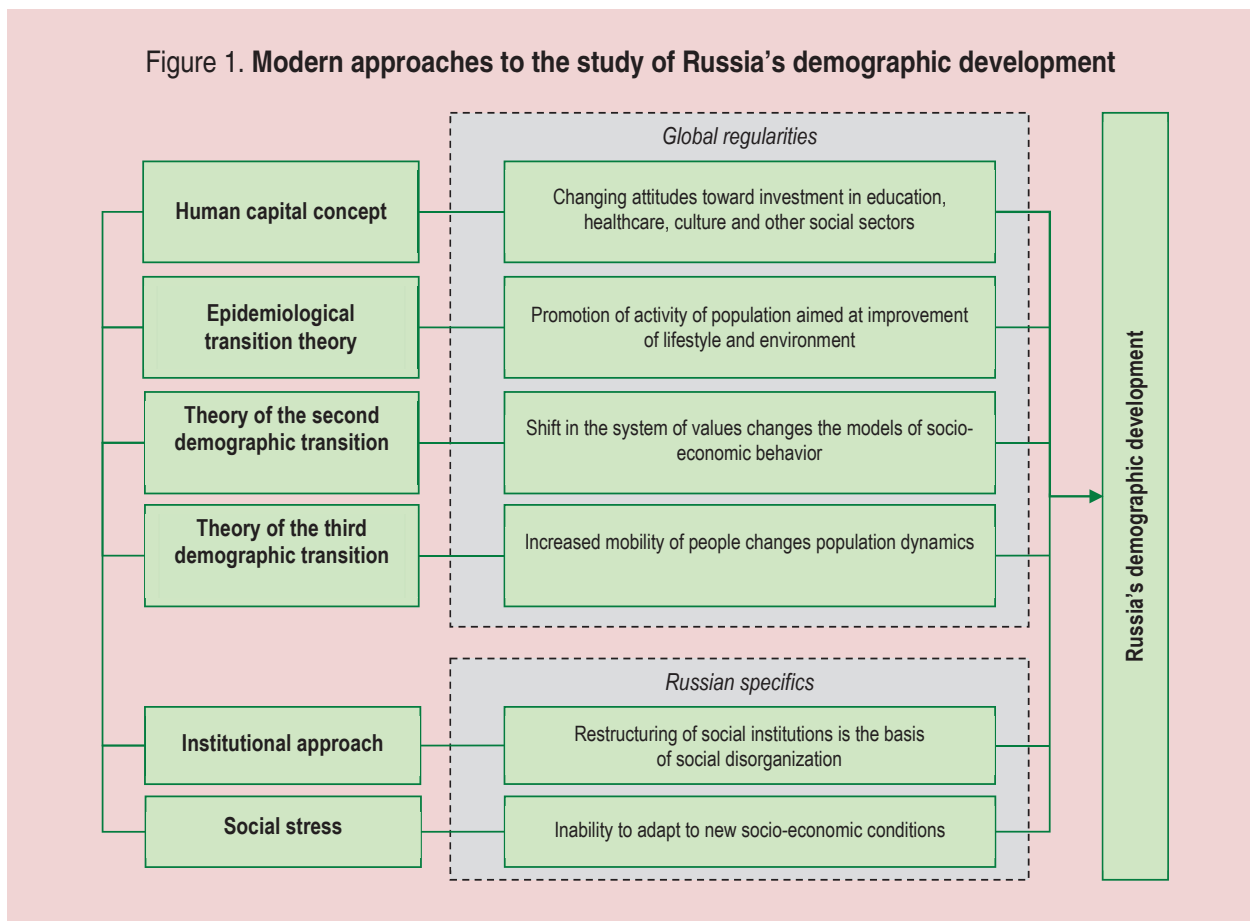
Theoretical and methodological basis of forecasting

Potential ways of Russian demographic development depend on the causes of the ongoing changes. In the global context, Russian demographic trends, on the one hand, are closely intertwined with the changes in developed countries; on the other hand, they demonstrate their specifics. There are several theories of demographic development, and they can be divided into two groups.

The first group comprises theories according to which all countries in their development pass consecutive steps and their identifying determinants are universal for the global process. Such theories include the concept of human capital [4]. This concept for the first time shows the area of practical application for the theory of investments in the "human factor". Mobilization of enormous resources, including the costs of health care, environmental protection, development of scientific research and substantial revision of health legislation – all this helped develop social infrastructure and thereby curb the adverse effects of physical and social environment on demographic development. As a result, there is a change in the patterns of mortality by causes of death, and the center of gravity shifts from the causes weakly associated with age, to the causes strongly associated with it. Such transformations formed the basis of epidemiological transition theory [27]. Along with epidemiological transition theory, modern science uses the theory of the second demographic transition [2; 5] that explains the emergence of new patterns of socio-demographic behavior caused by a given socio-economic environment. Demographic changes are associated not only with natural population reproduction, but also with its increased mobility. Immigration makes a significant contribution to the dynamics of local population and its composition. This allowed D. Coleman to formulate the concept of the third demographic transition – a special phase in the development of population during which the most significant contribution to the dynamics of population is made by migration [20; 21].

Russia's specifics consist in the fact the main transition stages are delayed, due to which the problems that have not been resolved at the previous stages move on to the subsequent stages of transition; besides, Russia has its own trends and features in social and economic development of its regions. The second group comprises theories that explain Russia's development specifics. The functioning of institutions is of particular importance from the viewpoint of demographic development characteristics. Under the influence of sudden economic, political, natural and other changes in the external environment,

Figure 1. **Modern approaches to the study of Russia's demographic development**

	Global regularities	
Human capital concept	Changing attitudes toward investment in education, healthcare, culture and other social sectors	
Epidemiological transition theory	Promotion of activity of population aimed at improvement of lifestyle and environment	**Russia's demographic development**
Theory of the second demographic transition	Shift in the system of values changes the models of socio-economic behavior	
Theory of the third demographic transition	Increased mobility of people changes population dynamics	

	Russian specifics
Institutional approach	Restructuring of social institutions is the basis of social disorganization
Social stress	Inability to adapt to new socio-economic conditions

there emerge destructive situations in the functioning of institutions, the so-called "institutional traps"[1]. According to N. Rimashevskaya, the 1990s reforms had a negative impact on socio-demographic development by greatly reducing the quality of living conditions and standard of living, increasing social stress and instability; besides, there emerged insurmountable difficulties in adapting to transition to the market system [33]. The set of pathological processes that in the course of the reforms caused the development of super-high and very early mortality of working age persons, health deterioration and negative natural population growth − B. Velichkovskii defines all these issues as social stress [10].

Systematization of theoretical approaches to research on Russian demographic development slowed us to note the dual nature of this development *(fig. 1)*. On the one hand, demographic processes take place under global development patterns, under the influence of alteration in value systems and lifestyles, and attitude toward education, healthcare and other social sectors. Such changes lead to certain qualitative demographic transformations:

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[1] Institutional traps are inefficient, persistent behaviors [26].

• increase in the average age of marriage and motherhood reduces the contribution of young women to fertility;

• transition to effective methods of family planning reduces the incidence of abortion;

• dissemination of marriage types that are different from the traditional model of marriage leads to an increase in the number of children born out of wedlock;

• empowerment of women, and gender equality in the labor market result in the fact that women delay motherhood to a more mature age, women have obtained an opportunity to use the childless period of their life for educational and economic purposes;

• modern healthcare greatly increases survival chances, so the decline in mortality is accompanied by a decline in the ratio of its exogenous and endogenous components: exogenous mortality becomes better controlled and its contribution decreases;

• change in the structure of diseases puts non-infectious diseases, especially cardiovascular disease and cancer, on the first place among threats to human health and life;

• endogenous factors in the development of the body, associated with its natural ageing, are unavoidable like the aging process itself, they lead to the shift of mortality to older age groups.

On the other hand, current demographic trends in Russia are caused by socio-economic changes that triggered Russian anomalies (high mortality, especially in men and from preventable causes), and by demographic policy that ensures certain natural population growth since 2012 onward.

Thus, there can be three possible scenarios of demographic development in Russia. First, the complicated current economic-political situation in the country may cause deterioration of people's financial situation and uncertainty about economic stability in the future, which will lead to the maintenance of high mortality and low fertility, which preserves natural population increase at the zero level. Second, vigorous efforts in the framework of current demographic policy can help achieve a significant increase in life expectancy (which will be in line with demographic patterns) and an increase in fertility (manifestation of development specifics). Third, in the future Russia can enter into "final" stages of demographic and epidemiological transition and will be in the Western European trend of population reproduction, which implies a significant population ageing and the spread of nuclear families. Regardless of the scenario according to which demographic development goes on in Russia, dependency burden on the working population will

increase. However, the magnitude of this burden will depend not only on the scenario but also on the decision about raising the retirement age.

Currently, the budget of the Pension Fund of the Russian Federation is planned according to state reporting form 94 (Pensions), which contains information about the number of pensioners and the amounts of pensions assigned to them[2], the planning also takes into consideration statistics data on the number and mortality of population and uses analytical and extrapolative forecasting methods [11; 36]. These methods do not fully take into account changes in the age-sex structure of the population, which could cause errors in the forecast. In addition, extrapolation method involves the assumption concerning the conservation of force and the impact of defining determinants of development of the retrospective period in the future, which is not always true.

When forecasting the number of pensioners, it is logical to use the method of components, or the age shifting method. It is fully consistent with the logic of population ageing and renewal. This method helps not only calculate the total number of pensioners, but also arrange them according to sex and age.

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[2] The form does not include pensioners of the power structures, as well as a number of other departments and categories of public servants, i.e. pensioners who are not registered with bodies engaged in pension provision [7].

Applying this method is based on the use of the demographic balance equation:

$$P = P_0 + (N - M) + (I - E),$$

where P is total population;

P_0 – population at the beginning of the year;

N – number of births;

M – number of deaths;

I – number of arrivals;

E – number of leavers.

The difference between variables N and M is called natural population increase if $N>M$, or natural population decline if $N<M$, and the difference between variables I and E is called net migration or migration balance. In this formula, variables N, M, I and E are components of changes in the number of population during the year. The essence of the method lies in the fact that data on the number of age and sex groups move each year to the next age given the mortality rate and age-specific net migration. The number of the zero age group is determined on the basis of the forecast of annual number of births and infant mortality. The forecast of annual number of births is based on the number of women of childbearing age and frequency of childbearing among women of this age.

To optimize the process of forecasting, a program is used to calculate demographic forecast [30], the program is based on the method under consideration. This program

is written in VBA and is implemented as a macro for Microsoft Excel. To build the forecast, it is necessary to have the following baseline data for the beginning of the first year:

• population by five-year age groups and by sex;

• total fertility rate;

• average age of mother at childbirth;

• life expectancy at birth for men and women;

• infant mortality rate;

• number of arrivals (immigrants);

• departure rate (emigration).

The program uses several dependencies that greatly facilitate the forecasting process concerning age probability of survival, age-specific probabilities of childbirth and age structure of migrants. The forecast covers 202 age probabilities (101 for men and 101 for women) of survival and 35 age probabilities of having a baby. Probabilities in different ages are linked tightly to each other, and there are fairly reliable models of these interactions. Age probabilities of survival closely correlate with life expectancy at birth. Therefore, for each value of life expectancy it is possible to predict with high accuracy all age-related indicators of survival. The age composition of migrants is especially prone to fluctuations, but it is not entirely random. There exists a certain objective logic in the formation of age distribution of emigrants and immigrants, which can help determine more or less accurately the age composition

of people arriving in the country and leaving it [7]. Therefore, it is sufficient to determine the resulting characteristics of mortality, fertility and migration, and the current models in the program will pass from them to their age indicators.

Population forecast up to 2036 is built on scenarios based on the three hypotheses regarding future trends of Russia's demographic development. The hypotheses that have been formed are based on highlighting global demographic trends and manifestations of specific Russian features of development in the processes of population reproduction. The first hypothesis is that in the processes of population reproduction in Russia for the forecast period there prevails the deviation from the common global trend under the influence of Russian specifics while maintaining the current level of migration. The second hypothesis suggests that in the next two decades the mortality rate in Russia would be in line with global demographic patterns, but with some delay, and the levels of fertility and migration would increase as a result of active demographic policy. According to the third hypothesis, at the end of the forecast period, Russia's population fully adopts socio-demographic behavior typical of developed countries, and this causes reduction in mortality (significant population ageing) and in the level of reproduction (growth in the number of small nuclear families). Based on these hypotheses the values of certain indicators are formed for the three scenarios *(tab. 1)*.

Table 1. Values of indicators for the three forecast scenarios for 2036*

Indicator	Scenario 1	Scenario 2	Scenario 3
Total fertility rate, units	1.79	2.15	1.98
Average age of mother at birth of child, years	30.2	32.3	33.2
Life expectancy at birth for men, years	69.7	70.9	73.3
Life expectancy at birth for women, years	78.5	79.9	83.2
Infant mortality rate, persons per 1,000 births	5.9	4.0	4.0
Migration increase, thousand persons	270	300	350
* Compiled with the use of [8; 24; 25].			

This method can be used to assess the effects of raising the retirement age in Russia. This estimate is based on the forecasts of the number of old age pensioners under the current labor legislation and its potential change in terms of increasing the retirement age. Conditions for its increase have not yet been presented in the form of a bill, so it is proposed that the forecast should take into account the provisions of the bill that is already approved and that provides for a gradual increase (annually for six months) in retirement age limit up to 65 years for men and women who work in the civil service [32]. Currently, the retirement age for these categories of citizens is the same as for all the rest. In order to study the effects of raising the retirement age to 65 years for all categories of Russian citizens the following assumption was made. The increase in the retirement age begins in 2016, goes on at a rate of six months a year and ends for men in 2026 and for women in 2036. Thus, by 2036, the established retirement age will be 65 years for both sexes.

The results of the forecast

The results of calculations are presented in *Table 2*. According to the forecasts, Russia's population will be reducing under any scenario. The most significant decline will occur under the first scenario of Russian demographic development, in the period of 2015–2036, it will reach 11.2 million or 7.7%. So, in under this scenario, population ageing "from below" will continue. The second scenario contains parameters that characterize successful implementation of demographic policy in Russia, this allowed us to build a relatively favorable forecast. Under this scenario, the population will decrease by 1.1 million, i.e. by 0.8%. This forecast is quite probable if we take into account positive demographic trends that took place in Russia in recent years. The calculation of the forecast under the third scenario shows that in 2036 the population will decrease by 3.6% and will amount to 141.1 million. The values of this scenario are based on the following logic. The trends of decline in mortality and increase in life expectancy are more stable and

Table 2. Forecast of demographic indicators in Russia for the year 2036

| Indicator	Fact 2015	Forecast		
		Scenario 1	Scenario 2	Scenario 3
Population, million people	146.3	135.1	145.2	141.1
Working age population, million people	85.4 (100.8)	80.2 (88.7)	82.1 (91.1)	81.6 (90.6)
Proportion of working age population, %	58.4 (68.9)	59.3 (65.7)	56.6 (62.7)	57.9 (64.2)
Population over working age, million people	35.2 (19.8)	39.5 (25.8)	42.3 (27.9)	42.0 (27.6)
Proportion of population over working age, %	24.0 (13.5)	29.2 (19.1)	29.1 (19.2)	29.8 (19.6)
Number of people over working age per 1000 working age people, people	411.7 (196.5)	492.9 (290.4)	514.7 (305.9)	514.4 (304.8)
Note. Parentheses contain the value of the index when raising the retirement age to 65 years.				

are universal in contrast to the birth rate that varies greatly in developed countries. Therefore, under the third scenario, the value of the total fertility rate is expected to be almost at the level of simple reproduction of the population.

According to the calculations obtained, a change in the age structure of Russia's population is forecast. The number and proportion of children will reduce under any of the three scenarios. Under the first and third scenarios, the share of population under working age in 2036 will be 12%, under the second scenario − 14.3% vs. 18% in 2015). In addition, Russia will experience an unprecedented increase in the number and proportion of elderly population. During 2015–2036, their share will rise from 24 to 29% (under the first and second scenarios) or to 30% (under the third scenario). The number of persons over working age will be the highest under the second and third scenario: it will be 42 million people, which is 20% greater than in 2015. As for the forecast of the share of working age persons, the results for all three scenarios are similar. In 2036, this proportion ranges from 57 to 59% depending on the scenario, what is at the current level of 58.4%.

Such forecast changes in the age structure define a significant increase in demographic burden on the working population. Moreover, this increase will occur only due to the growth in the number of persons over working age. If in 2015, the number of the elderly was 412 persons per 1,000 persons of working age, then by 2036, it can grow under different scenarios to 493–515 per 1,000. Thus, regardless of what demographic development scenario Russia has, the demographic burden on working citizens will increase due to further ageing of the population.

Figure 2. Forecast of Russia's population
by major age groups for 2036, million people
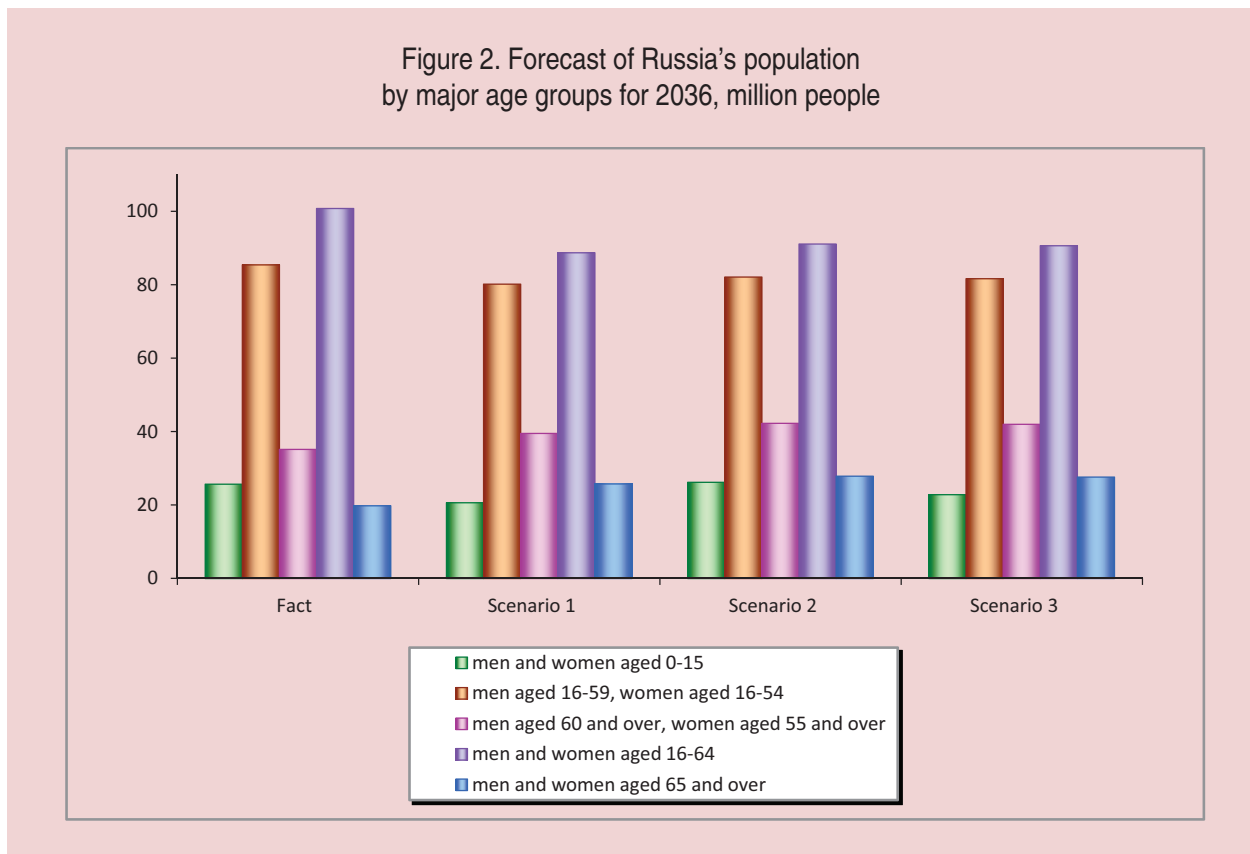
Raising the retirement age is the most widely discussed response to population aging, this measure ensures a long-term sustainability of the pension system. Some authors [22; 23] argue that this answer has no alternative from the viewpoint of systematically maintaining the correlation between the number of pensioners and employees. According to the forecasts obtained, with a gradual increase in the retirement age, this ratio will have been reduced by 2036. Depending on the scenario, there will be 290−305 people over working age per 1,000 working age people. And first of all, this reduction will occur due to the decrease in the number of retirement

age persons to 34−35% in comparison with the calculation when the retirement age remains unchanged, while the number of working age persons will increase by only 11% *(fig. 2)*. If the retirement age is raised, then the share of persons over working age in the total population in 2036 will be 19−20%, and 29−30% − if the retirement age remains unchanged.

With the increase in the retirement age the gender ratio of the working age population will not change, unlike the structure of the elderly population. According to forecasts, if the retirement age is not raised, then the proportion of men in 2036 will be 33%, and in the case

of raising the retirement age − 35%. This shift is characteristic for all the scenarios of Russian demographic development. After the results of the forecasts were obtained, we calculated the average age of the elderly population. In 2015, the average age of men over working age was 69 years; if the retirement age remains at the same level, then by 2036, the average age of men over working age will increase by one year, and if the retirement age is raised, it will increase by four years. The average age of women over working age in 2015 was 68 years, it is forecast to increase by one year in 2036 (if retirement age remains unchanged) and by seven years (if the retirement age is raised). It should be noted that the values of this indicator vary a little under different scenarios.

Thus, the obtained forecast results show that, first, the demographic burden on the working population will continue to increase under any scenario of Russia's demographic development, and it will increase most significantly under the second scenario that describes a successful demographic policy. However, it is necessary to take into account that the forecast obtained deals with the age structure of the population. The number of actual payers of pension contributions is much lower than the number of working age persons (due to the existence of economically inactive population, the unemployed, the informally employed), and the number of pensioners exceeds the number of retirement age persons (due to the presence of early old age pensions, disability pensions). And, second, the number of retirement age women is a considerable potential reserve for reducing demographic burden on the working population. Taking into account differences in the life expectancy of men and women, it is possible say that raising the retirement age for women is the most reasonable measure from the demographic point of view.

Summary and conclusions

The forecasts obtained show that population ageing in Russia is an inevitable process. Depending on whether demographic processes are in line with global trends or they show development features typical of Russia, population ageing process will take place in the first case "from above", and in the second case − "from below". The forecast confirms a well-known paradox that if the situation with mortality improves further, as happened in recent years, then the pace of ageing that negatively affects the balance of the pension system will be even higher, in the medium term, at least.

There exist two main ways to deal with population ageing. The first approach consists in moving from the distributive to the savings system. Pensioners' mandatory savings that were made during their labor activity become the source of pension payments instead of workers' contributions

[13]. However, this approach requires efficient pension funds. Profitability is a key measure of their effectiveness. The average yield of non-governmental pension funds (NGPF) in 2014 was 4.81% per annum [28] (when inflation is 11.35%). In addition, the development of Russian NGPF is hampered by people's distrust in private institutions engaged in pension insurance. Public confidence in pension reforms is also undermined by the lack of awareness and low financial literacy of the population. According to sociological surveys, almost one third of respondents do not know where their pension savings are, 41% of respondents do not know what the amount of pension savings is, and the majority of respondents (51%) do nothing with their retirement savings [6]. These survey results are quite predictable. If people decide to abandon their accumulated part of pension in full or to retain and invest the required funds through NGPF, they should evaluate a large number of factors relating to the functioning of the financial market (the experience of the NGPF and a management company, structure of assets, return, inflation, etc.).

The second approach, consisting in increasing the retirement age, leads to an increase in the number of payers of pension contributions due to the reduction in the number of pension recipients. The results of forecast calculations confirmed the possibility to reduce significantly the effect of population ageing on the pension system by raising the retirement age to 65 years, especially for women. Given the fact that a significant potential reserve of decreasing the demographic load on the pension system is the number of retirement age women who, in addition, now live longer than the retirement age and longer than men, it would be appropriate to begin to bring the retirement age for men and women to 60 years. This approach is largely justified by the current state of affairs. First, in the labor sphere, the traditional system of gender division of labor is being revised, dichotomization and polarization of male and female social and productive roles, activities and spheres of activity is being weakened [19]. According to sample surveys of the population conducted by Rosstat on the issues of employment, the share of women employed in the economy is 48% [18]. Moreover, the following pattern is observed: with increasing work experience, this proportion also increases. The proportion of women employed in the economy, with experience of 10 years or more is 52%. Second, labor activity of retirement age women is increasing: in 2005, there were 13 working women aged 60−72 per 100 women of the same age, and in 2015 this figure was already 18. The average age of women employed in the economy increases: over the same period, it increased by 1.1 years, and in 2015 amounted to 41.2 years [16; 17]. Similar

trends are observed in the employment of men.

However, according to opinion polls, the absolute majority of respondents do not support a gradual increase in the retirement age by five years. At that, more than half of respondents (56%) plan to continue to work after they reach the retirement age, but as the age increases, the proportion of those willing to continue work decreases [31]. This willingness depends largely on the state of health that is quite poor among the elderly population in Russia. At present, persons over the working age have two diseases on average [26]. Among the arguments against raising the retirement age experts name the high level of disability, which will cause a sharp leap in the number of recipients of disability pension if the generally established retirement age is raised [15]. Therefore, the issue of raising the retirement age still remains controversial and unpopular among the population. It seems that raising the retirement age is feasible but is should be carefully prepared so as to be gradual, and accompanied by a number of additional measures. These measures should first be aimed at improving the health of the population, the yield of pension savings, awareness and financial literacy of people; these measures should also eliminate incentives for informal employment both on the part of employers and employees. Only the combination of these measures will provide citizens with decent pensions.

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