ISSN 2409-2274

NATIONAL RESEARCH UNIVERSITY
HIGHER SCHOOL OF ECONOMICS

Demographic Review

A peer-reviewed,
open-access electronic journal

ENGLISH SELECTION 2019

CONTENTS

• DEMOGRAPHIC REVIEW •

The journal is registered on October 13, 2016 in the Federal Service for Supervision of Communications, Information Technology, and Mass Media. Certificate of Mass Media Registration ЭЛ № ФС77-67362.

ISSN 2409-2274

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Released quarterly. Published since 2014.

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English selection 2019

PENSION REFORM 2019:
DETERMINANTS, CONSEQUENCES, ALTERNATIVES

SERGEY IVANOV

The paper addresses, mostly with demographic tools, the rationale and consequences of the reform of Russia's distributive pension system. Contrary to official assertions, mortality conditions do not warrant an increase of the pension age. The reference to a rapidly falling demographic support ratio as a rationale of the reform's urgency is misleading. A rapid and large increase in the retirement age will considerably reduce the obligations of the Pension Fund of Russia, yet this will be far from enough to balance its budget. The reform creates a fundamentally new and difficult to implement task of ensuring the right to employment of persons deprived of the right to a pension. To the extent that this task can be accomplished, the Pension Fund of Russia and the State budget will be supplemented with additional revenues. At the same time, to the extent that this task remains unresolved, a social group of elderly people who are deprived of income will arise and continue to grow. For a limited time their life will be supported by unemployment benefits. Russia possesses large-scale alternative resources for resolving the pension problem, which consist, among other things, in increasing the collection of pension contributions, labor productivity and employment of the population, as well as in developing funded forms of pension insurance.

***Key words**: population ageing, mortality, compulsory pension insurance, distributive pension system, statutory pension age, Pension Fund of the Russian Federation, working-age population, employment, pension reform, sovereign wealth fund.*

In recent decades, many countries of the world have faced a problem financing distributive pension systems as a result of "double aging": the aging of the population and the aging of the pension systems themselves, which are less and less in line with the changing age structure. Pension reforms round out funded components and change the ratio between the resources of pension systems and their obligations by raising the retirement age (RRA). Although there is a wide consensus on the general principles of pension system reform, the correct structure and parameters of the reform are highly dependent on specific circumstances (Holzmann, Stiglitz 2001; Schwarz 2014). Along with the predominant preference for a three-tier pension system (distributive, mandatory funded and voluntary funded), there exists a point of view that for the post-Soviet space in the medium term, a distributive system is optimal (Grishchenko 2016).

There are many foreign precedents for raising the retirement age. Typically, a reform is preceded by a broad discussion of the purpose, scope, implementation protocol, and consequences of RRA (Grech 2014). The RRA itself does not exceed two years and is stretched out over time. In addition, mechanisms are developed to automatically adjust the parameters of the pension system (retirement age, pension, resources) in the future following eventual demographic shifts (Carone et al. 2016). Such mechanisms help to avoid abrupt changes in the pension system and strengthen citizens' trust (Arbatli et al. 2016).

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THE ORIGINAL ARTICLE IN RUSSIAN WAS PUBLISHED IN DEMOGRAPHIC REVIEW 2019. 6(2): 6-54.
DOI: 10.17323/DEMREVIEW.V6I2.9871.

The Russian pension reform of 2019 differs from these approaches in cardinal ways. The main difference lies in the combination of an unprecedentedly large RRA with the very high speed of its implementation. Another important difference is that the sudden decision[1] was not preceded by either a wide discussion or a preparatory period during which those affected by the future reform could adapt in advance to the change in their life trajectories (Remington 2018). Instead, the authorities announced only the goals of the reform: balancing the revenues and expenses of the pension system and using the savings to increase pensions. After the RRA was promulgated, the emphasis was shifted completely to incremental increases of pensions which, according to the authorities, would require large additional transfers from the federal budget - in addition to the money saved due to the RRA. Another difference of the Russian reform, which is mentioned at the end of the article, is that Russia has much greater unrealized potential than other countries for alternative ways to solve the pension problem.

The authorities justified both the possibility of and the necessity for RRA using only demographic arguments. The possibility of RRA was justified by increased life expectancy. The argument includes three points. Firstly, increased life expectancy means that the health of older citizens has improved so much that they are able to work longer. Secondly, life has become so long that at the current low retirement age, people live idle for too long, which is completely unfair and burdensome for the State. Thirdly, people themselves would like to work longer. As for the necessity of RRA, it was deduced from the assumption that the aging of the population completely determines the inability of the Pension Fund of the Russian Federation (PFR) to provide mandatory pension insurance (MPI) without supportive transfers from the state budget.

The following analysis of the factors determining the resource requirements and obligations of the Russian pension system and the forecast of the effects of RRA for the period 2019-2030 are based on data published by Rosstat[2]. An exception is demographic indicators borrowed from the United Nations Population Prospects. This exception is made because the UN publications describe in detail the methodology and the hypotheses, whereas one can only guess as to the reasons for even major revisions by Rosstat of its population projections. In addition, there is reason to believe that in its forecasts Rosstat uses unreasonably high hypotheses of the dynamics of life expectancy (and its components). Rosstat's hypotheses of net international migration which are higher than in the UN model are probably justified, but this does not balance other shortcomings. Forecasts of the size and age-sex structure of the employed population were obtained by combining Rosstat employment rates and the UN population projections (2017). The complexity of reproduction of specific groups of retirees (including early retirees) and those receiving pensions funded from the state budget (e.g. the military) as well as the incompleteness of data seriously restricts the predictability of their dynamics. In the following analysis, which, inter alia, aims to build a reliable forecast of the dynamics of the number of pensioners and

[1] Federal Law N 350-ФЗ "On Amending Certain Legislative Acts of the Russian Federation on the Appointment and Payment of Pensions" was adopted by the State Duma on September 25, 2018 in the third reading - less than 3.5 months after the bill was introduced by the Prime Minister (16 June 2018). Commentators, including government officials, usually called the bill a decision.

[2] Economic data are given for the following editions of Rosstat published in 2001-2018: Russian Statistical Yearbook; Labor force, labor and unemployment in Russia; Labor and employment in Russia; Social status and living standards of the population of Russia; Demographic Yearbook of Russia; Statistical Review; Labor force surveys; Information on the socio-economic situation of Russia.

working-age population, it was necessary to make the assumption that all and only citizens of retirement age[3] receive an old-age insurance pension.

THE DISTRIBUTIVE PENSION SYSTEM

In the Soviet Union, a universal system of mandatory pension insurance (MPI) of a distributive type was created. In Russia, it remains absolutely predominant, i.e. a universal and quasi-monopolistic form of old-age pension provision. The distributive system is based on the principle of payment of pensions for current pensioners from deductions from the income of workers, regardless of whether these deductions are explicit or hidden in other forms of redistribution of output. The peculiarities of the Soviet pension system were the low statutory retirement and the many exemptions from the general rules made on the basis of profession, geographical region, number of children or even ethnicity. For specific groups, a lower retirement age was established, which is explained by factors such as the danger and harmfulness of the profession (for example, miners), exposure to adverse environmental factors (regions of the Far North), the fulfillment of a particularly important social function that limits participation in the labor force (mothers of many children), and special benefits provided to indigenous peoples of the Far North.

The Soviet distributive pension system, including the features noted above, has survived in post-reform Russia. However, it differs significantly from the Soviet one in the following ways: (1) many pensioners receive basic old-age pensions below subsistence level; (2) territorial allowances have been introduced that raise pensions to the subsistence level or even to or above the national average pension; (3) pensions are indexed for inflation; (4) the MPI system is funded from several sources; (5) the complexity and opacity of changing pension rules make it difficult for citizens to plan their lives; (6) at the macro level, the flows of MPI system funds are also complex and opaque. Most functions of the Soviet social security agencies were transferred to the newly created Pension Fund of the Russian Federation (PFR), the sovereign extra-budgetary fund that manages the State pension system and is designed to ensure citizens' rights to pensions. The PFR collects deductions from the employer (pension contributions) for MPI and pays out pensions (previously, pension payments were made directly from the State budget) and receives transfers from the state budget.

Guaranteed retirement income upon reaching a specified age and regardless of the state of one’s health is one of the obligations of the social State, which the Constitution of the Russian Federation considers it to be. Other countries have long followed this principle. In Germany at the end of the 19th century, as in other Western countries several decades later, universal pension systems were established on the basis of a high retirement age (usually 70 years without gender

[3] In other words, it is assumed that all citizens of retirement age receive an old-age insurance pension which is the function of their previous pension contributions. In fact 3.1 million people receive “social pensions” which do not depend on previous contributions and 0.7 million receive special types of State pension (as opposed to insurance pensions, the outlays for pensions of the latter two categories are directly financed by the federal government). Further, it is assumed that only citizens 55 years of age and older (women) and 60 years and older (men) (and of incrementally higher retirement age, as provided by the reform) receive old-age insurance pensions, while in fact a number of professions allow for earlier retirement with full benefits.

difference); subsequently, this age was reduced to 60-65 years, which was one of the manifestations of the development of a society of social solidarity.

In Russia, the retirement age was established (1928) at 55 for women and 60 for men. It was recognized that upon reaching this age, every Russian has the right to receive a share of the public pie free of charge simply because he is a citizen of the Russian Federation[4]. In fact, the system became truly universal in the early 1960s when the coverage was extended to kolkhozniks (collective farmers). The right to an old-age pension is unconditional and universal. Although only insured persons who have accumulated "qualification rights" are entitled to an insurance pension, the State provides other types of pensions to all other citizens.

Although the right to retirement benefits is unconditional, the prevailing form of its implementation - old-age insurance pensions - implies the existence of a contractual relationship between the insured person and the insurer. An MPI agreement differs from other insurance contracts in that (1) the insurer is the State; (2) insurance is mandatory for all workers; (3) insurance conditions are determined only by the insurer; (4) State relations with citizens are not fixed in individual contracts but are implied. An implicit agreement with citizens is based on a perpetual explicit agreement between the State and society, an agreement enshrined in national law. In exchange for restricting the freedom of choice, the insured citizen receives a guarantee that the State as a whole, and not some of its specialized regulatory bodies, is responsible for financing their pension.

MANDATORY PENSION INSURANCE IN RUSSIA

The Russian national administrator of the pension system, the Pension Fund of the Russian Federation (PFR), has features that are relevant for the chosen way of adapting the pension system to changing conditions. The Pension Fund is the State monopoly regulatory organization for compulsory social insurance and, as a result, is the country's richest entity: its budget is more than 8 trillion rubles, which is equal to 1/10 of the GDP of the Russian Federation. The fund serves 43.5 million pensioners, including 39.8 million recipients of insurance pensions, and administers insurance contributions of 9.3 million policyholders - legal entities making MPI payments at a rate of 22 percent of the payroll, as well as self-employed payers of pension contributions (Pension Fund 2018). In addition, the functions of the Fund include the administration of "social pensions" (to retirees who do not qualify for insurance pension) and some other benefits, in particular a large fund which underwrites the "maternity capital".

The PFR has over 100 thousand employees — far more than anywhere else in the world. For comparison, the American Social Security Administration has 60 thousand employees serving 61.5 million pensioners. If the pension system in Russia were as effective as, for example, Sweden's, it would require no more than 14 thousand employees to perform a wider range of

[4] Foreigners working in Russia also have the right to an old-age pension, but, due to the country-specific conditions of labor immigration, they very rarely manage to accumulate the required years and seniority points. As a result, foreign workers are a net source of income for the Russian pension system. On the other hand, the PFR pays various types of pensions to 328 thousand citizens living abroad.

functions than the PFR currently performs. However, as follows from its annual reports, the Fund itself is pleased with both its work and the structure of the Russian pension system in general.

PFR annual reports contain more than 100 pages each, but only 4-5 pages have been allocated to the Fund's budget. The reports do not contain an actuarial analysis or other requirements of the international practice of reporting on sovereign pension funds. The PFR often revises budget indicators for previous years without explaining the reasons and methods of corrections, the sizes of which range from tens of millions to tens of billions of rubles. Not a single report after 2010 (the publication of online annual reports by the Foundation began in 2011) has mentioned a single problem that led to the 2018 decision on RRA. The Fund is not involved in the ongoing discussion on pension reform, although the PFR's leadership considers its public awareness work to be its particularly bright activity.

Of special interest in the PFR reports are the totals for revenues and expenses of the MPI system. Thus, the product of the number of people employed in the economy in 2016 (72 million people) by the average salary (408 thousand rubles per year) and the coefficient of deductions for MPI (22%) gives 6.5 trillion rubles, while according to the PFR report MPI receipts of contributions came to 4.5 trillion rubles. Such a huge discrepancy can be explained by the fact that MPI contributions are not paid for many millions of employees, which should be an enormous problem, but about which the PFR is silent. Thus if this were the sole explanation for the discrepancy, the number of workers not covered by the MPI system would have to be 22 million. This implies that it is a question not only of ineffectiveness of the PFR, but a more general problem of systemic deficiencies of the tax system.

On the other hand, the product of the number of old-age pensioners (36 million people) and the average old-age pension (158 thousand rubles per year) turns out to be, on the contrary, almost 700 billion rubles less than the reported amount of pension payments (6.4 trillion), the reason for which is not only not explained by the PFR itself, but is altogether a mystery. As a result, the estimated budget would balance with a surplus of 0.8 trillion rubles as opposed to the reported deficit of 1.9 billion rubles). Undoubtedly, there should be a good explanation for this phenomenon, but it is strange that a public organization with resources representing a quarter of the State's consolidated budget did not anticipate our questions in advance. In the framework of the paradigm of the rational functioning of State institutions, it is also difficult to understand why the Audit Chamber of the Russian Federation never, even in the context of preparing the pension reform, conducted a general audit of the Fund.

Table 1[5] contains data on the main parameters of the PFR budget that characterize the Russian distributive pension system. In 2011-2017, PFR revenues grew, adjusted for inflation, by 1.5% per year, and expenses by 3.5% per year. A surplus budget at the beginning of the decade

[5] Since it is not possible to correct the published data, budget indicators for the period 2010-2017 (table 1) are given according to PFR annual reports. The forecast of income and expenses for the income tax base is based on the demographic forecast and assumptions regarding economic parameters. Of course, it would be better to remove the inconsistencies in the budget data for 2016-2017 at the starting point of the forecast, but this is not possible. However, it should be emphasized that this drawback is unlikely to affect much either the logic of the proposed model or the relationships and trends it detects.

in 2015 became acutely deficit; in 2016–2017 the deficit was drastically reduced, though no explanation was provided.

Table 1. Revenues and outlays of the Pension Fund of Russia in 2011-2017

	Billion rubles		Average annual rate of change, %	Growth for the period, %	
	2011	2017		2017 to 2011	2017 to 2015
PFR revenues	5250	8250	7.8	57.1	15.8
Including					
MPI contributions	2826	4482	8.0	58.6	16.0
Transfers	2798	3671	5.6	31.2	18.4
Including to MPI		2213			
PFR outlays	4920	8320	9.2	69.1	8.5
Including					
Pension payout	4081	7167	9.8	75.6	16.0
Including to MPI		6378	5.0		
PFR balance		330	-70.0		-87.1
Including for MPI (before transfer)		-1896			
NWF funds (for reference)	2600	4385	9.1	68.7	4.4

Notes:

• MPI: mandatory pension insurance, PFR: Pension Fund of Russia, NWF: National Wellbeing Fund

• The table shows the values of indicators adjusted by the PFR itself (in later Reports) if the adjustment did not violate the balance sheet ratios.

Sources: Pension Fund of the Russian Federation. Annual reports for 2011-17. http://www.pfrf.ru/press_center/advert_materials~2074 (accessed 07.22.2018), Ministry of Finance of the Russian Federation. The movement of funds of the National Welfare Fund. https://www.minfin.ru/en/perfomance/nationalwealthfund/statistics/#ixzz5MGN4LLxD (accessed 20.07.2018)

The PFR's MPI outlays increased from 5.8 trillion rubles in 2015 to 6.4 trillion rubles in 2017, i.e. the growth rate did not keep up with the inflation rate (5.0% per year versus 5.7%). The driver of spending growth during this period, as throughout the decade, was an increase in the number of pensioners, while pensions in real terms decreased. The amount of contributions to the MPI increased over the same period from 2.8 trillion rubles to 3.9 trillion rubles in 2015 and 4.5 trillion rubles in 2017, in other words, income from MPI increased throughout the entire period by an average of 8% per year, significantly (1.7 percentage points) above inflation. Available data show that at the turn of the century the PFR budget had a surplus of hundreds of billions of rubles. In the first half of the 2000s the surplus quickly melted away, and in 2015 turned into a huge deficit, which in the next two years also fell rapidly. Based on the generalized data on the expenditures of the Pension Fund and the high (about 80%) share of its expenditures on MPI, it is reasonable to assume that the rapid reduction in surplus and its turning into a deficit was due to the deterioration of the balance of MPI flows precisely because of the population aging, provided that the collection of contributions didn't deteriorate.

The target transfer to the MPI in 2015 was 433 billion rubles less than the deficit of the PFR's own funds, in 2016 it just covered it, and in 2017 it turned out to be 317 billion rubles in excess. PFR reports do not explain the considerable excess of the target transfer over the need for it. This suggests that one should look for the potential of increased financing of the MPI in the Fund itself rather than rely on the NWF.

Forecasting flows of obligations and resources of the PFR should be based on the determination of relevant variables and parameters (preferably close to those accepted in world practice), the selection of an appropriate method of tracking the dynamics, and the use of public databases.

EQUILIBRIUM OF A DISTRIBUTIVE PENSION SYSTEM

When a distributive system is young, the total amount of contributions exceeds the amount of obligations. There are now not many countries where distributive pension systems are young enough and the populations are young enough to generate positive balances. The ideal state of a mature distributive pension system in an aging world would be the equilibrium of the amount of pension contributions and the amount of MPI liabilities.

The functioning of a distributive pension system is determined by many parameters. Among them, the most important are economic and demographic. The main systemic economic parameters (the rate of pension contributions and accrued pension rights) are established by the State, i.e. are prescriptive, but their effectiveness depends on factors external to the MPI system, with market factors prevailing among them.

Demographic parameters and, above all, the age structure of the population are external to the pension system, and at the same time are powerful drivers of the dynamics of MPI. The State has wide possibilities for regulating mortality and immigration, but very limited ones in the area of fertility. The idea of the future of a pension system based only on national programs designed to implement decrees is fraught with multiple and serious deviations of real trajectories from imagined ones.

The State directly regulates pension rights by changing the criteria that a pensioner must satisfy. This may be the retirement age, seniority, insurance record, work at enterprises of certain forms of ownership, the possibility of combining receipt of a pension with economic activity, etc. Although these possibilities of the State seem limitless, in reality they are limited by the social contract expressed in the Constitution and relevant laws, which in Russia declare the universality of the right to a pension and the State's obligation to fulfill this right. The conflict between these factors when carrying out pension reforms exists not only in Russia, and always manifests itself in an acute public reaction to changes in pension rights by the State.

The real possibilities of managing the pension system are also limited by economic factors. Thus, business is sensitive to changes in the rate of pension contributions, which in Russia has changed seven times over the past quarter century. The increases were detrimental to business and caused a decrease in the collectability of contributions, as a result of which they were adjusted. In addition to direct losses, the fluctuations of the contribution rate established by the State negatively affect the investment climate. Therefore, it hardly makes sense to raise its current level in Russia (22% of the payroll) in order to reduce the deficit of the MPI system's own funds.

However, there is another reserve for increasing total contributions. In Russia, the collectability of pension contributions is very low. In particular, contrary to the law, self-employed citizens generally do not make pension contributions, nor, by definition, do illegal migrants.

Effective actions to bring these categories of workers out from the tax shadow could, in principle, generate many hundreds of billions of rubles for the MPI's funds.

In Russia, the majority of pensioners have very modest pensions. Although data on the distribution of pensioners by the size of their pensions are not published, the proximity of the average pension to the poverty line points to a large number of extremely low-income pensioners. It is not entirely correct to compare Russian and foreign statistics on the replacement ratio of pensions to wages, due to major differences in methodology, but it would not be far from the truth to assert that in Russia the most simplistic pension replacement rate (33%) is nearly two times lower than that recommended by international organizations (60%) and more than two times lower than that already achieved in a number of countries. The restoration of the high growth rate of pensions which took place in the early 2000s would have made it possible to reach the recommended level of replacement in 10 years, but such a dynamics is utterly unrealistic; officials and researchers formulate much more modest goals (for example, 35% in 2024). The average size of pensions close to the poverty line and a low replacement rate mean that balancing the pension insurance budget by reducing the size of pensions would be completely unacceptable.

The equilibrium of the system, i.e. equality of resources and obligations, is an ideal, but not a necessary condition for a sustainable MPI. A shortage of MPI funds by itself does not necessarily destroy the system. Covering the deficit, regardless of why it exists, is an unconditional obligation, and not an act of good will of the State. The balancing lever is transfers from the State budget, which in OECD countries provide more than 1/5 of the financial resources of pension systems (Gurvich 2011). Although this is not an optimal situation, the need to fill the deficit of the MPI's own funds using budget revenues is nowhere considered a tragedy. RRAs are usually designed so that the deficit is reduced, but not necessarily completely eliminated.

A system of solidary redistribution of national income to finance the lack of a MPI's own resources is not a fatal aberration of a market economy, but rather a normal tool of a social State, especially adequate to an economy that is largely built on the exploitation of natural resources. In principle, it doesn't matter whether the mandatory insurance fund is financed through a specialized State organization that collects pension "contributions", or directly from the State budget through the same deductions called "taxes". In both cases, the tax base may not be sufficient to balance the MPI budget, but deficits are not supposed to lead to reductions of the State's MPI obligations.

Several analogies might be offered here. For example, the aerospace industry is economically not profitable, but the Russian State does not raise doubts about its necessity. By analogy with pensions, the State is obliged to provide education for citizens of the country. Should the desired rise in fertility occur, in 6-7 years a larger number of children will need schooling. But the right solution would hardly be to increase the age of admission to first grade, followed by a reduction in the duration of compulsory education.

In Russia, in 2008, an additional source of financing the MPI was created - the sovereign National Welfare Fund (NWF), replenished from oil and gas revenues. Like the Norwegian State Pension Fund (*Statens Pensjonsfond Utland*), the NWF redistributes natural resource rent to finance social development, including a deficit of the pension system's funds. The scale of the need for transfer is great, but the NWF is quite up to the task.

In this regard, it should be noted that an outright rejection of the acceptability of the growth in the share of pensions in the country's GDP (Kudrin and Gurvich 2012) is not at all obvious. In Russia, MPI payments amount to 7% of GDP, slightly lower than the OECD average of 8% and significantly lower than in many countries, including France (14%) and Germany (10%). There is no evidence that the high level of State social spending (pensions, healthcare, unemployment benefits) limits the competitiveness of the national economy (De Grauwe and Polan 2003; Yermo 2012).

POPULATION AGING AS JUSTIFICATION FOR INCREASING THE RETIREMENT AGE

In Russia, all citizens of retirement age have the right to an old-age pension and practically all of them exercise this right. At any given moment the number of such pensioners exceeds the population of retirement age, because many citizens retire before the statutory retirement age. There is no data on the basis of which it would be possible to separately track the dynamics of early retirees. However, since they eventually join the population of retirement age, this phenomenon does not have a big impact on the dynamic series of the number of pensioners. Thus, demography remains by far the major driver of the dynamics of the Russian population of pensioners.

The main factor determining the number of pensioners is their natural reproduction. It should be noted that in Russia, if not 40% of men died before retirement age, as now, but 5%, as in developed countries, the number of pensioners would be much larger. The process of population aging means higher growth rates of the population of retirement age compared to other age groups - regardless of the definition of its lower boundary. This factor is universal and little susceptible to government intervention. However, in different countries it manifests itself in different ways.

Population aging is caused by low fertility and lower mortality in older ages. Populations age differently and are at different stages of this process. For example, in Russia and the European Union, the growth in the number of elderly people has long outstripped the growth in the total population, but in the second half of the 20th century these dynamics were relatively gentle and attenuated, and in the early decades of the 21st century growth stopped and will probably not resume again. At the same time, during the same period the number of elderly people grew rapidly in the USA and China, having doubled in the USA (compared to 1950) and nearly tripled in China; and what is more, in the USA the retirement age population will continue to grow for almost a century, while in China, due to the rapid demographic transition, the number of elderly people has already passed the inflection points and will continue to decline (Fig. 1). The gender and age structure of the Russian population is such that in the next 8-10 years the pension burden on the MPI system would decrease even without RRA.

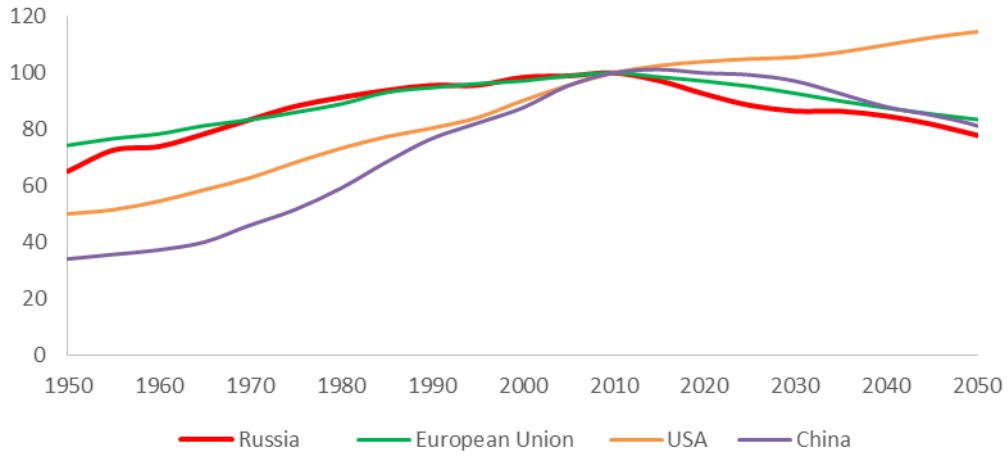

Figure 1. Dynamics of the population aged 60 and over in Russia, the European Union, the USA and China, 1950-2100. (2010 = 100)

Source: United Nations (2017). World Population Prospects. The 2017 revision

In the discussion of pension reform, it is often forgotten that it is the dynamics of the absolute number of pensioners that is the main parameter of the pension system. In particular, these dynamics determine the volume of obligations of a distributive pension system. Consequently, it partially determines the MPI deficit and the need for a transfer from the SWF through the State general budget to cover the pension obligations of the State[6].

At the same time, in a distributive pension system the balance of receipts and payments is directly related to the most common indicators of population aging - the share of the number of elderly (pensioners) in the entire population (Fig. 2) and the ratio of the population of retirement and working ages. While in the vast majority of countries that have completed the demographic transition, the trends of the elderly population size are currently changing direction, the relative indicators of aging continue to grow. This increase is the main argument in favor of a systematic adjustment of the retirement age.

[6] The sometimes used inertial one-factor forecasts of the total population or the size of individual age groups (arithmetic, hyperbolic, logistic, etc.) both at the national and at any administrative level are incorrect. In principle, they lead to false or even absurd results. To analyze the past and predict the future of the pension system, there are accessible, reliable resources posted on the Internet. In Russia, these are the forecasts of the Federal State Statistics Service (Rosstat) and the Institute of Demography of the Higher School of Economics. Supplements and / or alternatives to these resources are databases maintained by the Population Division and the Statistics Division of the United Nations Department of Economic and Social Affairs. The United Nations Population Division's website (https://www.un.org/en/development/desa/population/index.asp) contains several databases, including harmonized demographic estimates and projections for all countries of the world revised every odd year (United Nations 2019). The revisions use both national State official statistics as well as other sources of demographic information. The Division takes into account government replies to questionnaires, feedback from specialized Agencies and Programs of the UN system, other intergovernmental organizations, international and national NGOs, academic institutions and researchers. Relevant issues are regularly discussed at the annual sessions of the United Nations Economic and Social Council Population and Statistical Commissions. All UN Secretariat entities are required to use foremost population estimates and projections compiled by the Population Division.

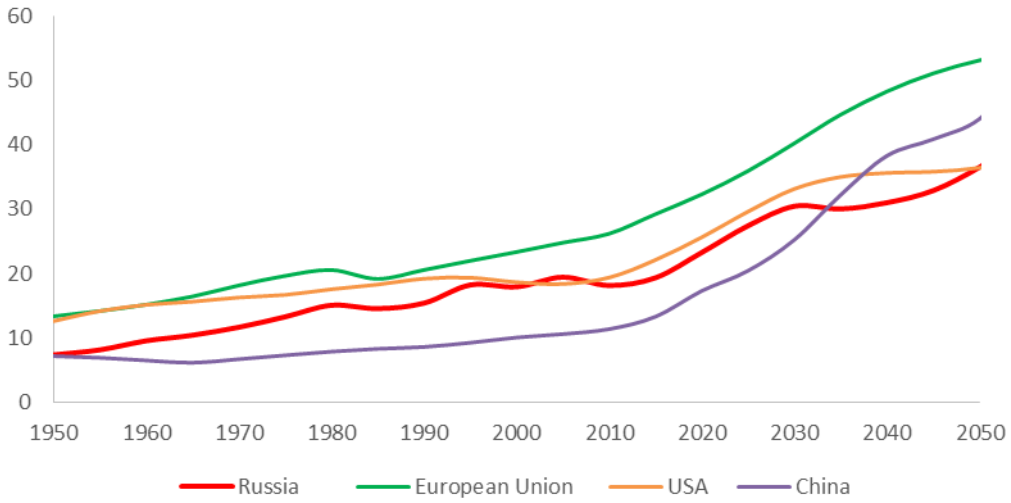

Figure 2. The ratio of the population aged 65 years and older to the population aged 15-64 in Russia, the European Union, the USA and China, 1950-2050, %

Source: United Nations (2017).

With the same age structure of the population, the number of employed persons varies significantly depending on the levels of economic activity and employment. What matters for the pension system is the number of employed persons (who ultimately pay pension contributions), not that of persons of working age. Meanwhile, in justifying the need for raising the retirement age, the distinction between the demographic burden on the working-age population and the economic burden on the working population, as well as the differences between long-term trends and short-term fluctuations in the age structure, are often ignored (see, for example, A. Kudrin and A. Gurvich 2012). Therefore, often, including in Russia, RRA is presented as a measure with no alternative (Denisenko et al. 2018), and the problem solution cost is conceptualized not as the totality of real costs, but only as the easily observable part of this totality.

Besides, when considering the scale and timing of RRA, it is necessary to take into account not only universal long-term demographic trends, but also their national specificities. Russia differs from other countries not by the fact of aging, but by the shape of the curve describing it. As a rule, aging is a smooth process, but in Russia the curve is so broken that in some intervals aging is not noticeable at all. The seemingly chaotic fluctuations around the uptrend are generated by the demographic echo of the tragic events of the first half of the 20th century, which dramatically deformed the age and sex structure of the population (Fig. 3). In addition, in contrast to Western countries, a decrease in adult mortality played an insignificant role in the aging of the Russian population because over the entire twentieth century this mortality almost did not decrease.

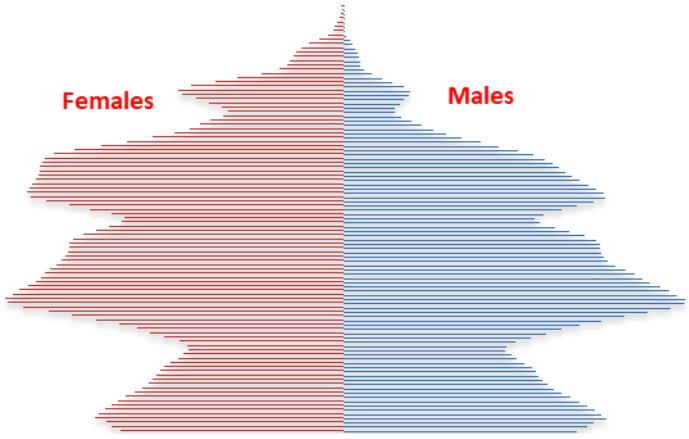

Figure 3. Sex and age structure of the Russian population in 2018

Source: United Nations (2017).

The result of this deformation was the "dancing" dynamics of the retirement age population. The deformations of the age structure are so strong (Fig. 4) that, without taking them into account, a discussion of any "remedial actions" becomes meaningless, since the real effects of an intervention will coincide with the theoretical ones only by chance. In addition, the low retirement age in Russia alone leads to an exaggerated understanding of the extent of aging (Gietel-Bastien et al. 2017).

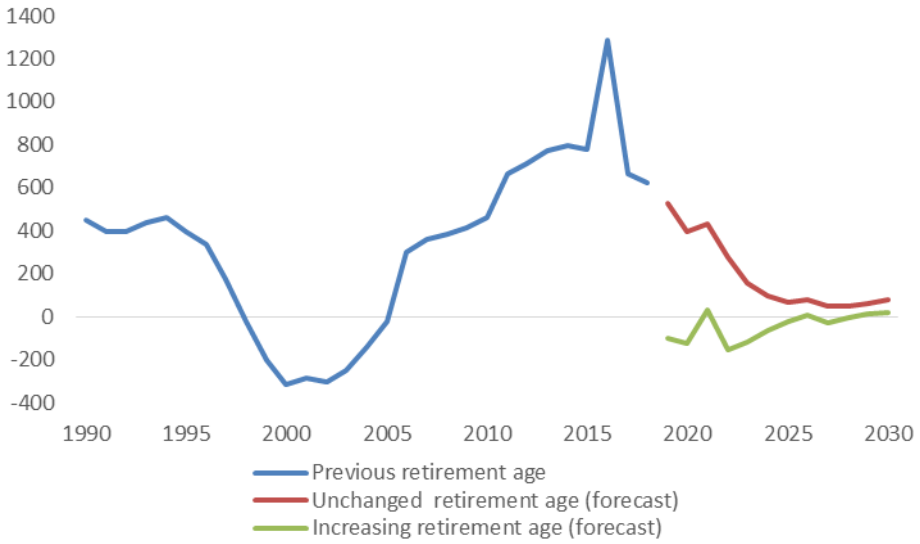

Figure 4. Increments of the retirement age population in Russia in 2000-2030, thousand per year

Source: United Nations (2017).

RRA followed rather than anticipated the rapid acceleration of the growth in the number of pensioners. The peak of growth has passed, and the growth of the retiree population (as defined by previous age criteria) is decreasing as quickly as it had been growing before (Fig. 4); in 2018, it was half that in 2016, and in 2019-23 it will rapidly decrease. After that, the pendulum will swing in the opposite direction, but with a smaller amplitude. Consequently, it is wrong to use rapid population aging as the rationale for urgent and drastic RRA.

In contrast to the number of pensioners, the number of people employed in the economy, i.e. payers of contributions to the MPI, is determined not only by demographic factors. Not all and not only people of working age work. The reproduction of labor resources is a function of the size of age–gender groups and the levels of economic activity and employment in these groups. Since these economic characteristics vary by sex and age, the age and sex structure of the population affects the total number of employees.

Thus, in terms of economic activity rates (participation in the labor force), men usually surpass women, but not at all ages; people aged 30-60 years are more involved in the labor force than people of older age groups. Yet, many people of retirement age remain in the labor force. The unemployment rate is especially high among young people. These parameters vary in time and space. Although their interrelations with demographic phenomena and processes have been observed (for example, the size of a cohort sometimes affects its position in the labor market), these are weak influences and can be ignored in this context; that is, it is assumed that the economic parameters of labor reproduction are independent from the demographic parameters.

Table 2. Working-age population, labor force and the employed. Russia, 2000-2018

	Number of people, million persons				Average annual growth rate, percent		
	2000	2010	2017	2018	2000-2005	2005-2010	2010-2018
Working-age population*	87.2	87.8	83.2	83.0	0.7	-0.5	-0.8
Labor force**	72.3	75.5	76.1	75.9	0.4	0.4	0.1
Employed	65.3	69.9	72.1	72.3	1.0	0.4	0.4

*Notes: * men aged 16-59 years and women aged 16-55 years; ** economically active persons aged 16 years and older*

Sources: Rosstat. Russian Statistical Yearbook; (2002, 2005, 2010, 2018); Rosstat. Labor and employment in Russia (2005, 2017); United Nations (2017).

Labor force participation rates are particularly high in the largest age group - in the working-age population. Therefore, the role of natural reproduction and migration in the dynamics of this age group of employed is especially significant. Wherever fertility remains below replacement level for long periods of time and net immigration does not substitute for it, the growth of the working-age population ultimately becomes negative. In most European countries, this turning point occurred simultaneously, at the turn of the 21st century. The faster was the decline in fertility in the 1960-1990s, the faster is the decline of the working-age population now. In China, the collapse of fertility in the 1970-1980s will cause a sharp decline in the working-age population already in the coming decade. Only in the USA and Australia can and will the working-age population grow for a long time, because fertility in these countries is higher and immigration is greater. For a long time, the Russian trajectory did not differ from the European one, and in 2010-30 there has been and will continue to be an accelerated reduction in the working-age population[7].

[7] In the Soviet Union, demographic projections were rarely implemented and were classified, but experts knew about Western research. In post-Soviet Russia, not only authoritative research organizations, but also Rosstat – the Government Statistical Agency - are engaged in demographic forecasting. So the trend shown in fig. 3 should not be a sudden revelation.

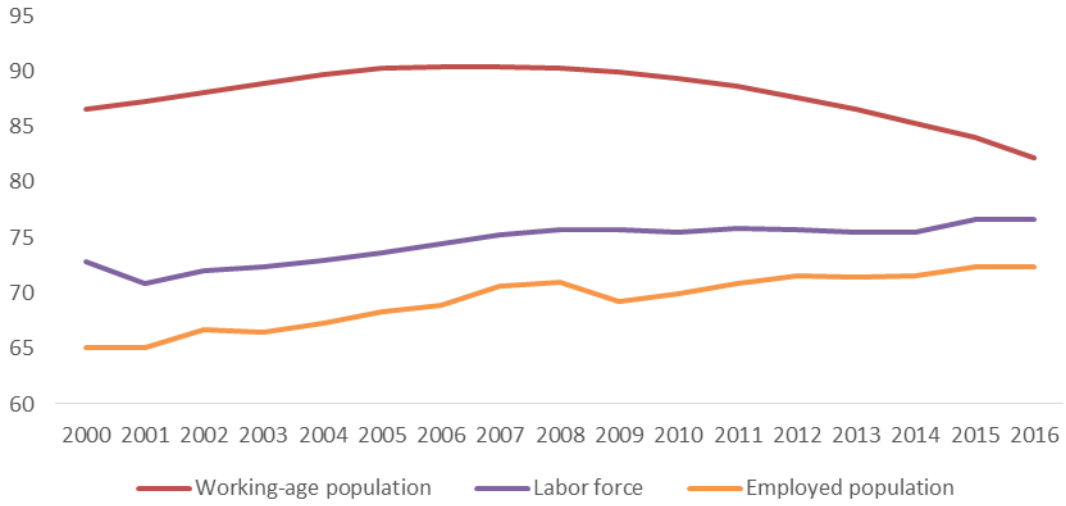

Figure 5. The working-age population, labor force and employed population. Russia, 2000-2016, million people

Note: The data of the chronological series have flaws: Rosstat often revises estimates and does not explain the reasons in all cases.

Sources: Rosstat. Russian Statistical Yearbook (for different years); Rosstat. Labor and employment in Russia (for different years); United Nations (2017).

A demographically determined rapid decrease in the working-age population[8] (by 7.3 million people over 6 years) was already taking place in the 2010s. The labor force also decreased, but to a lesser extent (by 2.7 million people). The economic recovery of the first half of the 2010s significantly increased the demand for labor, and the ensuing recession caused a reduction in the number of employed. The number of employed in 2010-2014 increased by 860 thousand people, and then over the next two years shrank by 820 thousand. The strength of economic factors was so great that they overcompensated for demographic shifts. The current economic crisis is unfolding against the backdrop of a deep spatial mismatch between the distribution of the working-age population and jobs in the context of the underdeveloped national labor market. As a result, low unemployment (i.e., a low proportion of unemployed people in the labor force) is combined with a low level of economic activity, which suggests that many working-age people do not enter the labor market because they do not believe that an active job search will be crowned with success. While in the developed countries this problem is marginal, in the underdeveloped economies of the South it is pervasive and presents a fundamental obstacle to development. Russia is situated somewhere in between.

However, the dynamics of labor force participation is more nuanced than suggested by the figures cited above. For instance, the number of working pensioners increased from 5.6 million in 2010 to 6.9 million in 2016. This was partly due to an increase in the number of pensioners, as the

[8] The working–age population, according to the definition valid before the pension reform, consisted of men aged 16-59 years and women aged 16-54 years. Employed are those who were employed or who received other labor income during the week preceding the survey. The labor force (economically active population) consists of persons who were employed or unemployed (i.e. did not have a labor income and were actively looking for work) during the same period.

large generations of post-war baby boomers entered retirement age. However, the largest component of the increase in the number of working pensioners in the 2010s was the growth of their economic activity, which was not due to any shift in the retirement age, but occurred "on its own". The reason, apparently, was a low ratio of pensions to wages and a decrease in the real size of pensions.

Thus, there was no generalized linear positive relationship between the demographically determined number of working-age people and the economically determined number of employed people (Fig. 5). Actual trends can even be interpreted as a feedback: a rising level of employment compensates for the decline in the working-age population when the demand for labor is constant. If so, then the market is building a healthy, effective and promising mechanism of adaptation to demographically determined reduction of labor resources. Moreover, it looks like in this area Russia has a relative advantage over developed countries, which will inevitably have to search in the immediate future for an answer to the challenge of aging and depopulation.

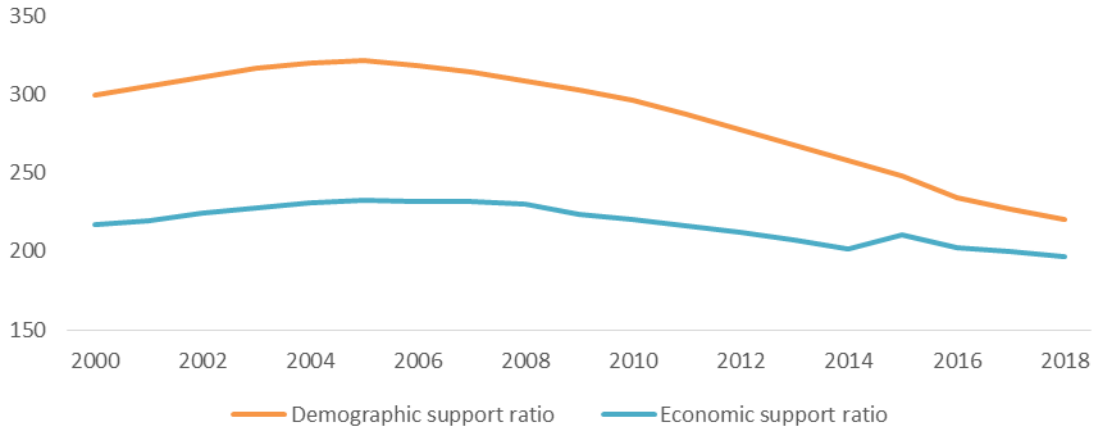

Figure 6. Demographic and economic support ratios in Russia, 2000-2018, number of pensioners per 100 working-age and employed persons

Note: The data of the chronological series have flaws: Rosstat often revises estimates and does not always explain the reasons

Sources: Rosstat. Russian statistical ... (for different years); Rosstat. Labor and employment in Russia (for different years); United Nations (2017); Model estimates for 2017-18.

The demographic support is inadequate to gauge the ratio of sources to recipients of MPI funds, as having a job does not always correspond to being of working age. The demographic support ratio can be used to predict a smoothed trend in the sustainability of the pension system for many decades to come, but in the range of 10-20 years it is unacceptable, especially with respect to Russia. The forecast for this interval must necessarily include the hypotheses of economic activity and employment, which is a separate task.

The economic support ratio is adequate for retrospective analysis. It shows (Fig. 6) that over the past two decades the ratio of the number of employed to the number of recipients of insurance pensions has not changed much[9], while the ratio of the number of people of working age

[9] The explanatory note to bill N 489161-7 justifies the RRA by the fact that "the ratio of the number of employed

to those of retirement age (the demographic support ratio) has decreased by ¼. The economic support ratio does not refute the argument about decreasing the ratio of payers of contributions to recipients of insurance pensions in the long run, but it does show that there is no reason to dramatize the trend.

As the demographic and economic ratios have come close to each other, the demographic projection suggests that the economic support ratio will decline, but the decline will be moderate and will not exceed 20 points by 2030. Of course, if Russia effectively embarks on an intense, i.e. labor-saving, path of economic growth, then the employed population will decline even without a demographic factor. Consequently, the decline in the economic support ratio will accelerate. In this scenario, a decrease in the working-age population will become a favorable factor limiting the growth of unemployment. By analogy with the current redistribution of oil and gas revenues, it is quite natural to channel part of the income thus saved (from modernizing the economy (because of a lesser need for unemployment benefits) into the pension system. All other options for balancing MPI income and expenses (increasing contribution rates, reducing pensions, RRA) are worse on social grounds.

JUSTIFYING AN INCREASE IN RETIREMENT AGE BY A GROWTH IN LIFE EXPECTANCY

Over the past 10 years, life expectancy at birth has increased by 6 years. By world standards, this seems to be a good result, if one ignores the long-term trend, its gender structure and comparison with the experience of other nations. In fact, the growth of life expectancy in 2007-2017 only compensated for the surge in mortality in the 1990s, when life expectancy was reduced by 4.5 years, plus a modest one-and-a-half-year increment. In Russia, the life expectancy of women at birth is 3 years less than in China and 7 years less than in the European Union. This lag is significant, but for men it is striking - 9 and 13 years, respectively (Fig. 7). When the RRA began in European countries, the life expectancy of men was 5 years longer than now in Russia. Thus, if life expectancy at birth is considered an adequate indicator of readiness for RRA, then Russia is obviously not ready for it. The authorities used the argument that life expectancy should rise to 80 years by 2030. The problem with this argument is that it is not clear *why* it should or *how*. Pension reforms usually rely on already achieved demographic parameters, yet both long- and short-term past life expectancy trends in Russia call into question such a forecast.

Meanwhile, the indicator of life expectancy at birth is generally not adequate to the task. One cannot, as is sometimes believed, subtract the retirement age from this indicator to obtain the life expectancy in retirement[10]. If this were so, then in Russia in 2000, men who reached 60 years

and pensioners by 2025 will be 1.04 [*104 in the dimension used here*], while now it is 1.12 [112]." This statement is incorrect for three reasons. Firstly, deductions to the MPI are paid (should be paid) by all employed, and not just hired workers. Secondly, the number of pensioners is much larger than the number of pensioners receiving an MPI pension. Thirdly, not all pensioners receive an insurance pension. No matter how you count (with or without correction of the numerator and denominator), the support ratio is almost twice as high as that given in the note.

[10] Russian government agencies systematically stumble over the interpretation of demographic indicators. Thus, the Ministry of Health, and after it the government apparatus and the Presidential Administration mistakenly believe that the number of births shows the fertility level, and that life expectancy and mortality are

of age would have been characterized by a negative life expectancy, and even now the PFR would not have the problem of financing insurance pensions (i.e. there would be few to receive them), as after slaving in the galleys one would immediately cross the Styx.

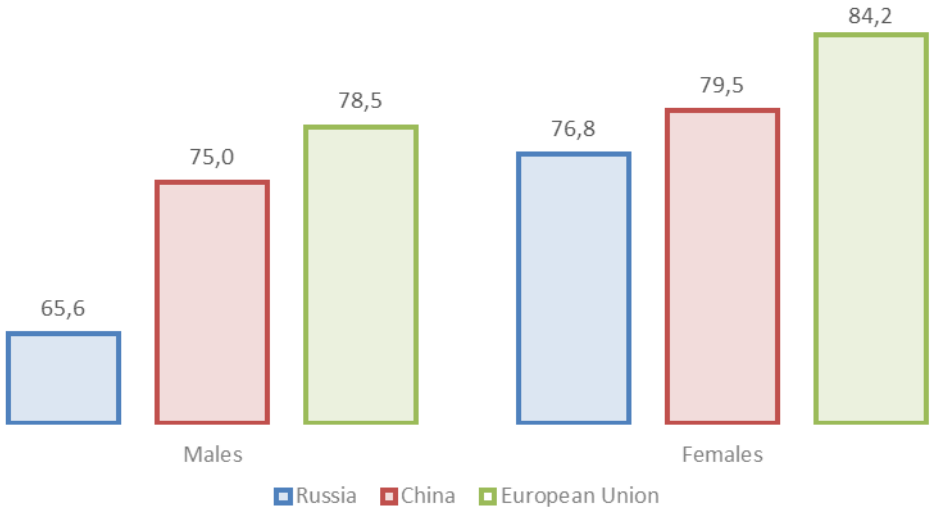

Figure 7. Life expectancy at birth in Russia, China and the European Union in 2015-2020, years

Source: United Nations (2017).

Life expectancy at birth and upon retirement are not linearly related; there is no and cannot be a general formula for the transformation of one indicator into another. Since not only the levels, but also the dynamics of mortality are age-related, the trends in life expectancy at birth and age-specific expectations of remaining life are not parallel. In Russia, this discrepancy is especially large due to the extremely high mortality of working-age men.

Table 2. Life expectancy at age 60 in Russia, the European Union and China, 1950-2020. Average annual levels (years) and growth rates (% per year)

	European Union	China	Russia
Men			
Life expectancy			
1950-1955	15.7	9.6	14.9
2015-1920	22.2	18.9	15.8
Average annual increase in 1950-2020	0.6	1.1	0.1
Women			
Life expectancy			
1950-55	18.4	11.7	18.8
2015-20	25.3	20.7	21.0
Average annual increase in 1950-2020	0.5	1.0	0.2

Source: United Nations (2017).

Thus, the appropriate indicator for measuring mortality of retirees is life expectancy at retirement. Six decades ago, the life expectancy of 60-year-olds in Russia did not differ much from the average European level, and it exceeded the Chinese level by 5 years for men and 7 years for

different concepts.

women (Table 2). Subsequently, these indicators in the European Union grew by 0.5-0, 6% per year, and in China twice as fast. In Russia, the life expectancy of 60-year-old women increased 2.5 times more slowly than in the European Union, and of 60-year-old men - 6 times more slowly. As a result, in the space of 65 years Europe achieved a 7-year increase in this indicator and China a 9-year increase, while in Russia it increased by only one year for men and 2 years for women. The country lagged behind Europe by 4 years for women and 6 years for men, its lead over China in women's life expectancy disappeared, and for men, a 5-year lead turned into a 3-year lag. This is not a hypothesis that can be challenged, but an observable statistic.

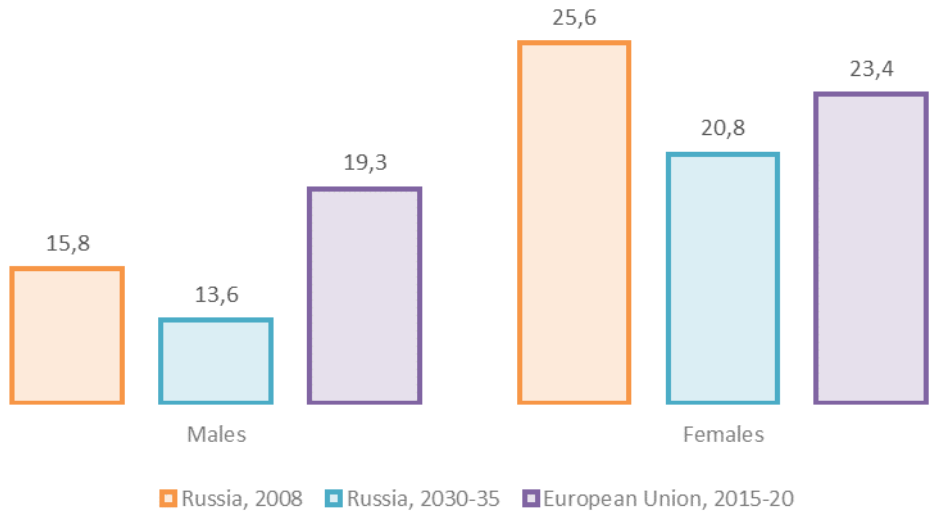

Figure 8. Life expectancy at retirement in Russia and the European Union, years

Notes: Russia, 2018: life expectancy of men aged 60 years, women aged 55 years; Russia, 2030-35: life expectancy of men aged 65 years, women aged 60 years; European Union, 2015–20: the average retirement age in 2017 was 64 years for men and 63 years for women, but the estimates given here relate to life expectancy at 65 years.

Source: United Nations (2017).

Assuming a life expectancy in retirement that has been achieved in the West when RRA started to be a criterion of readiness, then Russia does not satisfy it (Ivanov 2016). On the other hand, the decreed 5-year RRA will far exceed the expected increase of life expectancy at retirement ten years from now. As a result, life in retirement will be reduced (Fig. 7), which is unlikely to please citizens, though it is in the interests of the PFR. Even if improvements go as quickly as the Government wants, men's life expectancy in retirement even by 2035 will not have reached the milestone that Western countries had reached when their RRAs began.

Several studies have shown that retirement contributes to better health, while continued work beyond retirement age, on the contrary, leads to its deterioration (Hessel 2016; Blake, Garrouste 2017). This deterioration is especially noticeable for people with inferior education, whose life expectancy is much lower than for people with higher educational levels (at the age of 50 by 4.4 years for women and 3.0 years for men - see Shulgin, Zinkina, Shcherbov 2018). Therefore, RRA is in conflict with the proclaimed goal of rapidly increasing life expectancy.

SCHEDULE OF INCREASING THE RETIREMENT AGE

Over the past 10-15 years, the retirement age has been raised in many countries. As in Russia, this is taking place due to continuous shifts jeopardizing the solvency of redistributive pension systems. Usually, States resort to RRA when they realize that serious changes are occurring in the economy and society, and that civil society is sensitive to this issue. The main conclusion, which follows from accumulated experience and does not necessarily need to be confirmed by one's own national experience, is the idea that even a modest increase in RRA will have a serious impact on resource flows.

As a rule, governments preparing a RRA do not try to conceal that such a reform is, in principle, a zero-sum game, and do not pretend that everyone will immediately experience the beneficial effects. They strive to prevent the painful impacts of the reform from crossing the lines of outright rejection by the society and therefore choose a small angle of inclination of the RRA, limiting the scale of the increase, stretching it over time and avoiding jumps – that is, sacrificing a part of the financial gains in order to minimize social risks. This is the decisive qualitative parameter of the reform, a guarantee of its acceptance by society and of its irreversibility. It is so clear to everyone that it is wrong and dangerous to hide one's head in the sand for decades, then try to jump as far as possible in order to immediately begin correcting the consequences of the deed, that such aberrations are not often discussed in the literature.

In the West, the most radical RRA has been carried out in Italy. In 2012, the retirement age for women in the private sector was increased immediately by 2 years to 62 years, and subsequently by 8 months a year until reaching the age of 66 in 2018. Since 2019, a periodic (every two years) linkage of retirement age with life expectancy has been introduced. The technocratic cabinet of M. Monti paid for the reform with the foreseeable resignation and crushing defeat of his party coalition in the parliamentary elections. In France, the increase by the government of N. Sarkozy of the retirement age from 60 to 62 caused the longest nationwide strike in the history of the country, which almost led to a government crisis.

Typically, the retirement age is raised by 2-3 months per year, sometimes with intervals being made between the increments. For example, in the American system of state pension insurance (Social Security), the full retirement age is 65 years for people born before 1938; each annual cohort born in 1938-1942 begins to receive a full pension two months later than the previous one; for generations born in 1943-54, there is a common retirement age of 66 years; for the generations born in 1955-59 the retirement age is increased in two-month increments; and for subsequent generations there is a common retirement age of 67 years. At the same time, there is an unconditional opportunity for everyone to start receiving a pension both ahead of schedule and after retirement age with a corresponding reduction or increase in the size of the pension.

An indispensable condition for a successful RRA is the preliminary study of the whole complex of socio-economic consequences of the reform. It is trivial but fair to emphasize that a thorough public discussion of the reform project by involved departments, experts, the media and NGOs - with the contribution of such experienced international organizations as the IMF, World Bank, ILO, OECD and the European Union - not only ensures the quality of the reform, but also contributes to reaching a national consensus on the basis of a compromise among the interests of different groups. In other words, it is necessary to seek the prior consent of society for reform, and

for this it is necessary to ensure the financial literacy of the population. Data on legislative elections in 21 countries in the period 1990-2010 show that the financial literacy of the population reduces the electoral price of large pension reforms, while the general educational level of the population does not compensate for the lack of relevant knowledge (Fornero, Lo Prete 2019). Financial literacy not only directly contributes to public understanding of the need for reform and the correctness of the methods proposed by the government, but also pushes the media to a balanced and comprehensive coverage of these issues.

Russia has taken an original path in this matter. It was decided to raise the retirement age by quite a lot, to do it in large annual increases and to start almost immediately after the public announcement of the decision. Even if we assume that the Russian Government correctly formulated the problem, made the correct diagnosis and correctly determined the goals of the pension reform, it turns out that the method of its preparation and the scheme itself are still questionable.

For a decade and a half, the official position in Russia was to refuse RRA from the very outset, although reforms of other aspects of pension provision were carried out. Neither the PFR annual report for 2017, nor the federal budget for 2018, nor the message of the President to the Federal Assembly of 2018, nor his Decree of May 2018 which formulated the strategic objectives for the development of the country contain even a hint of a crisis in the pension system and the need for RRA. Moreover, the President positively assessed the demographic situation in the country. Then, the Government suddenly announced an RRA starting January 1, 2019, limiting discussion of its decision to just a few months. Contrary to statements by the Presidential Administration about negative changes in the demographic situation that have occurred over 15 years, they contained no new revelations in terms of facts and ignored the definitive prediction that population aging will keep slowing down. Concurrently, the Government kept silent about the new and bad economic trends, yet it is repeatedly stated that the implementation of the 2018 State budget ended up in a large surplus. As is increasingly happening on other issues as well, the Government–related media covered the reform from a purely partisan position, neither bothering to check the scattered information nor paying attention to formal contradictions in their own narrative.

Less than 3.5 months after the Government introduced the bill on RRA in the State Duma, it was adopted in the final reading, despite earlier protests from the opposition (which in itself was a unique phenomenon), and its widely publicized mitigation in just one aspect (RRA for women for 5 years instead of the originally proposed 8 years) was accompanied by a significant, but all but unnoticed tightening in another (cutting in half the time between RRA increments). A public opinion poll showed that 85% of citizens reacted negatively to the RRA legislation (Levada Center 2018).

The explanation for the suddenness may consist in the fact that the problem of the chronic large deficit of the PFR had been ripening for a long time, the government hoped that it would resolve by itself, and since it did not, it was decided to go on a frontal attack and push the reform through before everyone came to their senses – and, what's more, implement the RRA to the maximum. An alternative explanation is that the Government ignored the problem, but something or someone finally opened its eyes to the deplorable situation. The most likely explanation is

opportunistic. In the early summer of 2018, two negative phenomena intertwined in a tight knot: the windows for overcoming economic stagnation were closed and foreign policy risks aggravated. The authorities, as usual, decided to apply the principle of socialization of costs with the monopolization of benefits. This explanation is consistent with the reluctance not only to recognize, but even to discuss the fact that the trillion ruble increases in the consolidated national budgets due to RRA are not manna from heaven and not a surplus value, but the result of redistributing the national economic pie.

The explanatory note to the pension reform bill of June 16, 2018 unequivocally named the goal of the reform: to eliminate the demographically caused deficit in financing pension insurance. Significantly broader economic and social justifications would gain ground in official explanations and opinions expressed in the media by MPs, Government officials and associated supporters of the reform: to provide the country's economy with labor resources, national projects with financing, pensioners with higher pensions, and senior citizens with better opportunities for self-realization. Implied, and sometimes openly used, is a civilizational argument: we are not the first, in the West they have been raising the retirement age for a long time, it is time for us to do the same. It is proposed to take on faith the assertion that if the RRA is not raised immediately and to the degree decided on, then inevitable future reform would be even harsher.

THE IMPACT OF INCREASING THE RETIREMENT AGE ON THE DYNAMICS OF THE NUMBER OF PENSIONERS

The irregularity of the age structure of the population of Russia caused by the Great Patriotic War predetermines the undulating dynamics of the population of retirement age: a seven-year growth period in 1990-1997 was followed by a 7-year decline in 1998-2005, then by 12 years of rapid growth in 2006-2018. Over the next 4 years (2019-2023), annual growth will decrease by almost half, and in 2024-2030 the number of men over 59 years old and women over 54 years old will almost stabilize.

The reform will automatically reduce the number of pensioners. By July 1, 2019, there will be 1.5 million fewer pensioners in the country than on July 1, 2018, and 2 million fewer than there would have been without reform. The number of pensioners in 2034 will be 8.2 million fewer than if the retirement age had not been changed. However, the dynamics will not be monotonic. The RRA will produce the greatest effect at the reform implementation stage, i.e. in 2019-2023: instead of an average annual increase of 357 thousand people, the number of pensioners will be reduced by 1,439 thousand people per year. However, as soon as the reform is completed, the growth in the number of pensioners will resume (Table 3).

Table 3. The average annual change in the number of pensioners, 1950-2034, thousand people

Period	Constant retirement age	Increasing retirement age
1990-1997	380	
1998-2005	-218	
2006-2018	632	
2019-2023	357	-1439
2024-2030	68	220

Source: United Nations (2017).

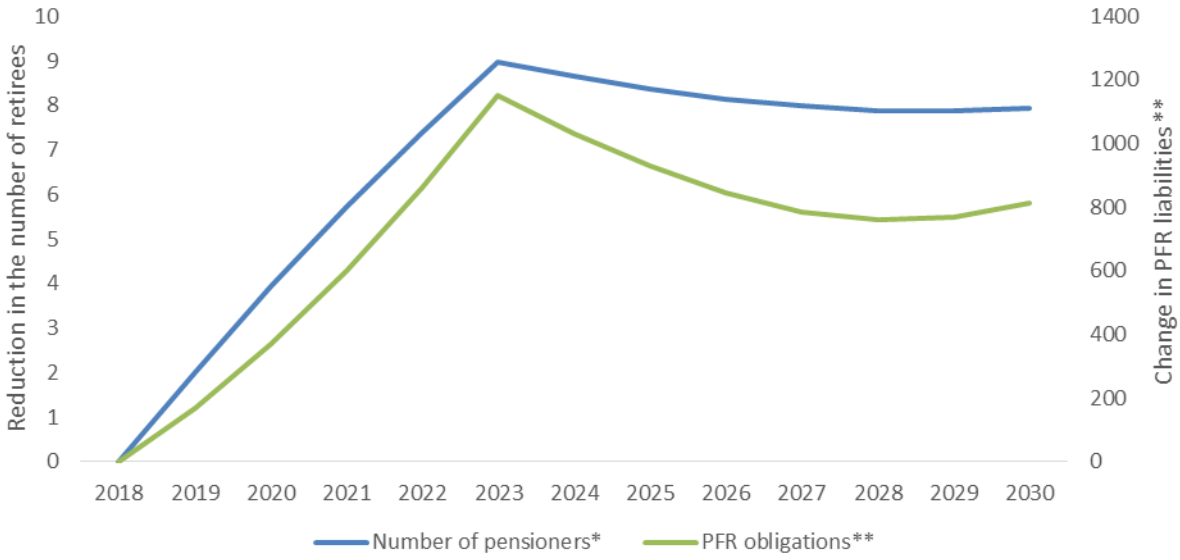

Figure 9. Change in the number of pensioners (million people) and PFR obligations (billion rubles), 2018-2030

*Note: * compared with the number of persons of retirement age by its previous definition; ** the difference between the PFR's MPI obligations in the absence of a RRA (while maintaining the inflation adjustment of pensions at 4% per year) and the total obligations of the PFR in the case of RRA and the fulfillment of the obligation to annually increasing pensions by 1000 rubles.*

Source: United Nations (2017)

The flip side of the encouraging dynamics in the number of pensioners will be the emergence of a problematic group of people whose retirement was postponed by RRA (the "Contingent")[11]. Social protection of this group of elderly people and their adaptation to new conditions will require significant efforts of the State and society (see below).

THE FINANCIAL EFFECT OF INCREASING THE RETIREMENT AGE

The financial consequences of RRA for the State are determined by the size of the Contingent and a number of economic parameters. The size of the Contingent is set by the demographic trends. The most important economic factor in the balance of funds will be the dynamics of the size of pensions. In principle, the average future pension depends on many factors that are difficult to predict. However, the task is facilitated by the fact that the government has firmly promised to annually increase monthly pensions by 1000 rubles. This will substitute for the indexation of pensions for inflation, which is implicitly confirmed by the official estimate of the size of pensions

[11] There is no well-established name for this group of people Various designations would be equally suitable , for instance, "Citizens with a deferred right to retire," "Workers who have postponed their retirement"; "Persons with lost pension income"; "Workers who are denied the right to retire in accordance with legislation in force until January 1, 2019"; "Persons in respect of whom the policyholder has changed the terms of the insurance contract"; "Persons of revised working age"; "Pension reform target group". These terms are accurate enough but cumbersome. The short designations "deprived", "refuseniks", "losers" are too emotional. The word "Contingent" is used below as a short, emotionally and ideologically neutral contextual name for this group, not claiming scientific or legal correctness.

in 2019. Until 2030, the new procedure ensures faster growth of pensions, provided that inflation does not exceed 4%: by 2024, average pensions will cumulatively increase by 2.3 thousand rubles more than indexation would give, and by 2030 - 3.5 thousand rubles more. However, due to a continuing decrease of the relative weight of the thousand-ruble pension increment, the trajectories of the pension size according to these two formulas (indexation for inflation and constant increment) will intersect beyond the projection horizon. The greater the excess of the actual inflation rate over the planned one (4% per year), the earlier this intersection will occur. Anyway, an annual thousand-ruble growth of the average pension at four percent inflation will ensure a slow growth in the currently low living standards of pensioners. On the other hand, the new formula would not prevent the ratio of pensions to wages from deteriorating. For example, if the average wage in real terms increases by at least 1% per year, then starting in 2021 the growth of pensions will lag behind the growth of salaries, which will lead to a decrease in the replacement rate from the current low level of 33% to 28% in 2030.

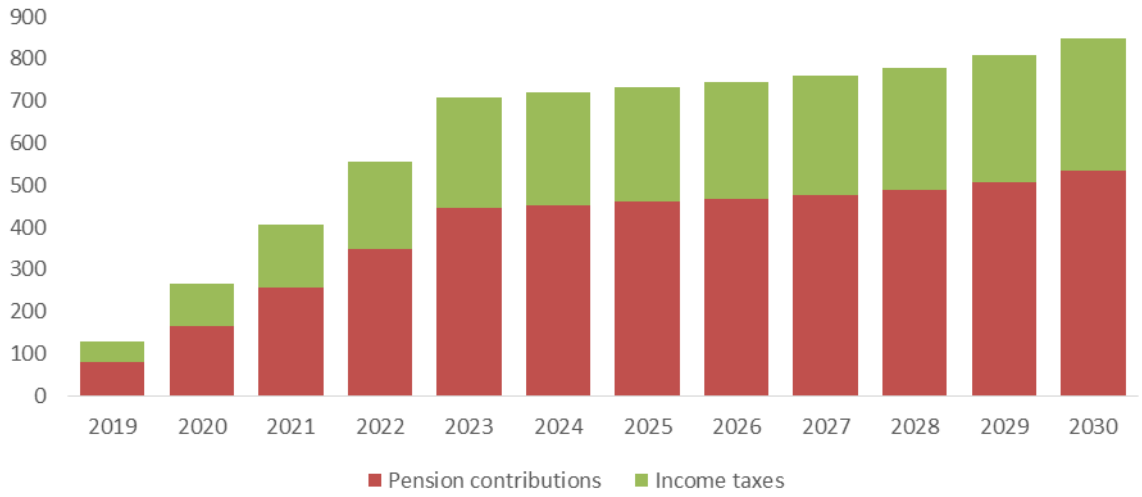

Figure 10. Additional pension contributions and income taxes if 80% of the Contingent are employed

Note: in 2016, 39.4% of men aged 60-64 years and 52.4% of women aged 55-59 years were employed. The number of people employed in the Contingent is calculated as the product of the size of the Contingent and the additions of these values to 80%. The average salary in 2018 (the first half of the year) amounted to 42,550 rubles. It is assumed that the nominal salary in 2019-30 will grow by 5% per year.

Calculated by: United Nations (2017); Rosstat (https://regnum.ru/news/2459352.html).

RRA will save money for the PFR due to the reduction in the number of pensioners, even if the PFR fulfills its promise to annually increase pensions by an average of 1000 rubles. In 2019, the amount of savings will be about 170 billion rubles, and for the period 2019-2030 the cumulative decrease in PFR obligations will amount to more than 9 trillion rubles, but only marginally if the additional accumulated outlays for underwriting the promise to keep pensions increasing faster than inflation are deducted. Along with the dynamics of pensions, the financial consequences of RRA for the PFR (as well as for the State budget) will be determined by the Contingent's employment, as employers make contributions to the MPI, while employees pay income tax.

The following calculation is based on the assumption that 80% of the Contingent will work[12], receiving the national average wage which will grow by 5% per year (in nominal terms), i.e. will reach 57 thousand rubles in 2024 and 76 thousand rubles in 2030. If it proves feasible to keep employment of the Contingent at 80%, over the period of 2019-2030 the PRF will receive an additional 4.7 trillion rubles of pension contributions, and the State budget will receive 2.8 trillion rubles of income taxes (Fig. 10). Thus, the State's total net revenue from RRA for 12 years would reach 5.2 trillion rubles.

It should be borne in mind that the hypothesis of a very high employment of the Contingent is unlikely (see below). One uncreated job will cost the State more than 200 thousand rubles a year in lost revenue from taxes, pension contributions and expenses for unemployment benefits. In case no additional jobs are created, the reform will produce a net accumulated loss of 3 billion rubles. Thus, the fate of the reform directly depends on success in ensuring the employment of the Contingent.

THE INFLUENCE OF INCREASING THE RETIREMENT AGE ON THE LABOR MARKET

On January 1, 2019, the dynamics of the working-age population changed radically. By 2030, it will increase by 5.4 million people and reach 81.4 million people, while maintaining the current retirement age would have led to a decrease of 5.4 million people. Linear interpolation between 2018 and 2030 yields an average annual growth rate of 0.4% as a result of RRA versus a mirror negative average annual growth rate without RRA. However, the true growth trajectory is a broken line, since the rapid growth of the working-age population in 2019-2023 will be replaced by its almost equally rapid decline in 2024-2030. In 2023, the last one-year increase in the retirement age will take place, and subsequently the aging of the population will take over.

To prevent a spike and subsequent more gradual increase in unemployment, the demand for labor should keep pace with the dynamics of its supply. In 2010-2016 the Russian economy created three million (± 200-400 thousand) new jobs per year (as reported by official statistics). In pre-crisis 2014, 3.8 million new jobs were created; even in the recession of 2015-2016, 2.9 million were added [Labor and employment ... 2017]. Against the backdrop of these figures, 0.6-0.7 million additional jobs a year ("earmarked" for the Contingent) seems to be an ambitious yet achievable goal provided a steady economic growth is maintained.

However, the optimistic obverse of the coin has a sobering reverse. Every year, millions of jobs disappear, and sometimes even in years of economic growth more jobs are eliminated than are created. So far, the negative balance of job dynamics has been offset by a demographically-driven reduction of the working-age population. The rapid increase in the working-age population in 2019-2024, on the contrary, will compound the negative effects of the economy–driven contractions of employment leading to increasing unemployment. Only rapid economic growth within the framework of an extensive development model could generate jobs in the quantities

[12] This is a super-optimistic assumption. For more information on the prospects of employment for the Contingent, see below.

necessary to absorb the rapid growth of labor resources generated by the RRA. Meanwhile, economic growth even according to the upper versions of medium-term forecasts (including official ones) cannot be called rapid. In addition, the Government wants to switch to an intensive, i.e. labor-saving, model of economic development.

An equally serious issue is the harmony (or rather the lack thereof) of structural characteristics of the labor force with the needs of employers. There is market demand not for just any labor, but for labor with industry–specific qualifications, geographic location and often particular demographic characteristics. In the situation created by RRA, the qualitative characteristics of prospective workers are fundamental. It is implicitly assumed that the increase in the labor force will be met not by absorbing young people into the labor market, as is usually the case, but by keeping senior citizens in it one way or another. It is difficult to measure the degree of disparity of their human capital with the needs of the current Russian economy (let alone a dreamt technological breakthrough), but it would not be an exaggeration to say that young workers are more fully in line than seniors with both the modernizing and the extensive economies.

One of the many aspects of this issue is related to the gender and age structure of the working-age population. As a result of the RRA, the share of men and women aged 40 years and older in the working-age population will increase by 9 percentage points by 2030 versus 6 percentage points in the case of an unchanged retirement age (table. 4). High male mortality combined with RRA will exacerbate the feminization of the workforce. The number of women 39-55 years old will increase by 1.7 million by 2030, and the reform will add another 6 million older women to the working-age population. As a result, the proportion of older women in the working-age population will increase from 18% to 30%. To the extent that labor demand has gender and age preferences, these shifts will require either adaptation of the economy's structure or correction of employers' requirements for labor. If neither happens, a massive increase in unemployment is inevitable.

Table 4. The percentage of men and women 40 years and older in the working-age population, in percent, Russia, 2018, 2024 and 2030

		2018	2024	2030
Men	Constant retirement age	22.5	23.5	26.1
	Increasing retirement age	22.5	26.8	30.1
Women	Constant retirement age	18.3	20.5	22.3
	Increasing retirement age	18.3	23.7	29.7

Source: United Nations (2017).

In the context of economic stagnation or timid growth, a radical, realistic, albeit partial solution to the problem of Contingent employment can only consist in a discontinuation of labor immigration coupled with the expulsion of all labor migrants from the country. It may seem that such a step is more difficult to implement than RRA, but in this domain law enforcement is more powerful than the relevant Government agencies. The predominantly temporary nature of labor migration into Russia facilitates the task. Indeed, one just has to stop issuing and renewing residence and work permits, revoke valid permits, increase penalties on employers for hiring illegal migrants and on landlords for renting them housing, and deport illegal migrants. Current legislation makes provisions for most of these measures, but their implementation is far from systemic. Applying them across the board and strengthening the built-in deterrents may lead to a

quick drying up of new immigration flows followed by a gradual decline of the number of foreigners in the country. Indeed, this is the exposition of one of several logical responses to challenges caused by RRA rather than an advocacy against immigration.

The logical goal may consist in replacing migrants by the Contingent in construction, agriculture, transportation and services, where foreign labor is used most. At the same time, most members of the Contingent, finding themselves in a precarious situation, would be unlikely to demand higher salaries and better working conditions than migrant workers routinely accept. In particular, this means that people of advanced age will have to agree to work 55-60, or even more than 70 hours a week (Tyuryukanova 2008). An alternative, in principle, could be hiring, to perform the same amount of work, 15 or more employees from the Contingent (with a higher salary) instead of 10 laid-off guest workers, which won't be an attractive solution for employers. On the other hand, if members of the Contingent do not want to work 10 hours a day, 6-7 days a week, they will have to accept a still lower salary.

In order to ensure the harmonization of demand for and supply of labor, it will be necessary to organize the relocation and resettlement of large masses of Contingent members. In addition, it will be necessary to organize the retraining of seniors. The price of such a national program would consume a large, if not most, of the additional pension contributions and income taxes. One could, of course, shift these efforts to the members of the Contingent themselves, but this would further significantly worsen their financial situation, not to mention create new health risks and emotional costs.

The aforementioned issues make the replacement of migrants by the Contingent a project that can only be initiated with forceful administrative methods rather than by market mechanisms, while intentionally ignoring its various negative consequences. However, even the most stringent and expensive methods will not guarantee success. In addition, even if it were possible to completely replace labor migrants with the Contingent, this would solve the problem of their employment only partially, because the number of labor migrants in the country does not seem to exceed 3.5 million people, and net migration does not typically exceed about 300 thousand people a year, while in 2019 alone 670 thousand jobs would have to be created for the Contingent, and this number will grow. In addition, this method of suppressing the effects of the pension reform would in principle be contrary to its main task, since temporary foreign workers pay pension contributions while only rarely claiming pension benefits.

Recognizing the incorrectness of its original premise that RRA was problem-free, the State decided to protect the Contingent by introducing in the Criminal Code[13] a rule of the Labor Code prohibiting age discrimination and explicitly forbidding layoffs of workers of "pre-pension age".

[13] A new article 144.1 of the Criminal Code adopted by the State Duma in September 2019 reads: "Unreasonable refusal to hire a person on the grounds of reaching pre-retirement age, as well as unjustified dismissal from work of such a person for the same reasons, shall be punishable by a fine of up to two hundred thousand rubles or in the amount of the wage or other income of the convicted person for a period of up to eighteen months or by compulsory labor for a period of up to three hundred and sixty hours. For the purposes of this article, pre-retirement age means an age period of up to five years preceding the appointment of an old-age insurance pension in accordance with the pension legislation of the Russian Federation." It is characteristic that punishment for violating the law is a fine benefiting the State, and not compensation for the citizen illegally dismissed or not hired. Moreover, the law has no provisions for a court to force an employer to reinstate or hire this person.

The new article does not please employers and impedes the normal functioning of the labor market. At the same time, it is easy to carry it out formally while sabotaging its purpose: it is enough to indicate another, legitimate reason for dismissal, something which employers usually do already in response to the long-established general prohibition of age-based discrimination. In many cases, this behavior of employers is economically justified by the desire to increase labor productivity by hiring younger staff. In individual cases, it is quite safe to do this, but mass layoffs may attract the interest of supervisory authorities. Para-state corporations and state organizations, threatened by eventual criminal prosecution (although it is not clear just who may be prosecuted), will feel compelled to obey the new prohibition, while begging endlessly for (and receiving) delays and exclusions. Most large private enterprises will sabotage it, because the punishment is less burdensome than losses incurred from following the law. For small entrepreneurs, the ban is almost as absurd as it is for the self-employed. That leaves medium-sized businesses, which already fall victim to all sorts of Government interference. But here as well, the effectiveness of intimidation should not be exaggerated. It is no coincidence that for over six months after the new criminal law was passed there was not a single case (publicized in the media) of its application, although real discrimination of "pre-pensioners" (persons who have five years or less left before reaching the pensionable age) undoubtedly exists. The new conditions may even aggravate "agism" in relation to employees and job seekers who are significantly younger than the retirement age (Klepikova and Kolosnitsyna 2017).

In case the new law is enforced, employers will have two options: not to dismiss the employee until he reaches the new retirement age, while continuing to hire young employees, or to stop hiring younger employees. The first option entails inflating the enterprise's payroll and decreasing the overall staff productivity. The second option may become even more an impediment for the enterprise's development. On a countrywide scale, doubling the number of unemployed citizens under the age of 30 would yield enough jobs to absorb the 2019 Contingent. It is clear that for the entrepreneurs this will result in economic losses, and for society, social problems.

The best option would be to expand the need for labor. So that the Contingent does not take away jobs from other economically active citizens, it is necessary to create these jobs in addition to the usual "old" new jobs. It will not be easy to force the economy to diligently carry out the "demographic task" caused not by the natural reproduction of the working-age population, but by man-made interference in this process. The Contingent has only one advantage over other potential sources of labor supply, consisting of unemployed youth, unemployed women with young children and prospective immigrants. This advantage lies in its members' greater experience in an already acquired profession. For all other relevant parameters (level of education, health, vertical, inter-industry and territorial mobility), the Contingent is inferior to younger groups. Thus, it is necessary either to tailor the extensive economic model only to the "old" industries, making their technological renovation unnecessary and unprofitable, or to make the growth in the demand for labor outstrip the possibilities of satisfying it from other sources. In the current Russian environment, both options require a pace of economic growth that far exceeds the Chinese one.

In order for additional new jobs to support the Contingent's employment, it is necessary that they be created precisely for this purpose. In the absence of a mechanism that deprives other groups of workers of the opportunity to get these jobs, members of the Contingent will be left

without work. On the other hand, it will be necessary to prevent the continuation of work after reaching retirement age. This, in turn, will lead to a reduction (compared with the pre-reform period) of employment of pensioners and, consequently, to a decrease in the economic support ratio. Once again, an even more serious problem is the need to create a national retraining system for millions of people.

For example, in 2019 1.6 million men born in 1959 and women born in 1964 turned 60 and 55 years old, respectively, thus becoming the first cohort of the Contingent. Let's assume that 80% of this cohort needs jobs (as opposed to 39% and 54%, respectively, as historically observed): this is the level of economic activity of 60-64-year-old men in Japan. In order to provide work for these people, it will be necessary to lay off one-third of the two million employees born in 1954-1958 or somehow distribute this quota among other, younger generations. In 2020, this cohort will attain the retirement age and will have to relinquish their jobs. If they do not, in 2020 it will be necessary to take approximately as many additional new jobs from elsewhere. But in any case, it will be necessary to increase the number of jobs by another 600-700 thousand to take up the replenishment of the Contingent created by raising the retirement age by one more year. And so on every year. Even if it had been possible to create an appropriate mechanism (which is unlikely), the obstacles created by it would outweigh its advantages.

Moreover, setting the national goal of creating that number of additional jobs for the Contingent would be insufficient to balance the supply of and demand for labor, since people don't just work, they work in certain geographical places and specific industries and in particular enterprises according to specific staffing tables. Hence, it becomes necessary to organize decentralized planning followed by centralized integration of plans and their timely implementation. It is clear that the market, in principle, cannot do this, no matter what signals the Government sends to it. Therefore, to organize such an unprecedented process a considerable administrative apparatus is needed. But even the smooth operation of such an apparatus is no guarantee of success in carrying out a task that is not inferior in complexity to optimizing the functioning of the socialist economy – a task the Soviet Union's command economy never quite managed.

It cannot be said that the State intends not to participate at all in covering the costs of RRA. The Government plans to allocate about 5 billion rubles a year (1.5% of the minimum estimated savings of PFR or 4-5 thousand rubles per person in the Contingent) for a new advanced training program for working citizens of pre-retirement age. Little is known about the program itself. So, it is not clear whether this refers to continuing education in a previous profession or retraining for another job. For example, it is not clear how the transition from an unskilled occupation to a trained driver (a profession currently in high demand) will be organized, or whether it would make sense to retrain teachers as medical workers, and office workers as janitors. There is no indication of whether workers themselves will have a choice in the matter. It has not been announced how and where the training will be organized, how long it will last, whether the entire Contingent will be immediately covered by retraining or if selection criteria (closeness to the source of funding, availability of instructors or urgency of need) will be applied. Employers and future students will be interested in being informed whether full-time education is expected and, if so, who is supposed to pay for the missed working days and eventual per diem. It would be helpful to immediately determine the status of the diploma: whether it will give the right to work in the acquired

profession, the obligation to fill a vacancy or the guarantee of employment. So far there is no word how this program has begun to work. In any case, the overwhelming majority of the male cohort of 1959 and the female cohort of 1964 are unlikely to be enrolled in the program.

SENIORS WITHOUT INCOME

The most urgent problem is to provide the means of subsistence to members of the Contingent who will lose their pensions while not being able to secure a job. If compensation payment is not introduced to all unemployed members of the Contingent, the RRA will certainly create a group of elderly people who are deprived of any means of livelihood - both because not all members of the Contingent are able to work, and because many working-age people will not be able to find work due to lack of demand for labor. In order to mitigate the social consequences of the reform, the duration of the unemployment benefit should be extended until reaching retirement age. The benefits should be increased. However, the more they approach the deferred pension, the less sense the reform makes. In any case, the social composition of older age groups will change.

Currently, 4 out of 10 citizens of age groups 55-59 years (women) and 60-64 years (men) have two sources of income - pensions and wages, and the remaining 6 are non-working pensioners. Let's assume that it is not possible to increase the employment rate in the Contingent compared to this level. Then there will be no more opportunities to work in retirement (see above), but a group of older people will appear who are deprived of the sources of an earned livelihood (Fig. 11). If the State doesn't come to the rescue, there will remain three possibilities of material support: family, charity or none.

A decision has been made to pay increased unemployment benefits to unemployed persons of pre-retirement age for a maximum of two years continuously. The size of this benefit (11 thousand rubles) is greater than the maximum unemployment benefit[14], but significantly less than the average pension. Such a cushion will significantly soften the impact of RRA at first, but the longer the RRA continues, the less this effect will be. Indeed, men born in 1959 will be able to receive this benefit for the entire duration of their stay in the Contingent (one year), while men born in 1964 - for 4/5 of the period for which pensions will be deferred compared to the former law. The costs of these benefits in the first year of the reform will be between 96 billion (should the Contingent achieve maximum employment) and 156 billion rubles (if none in the Contingent finds a job). Extending the period for receiving the unemployment benefit and/or increasing its size will improve the living conditions of the Contingent, while at the same time increasing the cost of the reform to the point the RRA becomes pointless. Besides, the psychological difference between receiving an earned income (wage or pension) and living on the State's largess should not be ignored.

[14] The reverse discrimination resulting from this measure is contrary to the spirit of labor law. You should at least choose a different name for these payments.

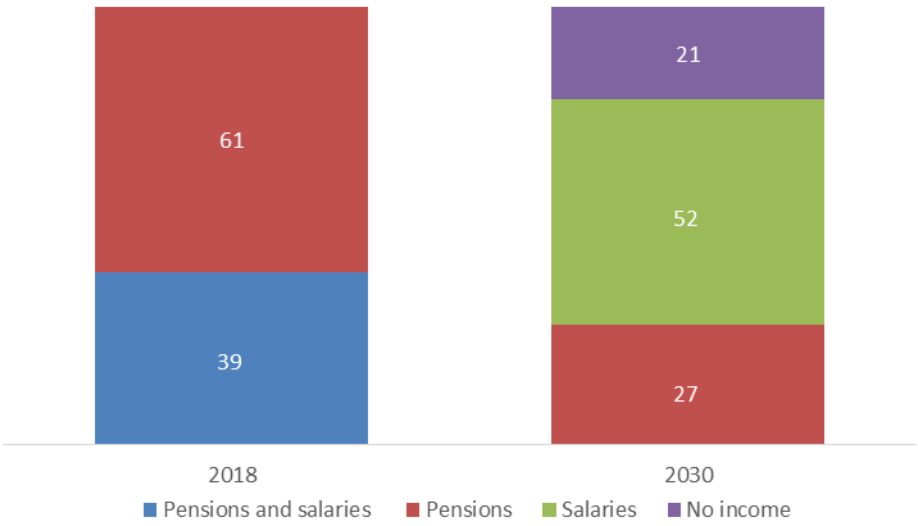

Figure 11. Distribution of men aged 60-64 years and women aged 55-59 years by income sources (unemployment benefits not included), 2018 and 2030

Sources: Rosstat. Social status and standard of living ... (2016); United Nations (2017).

Since the reform is conceived so that the average income in the Contingent cannot but decline, the role of family support, i.e. of spouse, children and grandchildren, should increase. For seniors who are left without their own income, there will be no other source of livelihood at all. Enthusiastic believers in Russia's special way of life will have reason to admire the impulse to strengthen the "traditional family". It is not very clear on what grounds such a hope is based - besides the presumption of familial duty. One has to reckon that the number of potential helpers is less than the number of senior citizens who will need income to replace the old-age pension or supplement the "old-age" unemployment benefit. Among people of this age — especially women — there is a high proportion of those who are single and a small proportion of those who are married to someone younger and therefore able to earn a living. It can hardly be expected that all adult children will enthusiastically not only provide some material support for their elderly parents, but assume it fully. Those who do can expect a significant decline in living standards. Aside from unproven assumptions of the inviolability of family values and traditional respect for the seniors, there is no reason to believe that in Russia such support will become as widespread as the intergenerational transfers characteristic of East Asian societies.

Fig. 12 presents two options for forecasting the number of the most disadvantaged - unemployed - part of the Contingent. The pessimistic scenario is based on the assumption that RRA will not affect the employment of men aged 60-64 years (it will remain at the level of 39.4%) and women aged 55-59 years (52.4%). The optimistic scenario is based on the hypothesis that employment in the Contingent will be raised to a maximum of 80%. The choice of this hypothetical level is due to several considerations. Firstly, at the age of 55-59, 80% of men are economically active, and at the age of 50-54, 86% of women, i.e. this hypothesis is fully consistent with confidence in a problem-free RRA. Secondly, 80% of Japanese of either sex 60-64 years old are economically active, and this is the highest rate among large developed countries. It is assumed that there will be no unemployment in the economically active part of the contingent. Thirdly, it's quite unlikely that this level can be exceeded. Three–quarters of Russians attain the former

retirement ages in good or satisfactory health compared to 90% in Western Europe (Andreev, McKee, Shkolnikov 2003). With such indicators, an 80% economic activity rate means that 10-15% of the Contingent will actively seek work despite being in poor health.

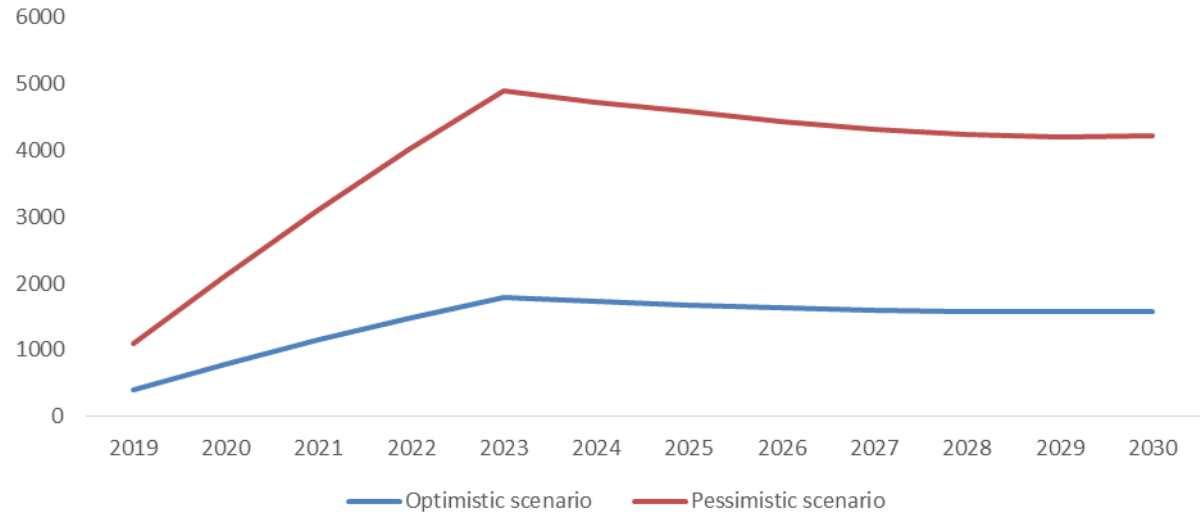

Figure 12. Contingent members with no pension or job, Russia, 2019-2030, thousand people

Sources: Rosstat Russian Statistical ... (2018); Rosstat. Labor force, labor and unemployment ... (2018); United Nations (2017).

It is clear that even those Contingent members who remain employed have little to gain from RRA. Fairly often a person plans his life and then, when something beyond their control interferes with those plans, they are understandably annoyed, especially when they were planning for just a few years ahead. RRA forces everyone with life plans to change them. Moreover, it is unlikely that, aside from a rather small minority for whom postponing the right to retirement will make it possible to fulfill a pre-existing desire to work longer, people would applaud the reform. It happens (in the West often, in Russia, probably rarely) that a person dreams of retirement because this will allow him to start a new career in another field. In the new conditions, the possibilities for this may be reduced. Parents of young children will not be able to count on the help of those grandparents who were asked to stay at work. This will affect the timing of fertility and is unlikely to give it the boost which the Russian State cares so much about.

The availability of work is not a characteristic of, but a prerequisite for material well-being. Also important are the level of income and the volume of other material goods associated with the social status of a pensioner which are foregone for the Contingent. If the Government fulfills its promise, then each member of the Contingent, upon reaching retirement age, will receive a larger pension than if the retirement age had not been raised[15]. The individual average gain from the reform can be estimated by comparing the amount of accrued (over a lifetime[16]) pension lost as a

[15] A frequently used comparison of pensions annually growing by 1,000 rubles per month with a permanent pension is incorrect, since, according to legislation in force until 2019, pensions should be indexed by the inflation rate of the previous year.

[16] The calculation refers to generations of men and women who reach the retirement age in 2024. Remaining life expectancy for men in 2020-2024 will be 16.0 years at the age of 60 years and 13.2 years at the age of 65 years. The

result of the RRA (adjusted for inflation) with the amount of accumulated pension increasing annually by 1000 rubles per month. It turns out that RRA leads to a significant net volume of lost income: 1 million rubles for men (21%) and 1.2 million rubles for women (12%). In the years 2020-23 the growth of the average pension according to the new formula will be approximately twice the growth guaranteed by the old legislation, assuming a 4% inflation rate. Each year the gap will decrease, and in the 2030s will become negative. The calculation does not take into account the loss of numerous significant benefits provided to pensioners in Russia, including but not limited to preferential tariffs on utilities, reduced real estate and real estate transaction taxes, preferential tariffs on public transportation, health and sanatorium services.

Considering from a cohort (as opposed to a calendar) perspective the shifts due to the RRA in the balance of pension contributions and pensions accrued during a lifetime, it turns out that at the former retirement age men contributed twice the amount of benefits they received while women contributed slightly less than they received. A 5-year increase in the retirement age, provided life expectancy increases as projected, will change these ratios in favor of the MPI system: slightly for men (from 2.0 to 2.1) and significantly for women (from 0.95 to 1.3).

INTERNAL RESERVES OF THE REDISTRIBUTIVE PENSION SYSTEM

Raising the retirement age will immediately and greatly replenish the State treasury. The social price of additional revenues of the consolidated State budget will be high, and some problems are unlikely to be resolved. Considering the existence of the problem of financing the MPI and the demographically predetermined aggravation of it in the long (but not medium) term, the question arises of alternative ways to solve it. The leitmotif of the official discourse is the assertion that such alternatives do not exist. This statement is far from the truth. There are many alternatives at all levels of determination of the flows of resources into the pension system.

It is hard to believe that in the PFR – an organization with a budget of 1/10 of the country's GDP - there are no internal reserves, especially since there has been no attempt to identify such reserves (at least the public is not aware of such actions). The lack of necessary information makes us refrain from quantitative speculation on this topic.

The provision of distributive pensions can be much better adapted to an aging population than raising the retirement age. The general direction should consist in equalizing pension rights. To do this, it is necessary to homogenize pension benefits and eligibility criteria for numerous occupational and otherwise defined groups. In recent years, the prevalence of occupational illnesses has been declining, while working conditions in hazardous professions, as well as environmental standards in at least selected heavily polluted cities, have been improving. Yet instead of gradually deconstructing the system of pension preferences and special benefits, including early retirement age, the State not only maintains them, but even enhances some.

A separate and potentially more promising issue is the need to improve the collection of contributions to the MPI. At present, the legal obligation to pay contributions to the pension

life expectancy of women will be 26.6 years at the age of 55 years and 22.4 years at the age of 60 years.

system, irrespective of the form of ownership, type of employment and the status of the employer, is not fully implemented for numerous categories of workers, and the number of workers evading this obligation runs into the millions or perhaps even tens of millions. This is not an innate incurable defect of the MPI: in most developed countries, it has been possible to maximize the collection of contributions to national MPI systems. The PFR could begin to solve this problem, but judging by its annual reports, the Fund considers it to be no longer on the agenda.

FUNDED PENSIONS

It is generally recognized that funded pensions should be a strategic way of developing a pension system because they overcome its dependence on population age structure and turn pension contributions into an economic resource. By its nature, the funded system does not depend on the age structure, but strongly depends on the quality of management of financial instruments. However, it is believed that the funded component should be considered - at least during the long period of its maturation - as an addition rather than a replacement for distributive pension provision.

It should be borne in mind that although the funded pension system does not depend on the age structure of the population, it does depend on mortality. The funds accumulated in a person's pension account should be sufficient to replace labor income at an acceptable level for the remainder of his life. Consequently, the increase in life expectancy in retirement would call for increasing pension contributions, decreasing pensions or raising the retirement age. However, unlike in developed countries, in Russia the significance of these features is small, both because funded pensions are nascent and because the positive dynamics of life expectancy in retirement are very modest.

International organizations recommend the introduction of pension systems consisting of three pillars: distributive, mandatory funded and voluntary funded. All OECD States (with the exception of Hungary) follow this path, and in almost half of the member countries of this organization (including Australia, Great Britain, Italy, Mexico, New Zealand, Norway, Poland, Chile, Sweden and Switzerland), the main tasks have been completed.

In Russia, the State established in 2010 funded insurance, but did little to develop its voluntary (private) component, and the mandatory (public) component used the regulatory potential of the PFR to all but kill its private counterpart. Mandatory funding was done through channeling part of pension contributions (6% out of 22% of regular pension contribution) paid by employers “on behalf” of employees; the insured employee could invest additional amounts. The public funded pension system developed until 2014 and, by virtue of its compulsory nature, covered all employees born after 1966 (the cut-off year of birth changed three times) or 42 million people, but the accumulated resources were modest as a result of predominantly low wages, an incipient stage of development of the new type of pension, high inflation and extremely conservative investment policy.

In 2014, to reduce the transfer from the federal budget aimed at balancing of the MPI budget, mandatory funded pensions were “frozen”, that is, the source of their growth (6-percent contributions) was blocked. Citizens' trust in this pillar of the pension system was undermined

before it had formed, and the Government did not even hint at the possibility of any compensation for confiscated savings. Public mandatory insurance could, of course, be reinstated with a single decree, which would go unnoticed as long as overall pension contributions do not increase. But the suggested formation of a voluntary public pension fund will be hindered by a lack of public confidence and an unwillingness to further limit disposable income. The solution to the problem may be to restore the fixed separation of unchanged total contributions into distributive and cumulative parts when the insured themselves have the right to choose a pension fund (public or private).

From the onset, public financial institutions tried to crush private pension provision and prevent shifts in overall management of funded pensions to the benefit of private financial institutions. New regulatory mechanisms were created in haste and without taking into account world experience. As a result, they did not so much protect the interests of contributors and beneficiaries as limit the possibilities of private ("non-State") pension funds (NPF) and increase transaction costs. Moreover, the weak popularization of private pension insurance was combined with corruption scandals. Despite this, NPFs are developing: in less than a decade, the share of employees with accounts in NPFs has increased from zero to 10%, and the average amount of accumulated contributions has reached 170 thousand rubles, which roughly equals 10 months of an average distributive pension. In 2017, 1.5 million people received pensions from pension funds for a total of 60 billion rubles (Pension Fund 2018). However, the achieved level of development of private pension insurance is quite modest. If, on average, in OECD member countries the ratio of NPF assets to gross domestic product in 2016 amounted to 86%, in Russia it was only 5%[17].

EXTERNAL RESERVES OF PENSION SYSTEM DEVELOPMENT

The scale of external resources of the MPI system's income generation is an order of magnitude larger than that of internal ones. The increase in the labor force in ways other than RRA and the increased productivity would be more than enough (individually, and even more so if combined) to compensate for the natural decline in the labor force or, from a different perspective, to replace the RRA as a way to increase labor resources.

In Russia, the level of economic activity of the working-age population is significantly lower than in many developed countries. One of the main reasons is the inability to find work in many cities and rural areas with a low level of geographical mobility. This impossibility predetermines the fact that many working-age people simply do not enter the labor market, which depresses official unemployment rates. Meanwhile, an increase in employment can to a large extent compensate for the effect of the demographic factor, i.e. an increase in the number of retirees, and therefore be an alternative to raising the retirement age. Poland's experience shows that the equalization of conditions for retirement (mainly the reduction since 2009 of the number of categories of workers eligible for early retirement) has contributed more to employment growth than the RRA conducted in 2013 (Chłoń-Domińczak, Strzelecki, Łątkowski 2016). Potentially,

[17] The OECD estimate is borrowed from (OECD 2017). The estimate for the Russian Federation is calculated from (Pension & Actuarial Consulting and the Russian Association of Non-State Pension Funds 2017).

there are more such benefits in Russia than in Poland, and the corresponding categories of workers number in the millions.

Another basic factor is labor productivity. Neither the Russian level of labor productivity nor the rate of its growth (negative in some years) can be considered satisfactory. For instance, in 2018 average labor productivity per worker was (in 2010 prices) in Russia 25 thousand dollars per year, as compared with 83 thousand dollars in the European Union and 113 thousand dollars in the United States. Assuming that labor productivity in Russia will increase at a constant rate of 1% per year, then by 2030 it will reach $30,000, which corresponds to the current average level in the G20. Even such a modest increase in labor productivity would provide the same positive macroeconomic dynamics as would be expected from an increase in the workforce due to RRA (provided that the increase is absorbed in the national economy)

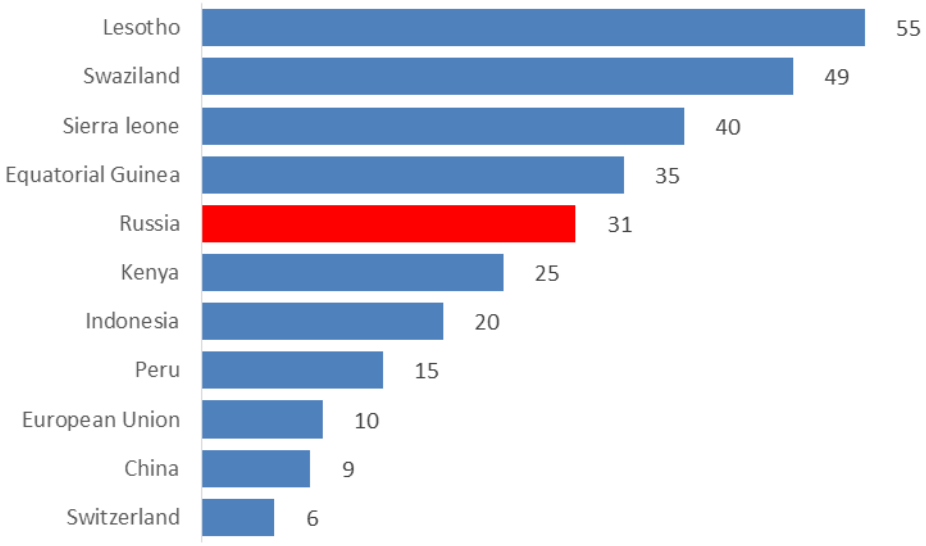

Figure 13. The proportion of 15-year-old boys dying before reaching age 60 in Russia and selected countries, 2015-2020, in percent

Source: United Nations (2017).

Russia has a specific huge reserve for growth in the number of employed which is not available to developed countries. The country has a scandalously high mortality rate of adult men. For women, the situation is not brilliant either, but their life expectancy is 10 years higher then men's. The extremely high mortality rate among men of working age has been a feature of Russian society for a century. Unlike the rest of the world, Russian male mortality at working age, if it has changed, several times has done so for the worse, only to then return to an almost unnoticeable ascending trend. If the risks of dying during working life do not decrease, then almost 31% of those born in 2003 (15-year-old boys in 2018) will not live to their 60th birthday (and over a third will not live to age 65), while, for example, in Switzerland this share is 5%. Fig. 13 compares Russia with selected countries with respect to this indicator.

A reduction in male mortality, even if not to the European, but at least to the Peruvian level, would give a much larger increase in labor resources than RRA. It is also clear that this is not easy to achieve, and that regular medical check-ups and propaganda for jogging, while useful, are far

from enough. The root causes of high mortality are deep. For Russia, it is especially important to reduce mortality from cardiovascular diseases and external causes of death (murders, suicides, traffic accidents, work-related injuries, accidental alcohol poisoning, etc.), but this is hampered by unfavorable features of a lifestyle rooted in large social groups – in particular, the well-known alcohol abuse.

In recent years, there have been positive changes in mortality rates, but it is wrong to mechanically extrapolate them to the future: strengthening favorable trends will require comprehensive social development, increased employment, higher incomes, the launching of social lifts and a decrease in inequality with respect to living conditions in social and territorial dimensions. The health care system has proven capable of ensuring progress in some areas, but at the same time, its endless reform is counterproductive, especially against the background of insufficient funding: with per capita public health expenditures one-fourth of Germany's, it is impractical to count on approaching German results (Vishnevsky et al. 2006).

CONCLUSION

Does all the above mean that the retirement age, which in Russia before the reform was especially low, shouldn't be raised at all? No, it doesn't. The aging of the population is a general and fundamental trend which in the long run will certainly lead to a faster growth of liabilities of the MPI system in comparison with the dynamics of its own resources. If you do not resort to either a reduction in pensions, or to an increase in contributions (via increasing their rate or improving collection), or to external resources (transfers from the State budget), then there really are no alternatives to RRA. The problem is that in the context of reform, these alternative measures were not even considered. At the same time, the Russian RRA model is distinguished by the following characteristics.

First, the wrong reform scheme was chosen. The difference between the Russian version of pension reform and the already proven more gradual and milder RRA schemes is the source of plausible and hardly soluble conflicts in the near future.

Secondly, the timing of the reform is dubious. The dynamics of the age structure in the coming years will, by disrupting the smoothness of population aging, in themselves reduce the obligations of the PFR. On the other hand, the high adult mortality rate does not suggest that Russia is ready for significant RRA.

Thirdly, RRA does not completely solve the problem of the MPI system's deficit. From this it follows that the need for transfers will continue, which in itself is not so bad, since there are oil and gas resources, and the NWF was created specifically to finance the deficit of the PFR.

Fourthly, it is necessary to correlate financial revenues with their social price. Obviously, in this sense, the reform was not thought through, although thinking it through was both necessary and possible. A paradigm that deals with trillions of rubles without taking into account the millions of people affected should give way to a more sensitive approach. Alternatively, the socio-political cost of mistakes could be high. Foreign experience of pension reforms based on multivariable models of pension provision is both abundant and readily available.

Fifth, in developing an integrated approach to pension reform, it would be necessary to look for eventual synergies. For example, a decrease in alcohol consumption can be both a factor and a consequence of increased economic activity. The development of cardiological care will raise participation in the workforce, and the improvement of working conditions will reduce morbidity. These and many other interconnections should be measured, their possible contribution to an increase in the flow of resources to the MPI system determined, and on this basis a budget should be elaborated and coherently implemented by the executive branch.

Sixth, funded pensions, which in other countries have proved to be highly effective as protection against population aging, are taking root poorly in Russia.

Seventh, it is known that the financial literacy of the population contributes to the approval of the reform by citizens and, in particular, mitigates its impact on electoral behavior (Fornero, Lo Prete 2019). In order to take advantage of this dependence, government officials and the media should be able to correctly comment on the reform, which was also not observed.

Eighth, neither academic institutions nor specialized government departments have sufficiently worked out the theoretical and practical issues of the RRA. Characteristically, despite wide public discontent, the announcement of RRA was not accompanied by a statement on mitigating measures. It seems that subsequent decisions, such as criminalizing the dismissal / refusal to hire people of pre-retirement age or introducing increased unemployment benefits, were hastily developed post factum.

A large stratum of problems that have attracted the attention of researchers in Europe, America, and Asia remains out of sight of Russian scientists. Along with the issues raised above, they include the political, economic and actuarial aspects of pension reforms; international comparisons of pension systems and pension reforms; relationships of the pension system with intergenerational flows of resources as well as with decisions to continue working after reaching retirement age; the age-specific ability to work and the health effects of work in older ages. Perhaps the most pressing task is the development of an integrated approach to pension reform which is not limited to any one parameter, no matter how important.

In addition, an understanding of the socio-economic context of reform and its consequences can be significantly improved by an adequate information base. For example, the dynamics of the Contingent and its characteristics could be more correctly assessed on the basis of the dynamic series of employment and wages in one-year age-sex groups: the absence of such information forced us to use rough (possibly incorrect) assumptions that the employment rates of one-year and five-year groups are equal, and that all employed members of the Contingent receive a national average pension. Direct information on the sources and magnitude of the Contingent's income would make it possible to adequately assess the need for Government assistance.

Pension problems cannot be solved in the margins of economic strategies. They should be approached with full cognizance of universal mechanisms that determine the demographic trends as well as national specifics. Successful pension reforms are integrated into economic strategies. Much can be done by adopting while adapting foreign experience, research and data collection practices. Otherwise, there is a great danger of getting something very different from what is desired, and repeatedly making the same mistakes.

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GEOGRAPHICAL PATTERNS OF POPULATION AGING IN RUSSIA

ARTUR PETROSIAN, EGOR SHEVCHUK, PAVEL KIRILLOV, NIKITA MOZGUNOV

The paper investigates the geographical features of demographic ageing using the age of retirement as the main definition for the old age boundary. The study is based on demographic statistics of Rosstat and the UN Population Division. The possible interdependence between population ageing and the implementation of social policies in the field of pension regulation is studied. The hypothesis about the relationship between low levels and a high pace of population ageing for countries of the world and regions of the Russian Federation was tested.

A cartographic and statistical analysis of spatial data at the level of regions and municipalities made it possible to identify and describe the main geographical factors of population ageing differentiation. The 'ethnic' subjects of the Russian Federation, as well as the Northern regions of new development (autonomous okrugs), where a minimum proportion of the elderly of retirement age is observed, are growing older the most rapidly. At the same time, the echo of social crises that took place during the 20th century still plays a significant part in the pace of ageing. However, over the course of this century its influence will increasingly weaken.

At the local level, ethnic and rural-urban differentiation is becoming a less significant factor of population ageing in comparison with migration: the working-age population continues to concentrate in the largest urbanised areas. The main territories of the "young" population concentration are the administrative centres of Russia's regions and areas with a high proportion of non-Russian ethnic groups with a high total fertility rate (TFR), as well as some other 'azonic' municipalities.

***Key words**: population ageing, retirement age, spatial differentiation, pension reform, demographic burden rate.*

Population ageing is one of the most important challenges for national economies in the current century. One way or another, all regions of the world during the 21st century will face the problem of an increasing proportion of representatives of older age cohorts (Scherbakova 2014: 26-51; Lutz, Sanderson, Scherbov 2008). Regional differences in the age structure of the population most often owe their existence to the fact that different territories are simultaneously at different stages of the demographic transition.

DEMOGRAPHIC AGEING AND RAISING THE RETIREMENT AGE

The focus of the study is the population of retirement age - people who in the modern world, of course, are not always "elderly" or old. However, given the ambiguity of the term "old age" itself, it seems more logical to use a legal definition as a threshold for the retirement age, a concept which plays a significant role in balancing the pension system and the labour market (Maleva 2010) and at the same time can reflect the processes of population ageing.

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THE ORIGINAL ARTICLE IN RUSSIAN WAS PUBLISHED IN DEMOGRAPHIC REVIEW 2019. 6(2): 55-83.
DOI: 10.17323/DEMREVIEW.V6I2.9872

Table 1. The degree and pace of the old age dependency ratio in countries where the age of retirement has been increased

Year of start of pension reform	Country	Old age dependency ratio (persons over 65 years of age per persons of working age (15-64 years)	Average annual growth rate of the old age dependency ratio for the 6 years preceding the start of reforms,%
2000	Japan	249	3.22
1993	Latvia	198	2.09
1993	Estonia	196	2.07
2019	Russia	208	2.01
1993	Lithuania	178	1.93
2018	Estonia	303	1.91
1995	Italy	242	1.89
2014	Latvia	289	1.46
2018	Belarus	216	1.46
2012	Lithuania	264	1.19
2000	Germany	243	1.17
2008	Italy	305	1.12
2012	Germany	316	1.02
2016	Kazakhstan	104	0.79
2010	UK	252	0.59
2011	Ukraine	224	-0.46

Source: (World Bank 2017).

The decision to increase the age threshold for retirement does not always depend on the current level and rate of population ageing (table 1). Such public policy measures are extremely unpopular and therefore often belated, since they rely on sufficient political will and broad support for the government's course.

Most likely, the decision to raise the retirement age is more related to the economic situation than to the demographic context, as noted by researchers on the socio-economic effects of ageing populations (Reher 2011). Thus, reforms that involve raising the retirement age take place in different demographic circumstances.

In many European countries, population ageing continues, but at a slower pace. A second wave of raising the retirement age is taking place in a more stable demographic situation: in 2010-2020 there has been a tendency towards stabilization of the growth rate of the proportion of people over 65 at the level of 1.5% per year (Disney, Johnson 2001; Dorn, Sousa-Poza 2010). In Russia today there is an increase in the rate of population ageing which the countries of Western, Central and Southern Europe (Spain, Portugal, Greece and Italy) experienced in the 1970s and 1980s, and the Baltic States (like the rest of Eastern Europe) - in the 1980s and 1990s. The rate of ageing of the Russian population is even higher if we consider the "old" population in the retirement age range that was in effect until recently. Thus, the decision to raise the retirement age occurred 10-15 years later than the optimal time (the beginning of the 2000s, when the workforce was still growing).

The retirement age was raised in 13 of the 15 post-Soviet countries. However, ageing trends in the former republics of the Soviet Union vary. So, in Central Asia, largely due to both the high fertility after the crisis of the 1990s and the outflow of the Russian-speaking population, characterised by an "older" age structure, the problem of demographic ageing as a factor in destabilization of the solidary pension system will become relevant only in the 2040-50s. Under

the current demographic situation, the reform in these countries was more tied to attempts by the authorities of these countries to reduce the budget deficit arising due to economic factors, at the same time partially protecting itself from an increase in pension expenses in the future.

Ukraine, by contrast, is an example of an increased retirement age that coincided with a short-term decrease in the demographic burden rate for people over 65. The reason for this was the effect of the demographic echo - older age cohorts in the 2000s were replenished with people born in 1932-1945 (famine and political terror, World War II). The difference from the Russian Federation is in the longer duration of this period due to the greater role of social disasters of the 1930s in the Ukrainian SSR, as well as a more pronounced peak in fertility in rural Ukraine in the 1980s (it was these cohorts that entered working age throughout the 2000s). Nevertheless, the country 8 years ago had a higher level of demographic burden than is observed today in Russia, which also indicates the "belated" nature of raising the retirement age.

THE PLACE OF RUSSIA IN AN AGEING WORLD

When considering the demographic burden rate of the elderly (over 65 years), the Russian Federation is in 49th place out of more than 200 world states and dependent territories. Similar values of the indicator are observed in developing countries that completed the demographic transition quite early: countries of Latin America and the Caribbean, where a population of European descent predominates (Argentina, Cuba), as well as relatively young countries in Europe, where Catholic Christianity is traditionally strong (Ireland, Slovakia).

However, Russia and Belarus, which have similar indicators both in terms of the level and the rate of its change, are characterised by lower growth rates of the demographic burden among older people over 65 (2% versus 3-4%). A similar fact can be explained by the significant lag of the post-Soviet countries in solving the problems of the second epidemiological transition (Vishnevsky 2015: 12-13). Prevention measures that are actively used in the above-mentioned European and Latin American countries can increase life expectancy and improve its quality.

In the countries of Latin America, values of the level of demographic old age are similar to those in Russia. The higher rates of population ageing in this region are mainly explained by the fact that they simultaneously cause a sharp decrease in the number of representatives of younger age cohorts (birth rates are higher than in Russia and are rapidly declining) and an increase in the age of survival at older ages (Vishnevsky 2005).

The concept of a demographic transition, the last phase of which is characterised by population ageing, suggests higher rates of ageing in the countries of the world that have only recently entered it (low ageing), and vice versa, lower ones in areas where population ageing has begun earlier. To assess any possible connection, the indicator of the old age dependency ratio (the most common threshold of the retirement age) was used. To calculate the "speed" of ageing, the average annual rates for the five-year period preceding the year for which the ageing level was calculated were chosen. In our opinion, the use of this indicator allows one to get rid of possible volatility in the calculation for shorter periods, and also corresponds to the "current" speed of the process at the time of the study.

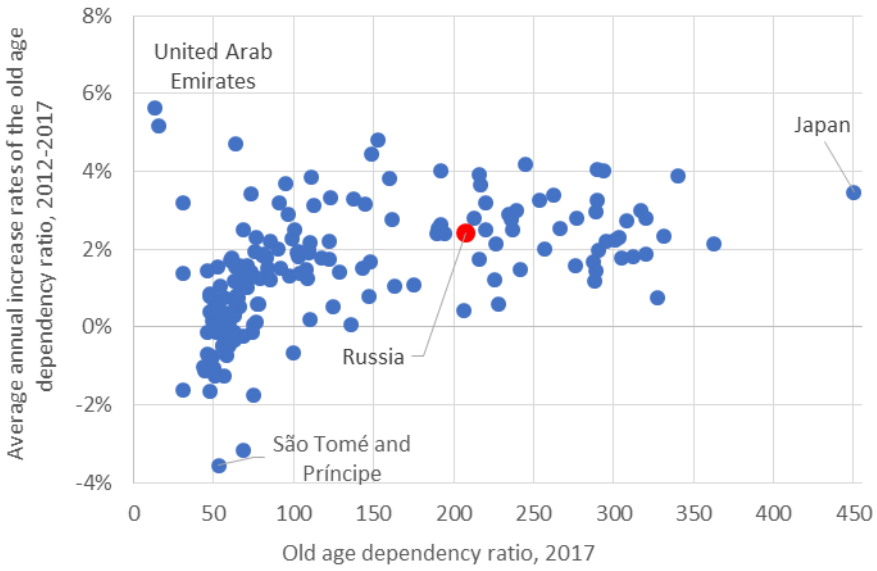

Figure 1. The achieved level and rate of old age dependency ratio in the countries of the world (UN member states with the exception of "dwarf" countries), %

Source: (UN World ... 2017).

No significant linear relationship at the country level was found (Figure 1). Nevertheless, the following difference can be traced: countries that are completing the demographic transition (high burden for the elderly) are characterised by approximately the same rate of increase in the indicator (2 ... 4%), while in countries with a low burden the rates vary significantly (-4 ... 6%).

Europe and Japan, as well as the USA, Canada and Australia, belong to the first group: the demographic transition in these areas took place in a similar way (a sharp increase in the population, then a transition to contracted reproduction and, as a consequence, the ageing of the population). Countries with a low burden have different trajectories: the least developed of them (for example, the Central African Republic, Chad, and Haiti) experienced a sharp decrease in mortality, but steadily high fertility rates do not allow us to speak of a change in the age structure of the population towards ageing. Moreover, in countries with the world's highest fertility indicators and a decrease in infant mortality, a decrease in the demographic burden of the elderly is observed. On the contrary, more developed countries that have a significantly deformed age structure due to migration (for example, the Arab states - Qatar, United Arab Emirates) are characterised by an average annual rate of 4-6%.

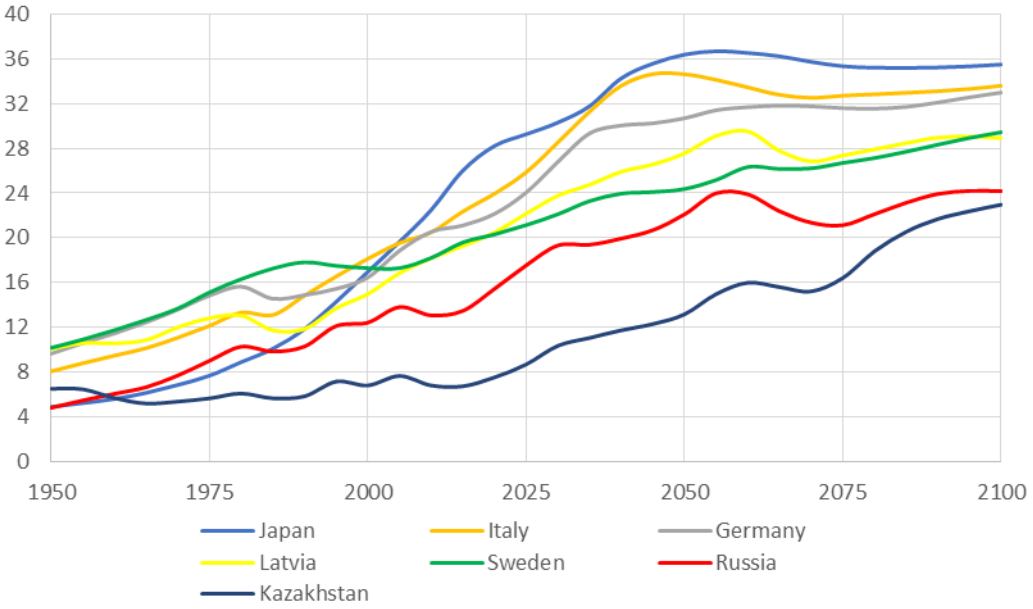

Figure 2. Proportion of population over 65 in some countries of the world in 1950-2100, %

Source: (UN World ... 2017).

Note: Values for 2020-2100 are given according to the average version of the UN forecast.

When considering the long-term dynamics of the proportion of the elderly (65+) in the Russian Federation against the background of some countries of Eurasia (Figure 2), there appears such a feature of the age-gender structure as sharp changes in the number of neighboring generations (consequences of the Second World War in the countries of the former USSR). Russia, Kazakhstan and, to a lesser extent, Latvia are characterised by a short-term slowdown in growth and even a decrease in the proportion of elderly people every 25 years (in the 2000s, older age cohorts were replenished by the extremely small generation born during World War II).

Also worthy of attention is the time lag of the degree of demographic ageing between Russia and developed countries. Its duration has an unstable tendency to decrease from 35-40 years in the 1980s to 25-30 years now and in the near future. In the future, the “lag” of the Russian Federation in terms of demographic ageing will also be associated with a gap in life expectancy with more developed countries.

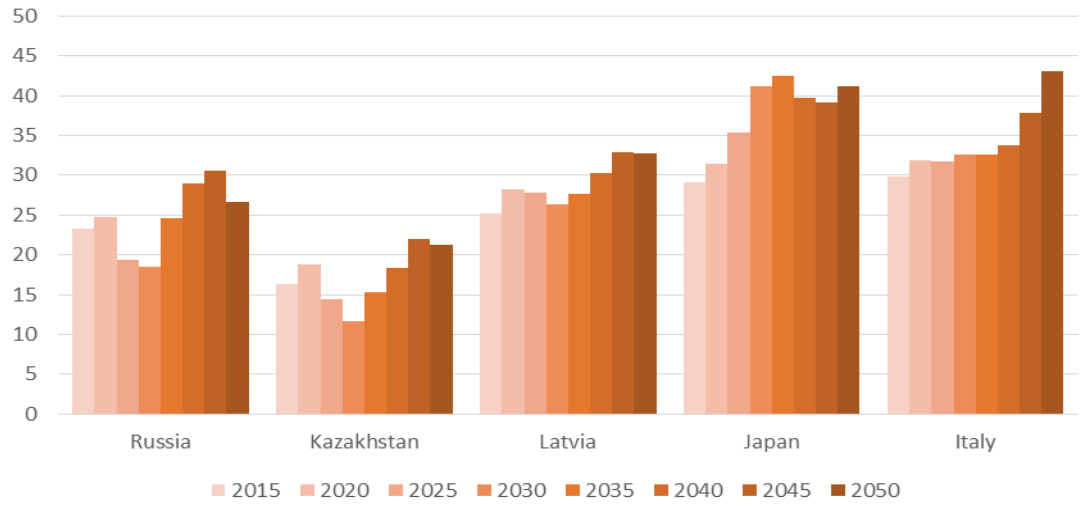

Figure 3. The depth of ageing index in Russia and some foreign countries, (the share of the population aged 80+ in the population 65+), 2015-2050, %

Source: (UN World ... 2017).

Note: Values for 2020-2100 are given according to the average version of the UN forecast.

Unlike developed countries, Russia has a low "depth of ageing" (Figure 3), which means the proportion of the oldest (over 80 years old) among the elderly (over 65 years old). An increase in life expectancy generally leads to an increase in the depth of ageing. However, in the case of Russia, the dynamics may be complicated by the characteristics of the age-sex structure of the population. When the large cohorts of the 1950-60s enter the non-working age, there may be, compared with the narrowed generation born during WWII, a short-term decrease in the indicator.

For post-Soviet countries, the growth trend is interrupted in 2025-2030 and again becomes noticeable after 2045. Nevertheless, in the second half of the 21st century the influence of the demographic echo of war on the heterogeneity of the age structure will decrease (the difference between the number of neighboring large and small age cohorts decreases with each new generation).

Russia is currently experiencing a new round of growth in the proportion of elderly people, which is largely determined by the continued entry into retirement age of a sufficiently large cohort of those born in the early 1960s and the simultaneous replenishment of the working-age population by the small generation of the 1990s. Other features of demographic ageing in Russia are its insignificant "depth" (low age of survival for people over 60) and distinct interregional imbalances (various trajectories of the demographic transition in the constituent entities of the Russian Federation).

REGIONAL DIFFERENTIATION OF THE PROPORTION OF RETIREMENT-AGE PERSONS IN THE REGIONS OF RUSSIA

The regions of the Russian Federation, despite their equal legal status, cannot be considered territorial units of the same taxon. They are a heterogeneous group that includes region-cities

(Moscow with a population of 12.5 million people and St. Petersburg with 5.5 million), regions of Central Russia with approximately the same number and structure of the population, and “ethnic” republics and autonomous districts which in terms of population and economic potential are sometimes comparable only with individual municipal areas of larger entities. Such a situation creates conditions for inter-regional differentiation associated with factors such as the level of urbanization and the ethnic structure of the population, which can significantly differ from the Russian average within the "special" regions (ethnic republics, the Arctic zone, federal cities).

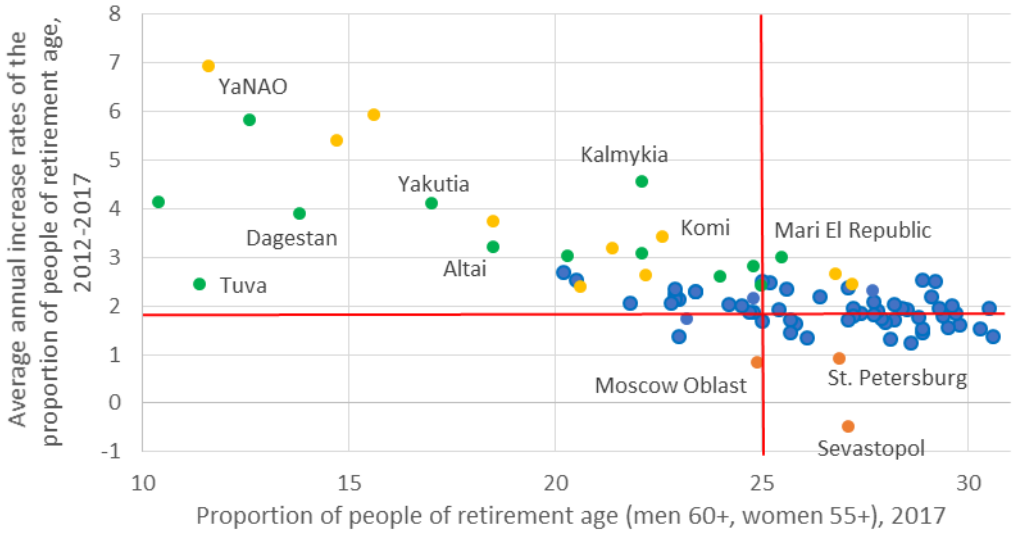

Figure 4. The achieved level and rate of population ageing (men 60+, women 55+) in the regions of the Russian Federation, %

Source: (Rosstat 2018b).

Note: The colors highlight the regions belonging to specific groups in which indicators deviate from the national average (red lines): green - ethnic republics (with high proportion of non-Russian ethnicities), yellow - regions of the Far North, red - leaders in migration growth.

The highest rates of ageing are observed in regions characterised by a low proportion of people of retirement age (Figure 4): the republics of the eastern zone of the North Caucasus with a high share of the rural population, as well as in the Siberian and Far Eastern republics (Yakutia, Altai). At the same time, the Republic of Tuva, where the factor of extremely low life expectancy is added to high fertility, is experiencing a much more modest increase.

The northern regions of new development are also rapidly ageing: younger oil producers (Nenets, Khanty-Mansi and Yamalo-Nenets autonomous okrugs) and older regions of the Russian North and Far East (Arkhangelsk Oblast, Komi Republic, Chukotka Autonomous Okrug, Magadan Oblast).

The most slowly ageing regions are characterised by a relatively high level of retirement age. In addition to low fertility, these regions owe their low growth rates also to an influx of working-age people: the Moscow Region, St. Petersburg and Sevastopol are examples of federal centers of attraction for migrants.

If we consider those regions of the Russian Federation characterised by a 23-30% level of people older than the retirement age and an average annual growth rate of 2%, then a relationship between the indicators is practically not observed. A similar fact may indicate a significant effect in the "old" regions of not only minor differences in fertility, but also of the migration situation. Thus, in most regions of the Russian Federation, where about 2/3 of the country's population lives, demographic ageing occurs relatively evenly, while maintaining small differences within this group.

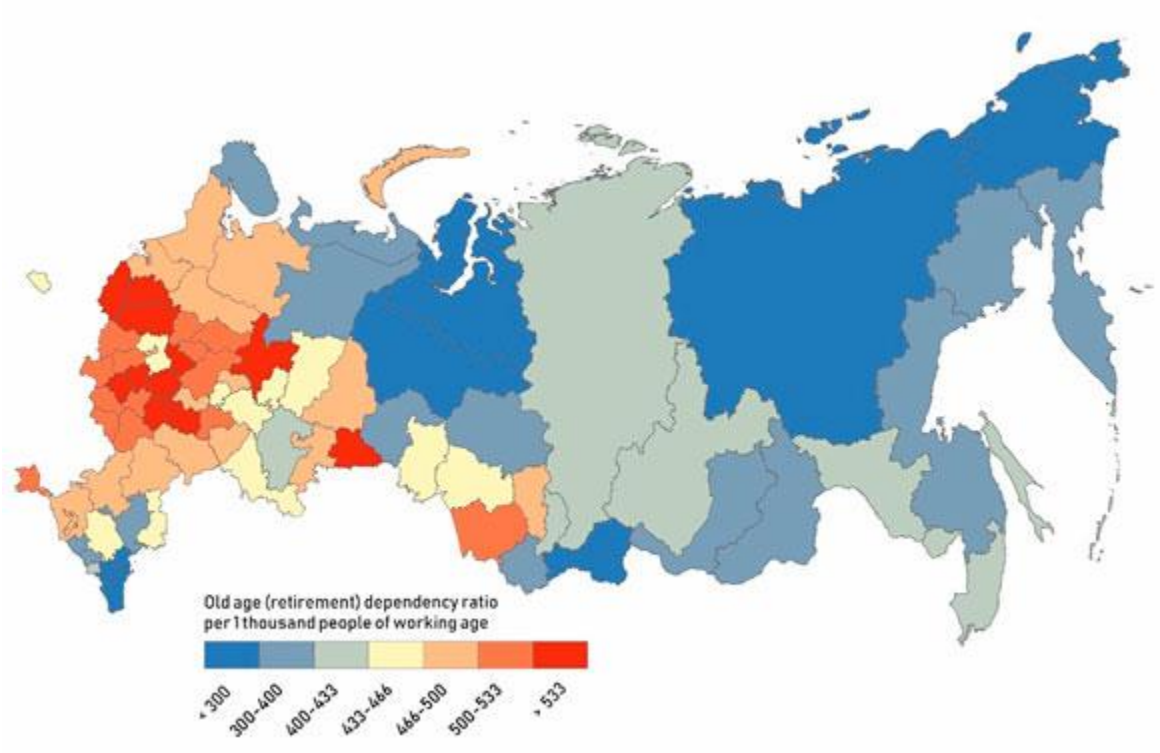

Figure 5. Old age (retirement) dependency ratio in the regions of Russia (men 60+ and women 55+), per 1 thousand people aged 15-54 (59) years, 2017

Source: Compiled by the authors based on (Rosstat 2018b).

In contrast to the share indicator, the pension burden rate makes it possible to identify regions where a high proportion of people of retirement age is associated with a low size of the working-age population. Such examples are the constituent entities of the Russian Federation that have become migration donors for neighboring agglomerations (Figure 5): the regions of the Central Federal District, the Volga Federal District and the North-Western Federal District for Moscow and St. Petersburg, the Kurgan Region for Yekaterinburg and to a lesser extent Chelyabinsk. On the contrary, such regions as Moscow, St. Petersburg, the Leningrad, Moscow, Kaliningrad and Voronezh oblasts, despite a high proportion of pensioners, are characterised by a lower burden (due to the influx of people of working age from other regions).

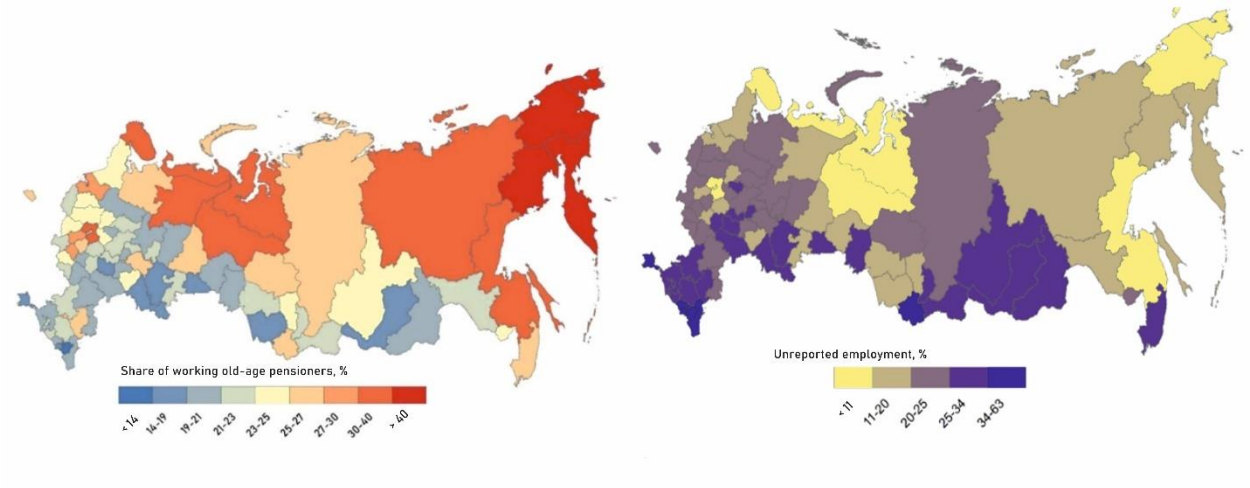

Figure 6. The proportion of working old-age pensioners in the regions of Russia and unreported employment (the proportion of people employed in the unreported sector between the age of 15-72 years), 2017, %

Source: Compiled by the authors based on (Pension Fund ... 2018; Rosstat 2017b).

The transformation of local labour markets in an ageing population is not universal: there is no correlation between the proportion of persons of retirement age in the population of the region and the proportion of working pensioners. The main differentiation at the regional level is expressed in a north-south dichotomy (Figure 6). In areas of the Far North and their equivalents, which include most of the regions of the North of the European territory of Russia, Siberia and the Far East, the proportion of working pensioners is significantly higher (Sonina, Kolosnitsyna 2015). This is due to the earlier retirement threshold available to those with sufficient working experience in such territories. The level of participation in the labour force among younger cohorts of the population (50-55 years old) significantly exceeds that of "ordinary" pensioners (55-60 years old). However, the main reason is the significant statistical undercounting of working pensioners, especially in regions with a high share of workers in the informal sector.

There is also a high proportion of working pensioners in the largest urban agglomerations (Moscow, St. Petersburg, Moscow and Leningrad oblasts) and developed regions with a diversified economy (Sverdlovsk oblast, Tatarstan), where, due to a higher quality of life and higher life expectancy, a model of active working age has partially formed (Belyaeva 2006: 55-56). At the same time, in Moscow itself, the proportion of pensioners who continue to work is slightly lower, which may be due to a fairly high level of pensions with significant regional allowances.

The smallest share of working pensioners is observed in the southern, more rural regions. There are several possible factors behind the low level of participation in the labour force for persons receiving an old-age pension. Firstly, many representatives of the older generation in regions with favorable agro-climatic conditions have a plot of land where they can grow products both for sale and for their own basic needs. Secondly, in some less urbanized "titular" regions, relations between the older generation and their children and grandchildren, who often form a single household with them, are much more significant. Material support from children is an integral part of a traditional family, widespread, for example, in the regions of the North Caucasus (Mironova 2014).

PROSPECTS FOR THE DYNAMICS OF POPULATION AGEING IN THE REGIONS OF RUSSIA TILL 2035

Based on the official demographic projection of Rosstat (middle scenario), the proportion of the population older than retirement age was calculated (Rosstat 2017b). As its boundaries, pre-reform values were used: 55 and 60 years for women and men, respectively. The dynamics of the indicator were analysed according to growth rates in three five-year periods: 2020-2025, 2025-2030 and 2030-2035.

First, let's study the dynamics of the largest territorial units. Most convenient for such an analysis is not the common statistical grouping by federal districts, but the more current and detailed grid of macro-regions used in the Strategy for Spatial Development of Russia until 2025[1].

In all macroregions (Figure 7), with the exception of the North Caucasus, the increase in the specific indicator is higher than the increase in the absolute number of people over 55 (60) years of age: the ageing of the population will occur not only due to an increase in the number of pensioners, but will also be accompanied by a decrease in the number of children and persons of working age. An additional factor in some macroregions (South Siberian, Far Eastern, Angara-Yenisei, Northern) is not only and not so much a decrease in fertility as a migration loss of a younger and more mobile population. The highest increase in the number of people of retirement age is expected to be observed in the North Caucasus, the Center and the Northwest (only due to Moscow, St. Petersburg and, to a much lesser extent, Kaliningrad).

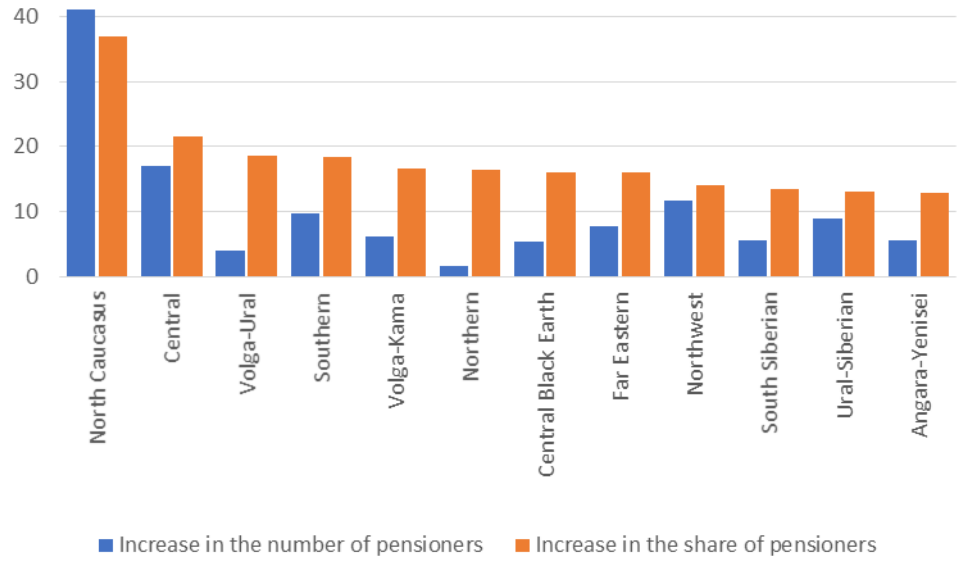

Figure 7. Dynamics of indicators of demographic ageing in the macro-regions of Russia (men 60+ and women 55+), 2017-2035, %

Source: (Rosstat 2017a).

An example of a significant ageing of the population without a corresponding increase in the number of pensioners is the Northern and Volga-Ural macro-regions. A similar trend is

[1] Approved by Order of the Government of the Russian Federation February 13, 2019 No. 207-r.

determined not only by a decrease in migration, but also by a significant decrease in the relatively high fertility in the rural areas of these territories.

In 19 constituent entities of the Russian Federation, an increase in the share of pensioners and the pension burden will be accompanied by a decrease in their number. First of all, these are the demographically oldest regions of the European part of Russia: Vladimir, Ivanovo, Oryol, Tambov, Tver, Tula, Arkhangelsk, Murmansk, Novgorod and Pskov oblasts. This group of regions also includes regions of the Volga region (Kirov, Nizhny Novgorod, Penza and Ulyanovsk oblasts) that have been actively and long involved in centripetal migration processes, as well as the Kurgan oblast, a predominantly rural region with low life expectancy and significant migration outflow to neighboring urban agglomerations of the Urals.

In the Asian part of Russia, a decrease in the number of people older than retirement age will most likely be observed in the Irkutsk and Kemerovo oblasts, as well as in the Jewish Autonomous oblast. These regions are located in the zone of the earliest development of Siberia and the Far East and therefore, in contrast to the more northern territories, are characterised by an older population. At the same time, each of these constituent entities of the Russian Federation is located in the zone of attraction of a larger and more attractive neighbour for migration (for Irkutsk and Kemerovo oblasts it is Novosibirsk and, to a lesser extent, Krasnoyarsk, for the Jewish Autonomous oblast - Khabarovsk), which also explains the decrease in the absolute number of pensioners.

The most primitive analysis using the growth rate of the share of pensioners at the regional level over three- and five-year periods revealed the effect of demographic waves in 66 regions: the ageing rate of the population will slow down in 2025-2030 and then accelerate in 2030-35. The exceptions are a few groups of regions, listed below.

1. Regions where the rate of ageing in all three periods is increasing (Moscow oblast, St. Petersburg, Sevastopol, Magadan oblast, Tula oblast). The first three regions are characterised by high migration growth of the working-age population, which will rapidly age in the next 15 years. The Magadan oblast, as a region of new development, is "getting old" late: the main migration growth occurred in the 1970s and 80s, and its members will enter retirement age in the medium term. Tula region is an example of a region characterised by an extremely high level of demographic old age: its proximity to the Moscow urban agglomeration becomes the main reason for the increase in ageing in 2020-35, acting as a driver of the migration outflow of the working-age population.
2. The Yamalo-Nenets Autonomous Okrug, where not only a slowdown in ageing will be observed, but also a "rejuvenation" of the population until 2030. The reason for this is the high migration growth of the working-age population, which is projected in connection with the implementation of large-scale infrastructure projects in the region's territory.
3. Regions where the pace of ageing will decline:
    a. "ethnic" regions with a low level of demographic old age (Dagestan, Ingushetia, Chechen and Tuva republics);
    b. "ethnic" regions with an "older" population, where a decrease in migration loss is expected (Republic of Kabardino-Balkaria, Karachay-Cherkessia, North Ossetia, Kalmykia);

c. demographically old regions in which the resources for migration outflow will be exhausted (Mordovia, Chuvashia, Tambov and Ulyanovsk oblasts). In the Chuvash Republic, a relatively high birth rate is added to this factor.

In light of the planned increase in the retirement age for 2019-2028, of particular interest is the question of how this measure will change the levels of the pension burden in the regions. Let's start with the dynamics of the indicator with a constant retirement age (Figure 8). In this case, the smallest increase in the pension burden rate would be the demographically old regions of Central Russia, where, despite the existing potential to increase life expectancy, the effect of a high base would lead to a limited increase of 5-15%. Another group of regions characterised by small changes in the coefficient are the regions of Siberia and the Far East, due first of all to both a lower life expectancy than average Russian values and a migration outflow of older people. In the Sverdlovsk, Chelyabinsk and Novosibirsk regions, such trends would also be supplemented by a migratory influx of working-age persons (agglomeration centers of these subjects of the Russian Federation are attractors of migrants at the macro-regional level).

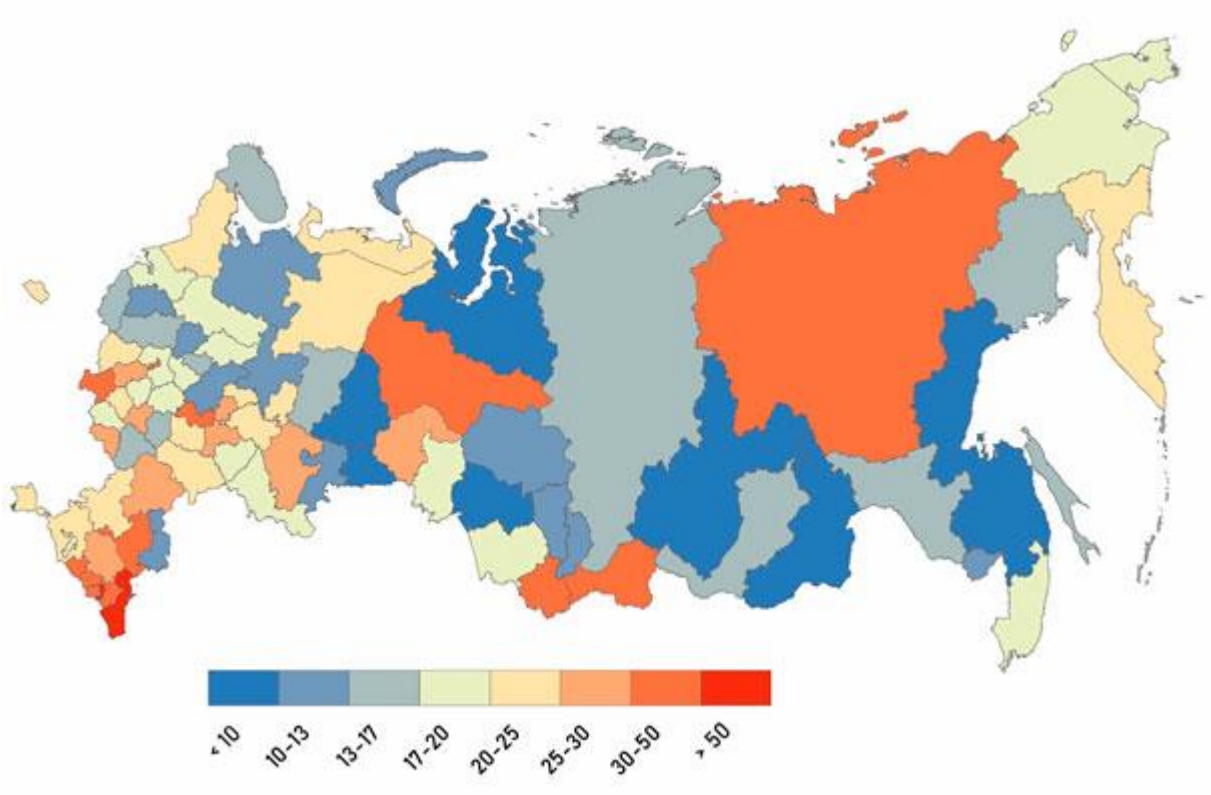

Figure 8. The growth of the pension burden rate in the regions of Russia, 2018-2035, %

Source: Compiled by the authors based on (Rosstat 2017a).

Note: The boundaries of working age, 15-54 (59) years, remain unchanged.

Average growth rates in the medium term would be observed in areas of the south of Russia (Krasnodar Krai, Rostov Oblast), which already have a rather high level of demographic old age, supplemented by an influx of migrants in older age cohorts (Mkrtchyan 2014). The same characteristics are also observed in the Volga region, where there is a "reserve" of demographic ageing in the form of more numerous age cohorts of pre-retirement age than in Central Russia or the North-West in rural areas.

The greatest increase in the demographic burden would be in regions with a low level of population ageing (the North Caucasus, especially its eastern sector, Tuva, Altai, Yakutia). The main driver of such trends will be a decrease in the high fertility in these regions by the end of the period under review due to the continuation of active urbanization (Karachurina 2007).

High rates are also observed in the "old" regions: Moscow, the Bryansk oblast and Mordovia. The last two regions can be considered part of the long belt of gravitation toward the Moscow agglomeration, so that, in comparison with the traditional donor regions of Central Russia, it seems to the authors that the potential for migration outflow from these entities will still not be exhausted in the next 10-15 years. Moscow may "age" more rapidly due to both the tendency to a decrease in the already minimal birth rates and the ageing of numerous generations of migrants from previous years (while the migratory influx of the working-age population, on the contrary, will decrease).

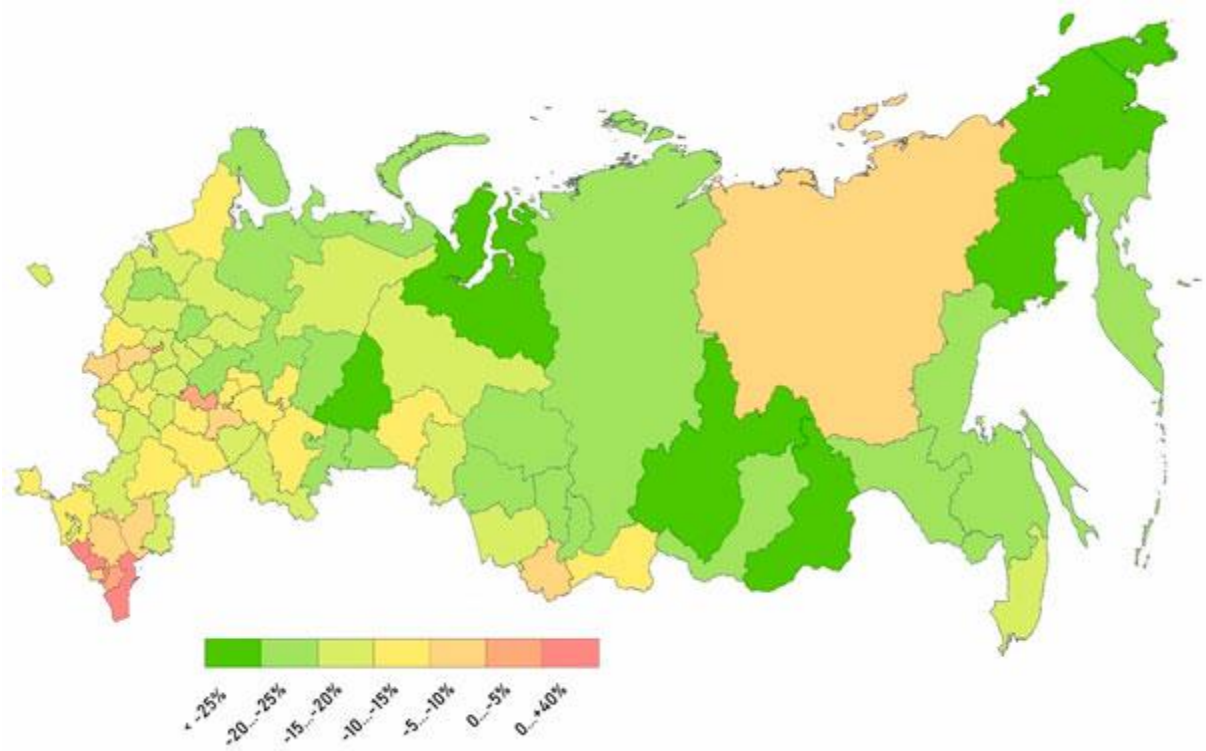

Figure 9. Growth in the pension burden rate, taking into account the increase in the retirement age, 2018-2035, %

Source: Compiled by the authors based on (Rosstat 2017a).

Note: For 2018, the boundaries of the working age are 15-54 (59) years, for 2035 - 15-59 (64) years according to the accepted option of raising the retirement age.

The application of the current option to increase the retirement age (Figure 9) will reduce the pension burden rate in most regions of Russia. Regional differences are due to the age structure of the population (the greatest "gain" would be observed in the northern and eastern regions of "Soviet" development, where the population is younger (more people would enter retirement age in 2018-2035)). Features of migration also play a role (these same territories are characterised by

a high migration loss of older people): having earned capital in the "north", the population seeks to spend its old age in the southern regions or large cities of the European part of Russia.

As for the end result, in order to stabilize the ratio of official pensioners and persons of working age, in 17 years an increase in the retirement age may again be necessary - even taking into account the current increase in the retirement age, ongoing ageing of the population will lead to the return by the start of 2036 to a pensioner demographic burden rate at the 2023-2025 level. Moreover, in the North Caucasus republics, which have significant differences in the age structure of the population from other regions of the country (simple reproduction mode), the burden will exceed even current values.

THE PROPORTION OF THE RETIREMENT-AGE POPULATION IN THE REGIONS OF RUSSIA: DIFFERENTIATION AT THE MUNICIPAL LEVEL

Analysis of demographic ageing at the regional and macroregional levels can be overly generalized. This fact becomes noticeable at a multiscale examination: the variation in the proportion of people over retirement age for 12 macro-regions is 1.84 times lower than for 2,312 municipalities. It is worth noting a more significant increase in the coefficient during the transition from the macro-regional to the regional level than from the regional to the municipal level (1.62 times versus 1.14, respectively). This can be explained by the fact that municipalities, in contrast to regions, whose framework was formed based on historical factors, were formed later and "normatively" (made homogeneous in terms of population and economic potential of the territory). At the same time, some macro-regions "smooth out" differences, including regions with a significantly different age structure of the population (for example, the Angara-Yenisei region, which includes the Krasnoyarsk Krai and the Republic of Tuva).

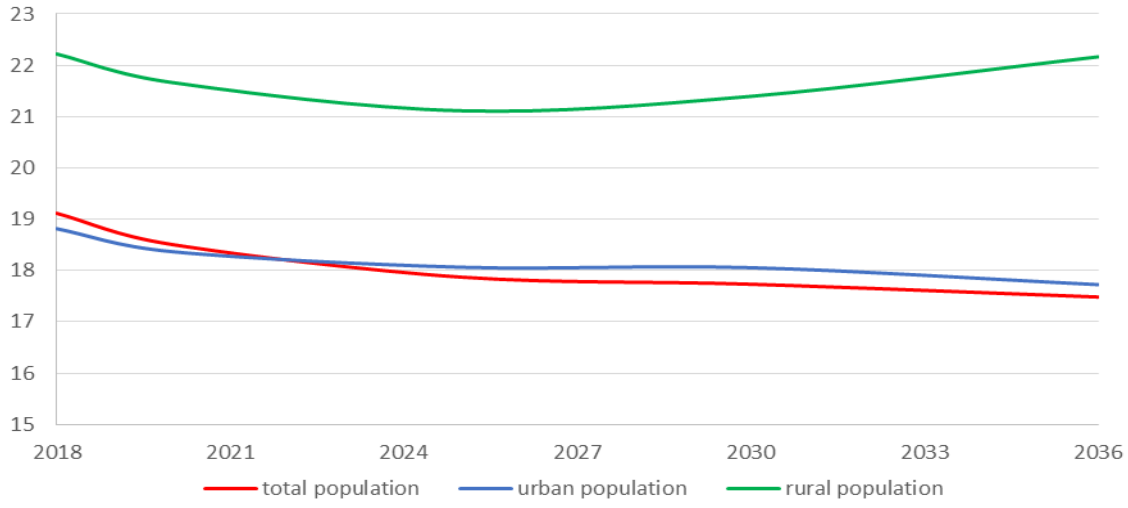

Figure 10. Coefficient of variation in the proportion of persons of retirement age (men 60+, women 55+) for the regions of the Russian Federation, 2018-2035, %

Source: Compiled by the authors based on (Rosstat 2017a).

Note: Retirement age limits are given until 2019.

Large units do not allow one to reveal either the true nature of the differences between extreme values at the local level, or intra-regional differentiation (Openshaw 1983), which in recent years has become increasingly noticeable in comparison with inter-regional differentiation (Shevchuk 2018).

Let's start by looking at the variations in the level of demographic old age (according to the "pension" boundaries) over time. By 2036, the variation in the proportion of pensioners in the regions of Russia will decrease (by 1.6 percentage points; Figure 10), which will largely be due to the regions "catching up" with the majority of subjects of the Russian Federation with the minimum percentage of pensioners (Chechnya, Tuva, Yakutia, Ingushetia, Khanty-Mansi Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Nenets Autonomous Okrug and Chukotka Autonomous Okrug). Russian cities in different regions are more similar than rural areas, more dependent on physical and geographical conditions (it's enough to compare the small "dying" villages of the forest zone and the large southern villages). The rural population of the regions has higher values of the coefficient of variation (rural areas have "hypertrophied" characteristics of the age structure of the regions - in Central Russia, rural peripheral areas are the "oldest" and, for example, in the North Caucasus the proportion of pensioners in rural areas is minimal).

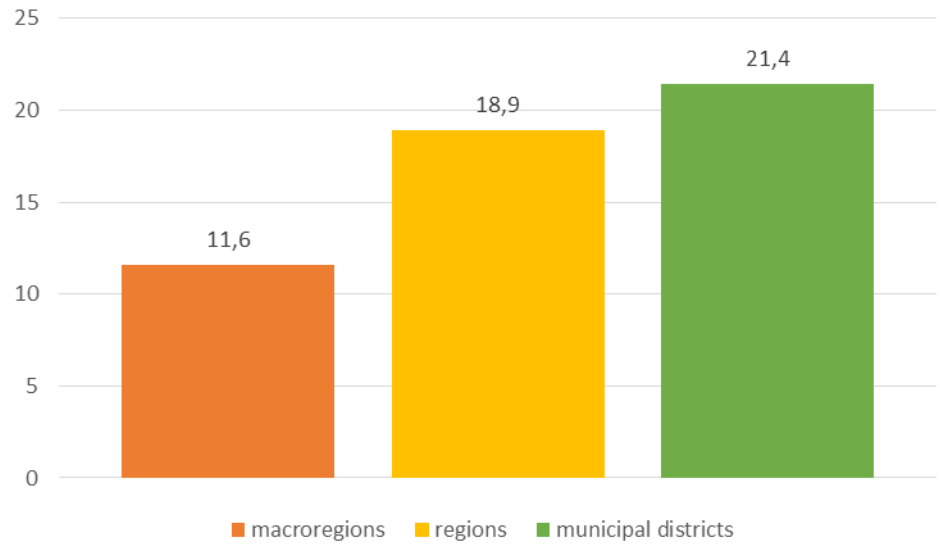

Figure 11. The multi-scale coefficient of variation of the proportion of people older than retirement age (men 60+, women 55+), 2016, %

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

Based on the data of municipal statistics at the level of 2,312 primary units (urban districts, municipal districts and cities of federal significance), a cartogram of the share of persons in retirement age (men over 60 and women over 55 years) in the total population of the corresponding municipality was constructed as of January 1, 2016 (Figure 11). A similar date was selected taking into account the low availability of the most relevant (2017, 2018) data at the municipal level in some regions.

The main problems in the analysis (especially when it comes to comparison in dynamics) are changes in the administrative-territorial and municipal divisions that occur annually. Another

important drawback of the municipal statistics system is the aggregation of data only by region, which makes even automated uploading extremely difficult. Many domestic regional researchers, for example N. Zubarevich (Zubarevich 2012), point to the low quality of statistics in some Russian regions.

Table 2. Municipal statistics in Ingushetia, 2016

Administrative-Territorial Units of Ingushetia	Total population, persons	Population over retirement age (men 60+, women 55+), persons.	Calculated share of persons of retirement age (men 60+, women 55+). %
UO* Karabulak	39,614	5253	13.26
UO Malgobek	36,870	4731	12.83
UO Magas	7,818	966	12.36
UO Nazran	116,020	13,793	11.89
Dzheyrakhsky district	2,917	341	11.69
Nazranovsky district	9,8102	11,463	11.68
Sunzhensky district	123,212	14,395	11.68
Malgobeksky district	5,5408	6473	11.68

**UO – Urban Okrug*

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

An example is the Republic of Ingushetia, where in 4 out of 8 municipalities the estimated proportion of people older than retirement age coincided to 0.01% (table 2). The likelihood that such an event is a reflection of the real situation, and not a statistical error or falsification, is extremely small, especially considering the large population and significant differences in the population density of these municipalities. Interestingly, in the neighboring regions of the North Caucasus, such phenomena are not observed.

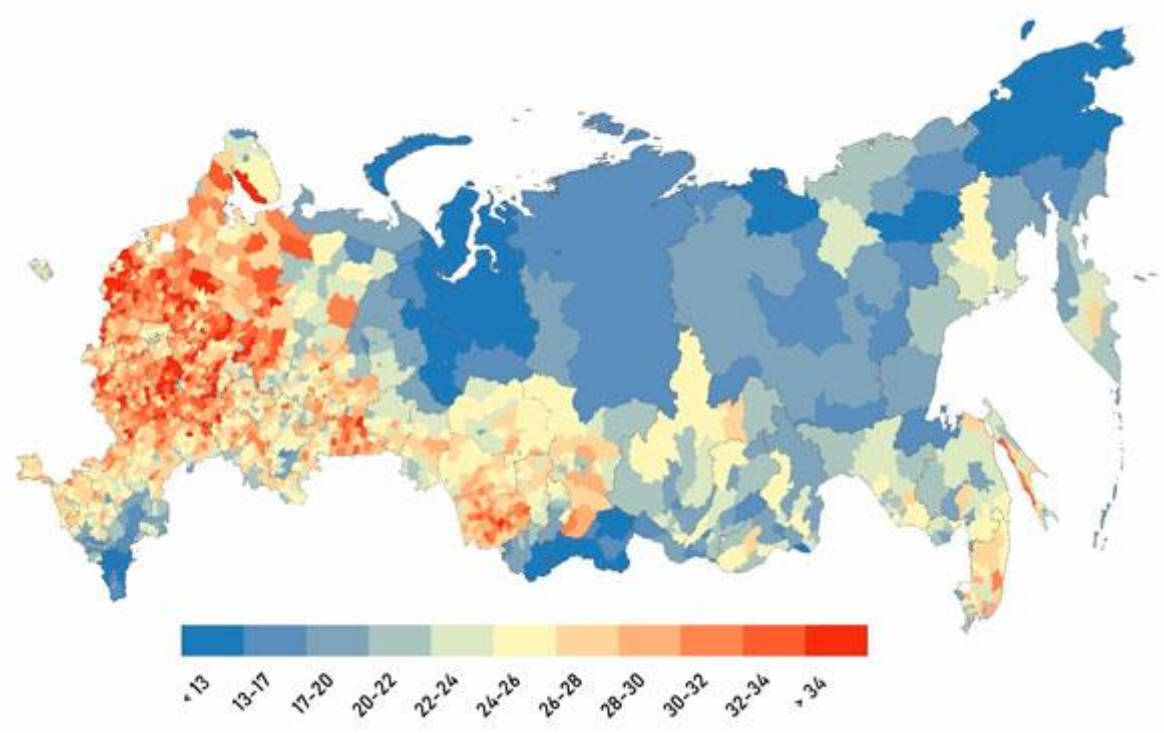

Figure 12. The proportion of people over retirement age (men 60+, women 55+) by first-level municipalities, 2016, %

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

Cartographic visualization at the municipal level (Figure 12) allows one to clearly distinguish the areas with the highest proportion of an "old" population (Central Russia, North-West), with a relatively high share (Southern regions with predominant Russian ethnicity, Volga Region, Urals, the main settlement zone in Siberia and the Far East) and with a low share (areas of new development of the Far North, ethnic territories of the North Caucasus, Siberia and the Far East).

The main reason for such differences is the demographic history of these territories: areas with a maximum proportion of the elderly are territories that have served as migration donors since the turn of the 20th century. "Middling" territories are those that were actively settled throughout the 20th century and have begun to show negative trends in migratory and natural movement only in the last 30 years. The lowest proportion of elderly people is observed in territories with high natural growth and an influx of predominantly young people (oil-producing autonomous okrugs).

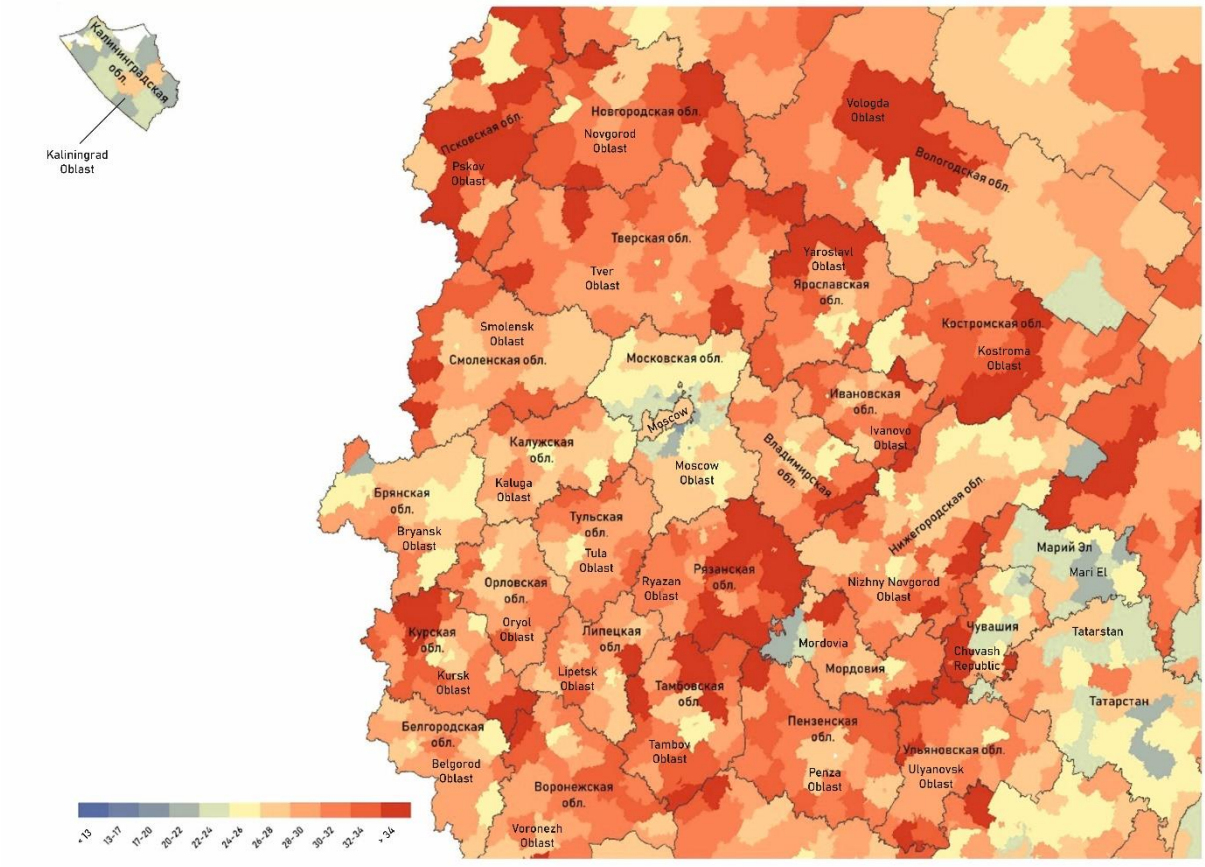

Figure 13. The proportion of people older than retirement age (men 60+, women 55+) by first-level municipalities, Central Russia, 2016, %

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

Central Russia is one of the demographically oldest regions of Russia. On the cartogram (Figure 13), you can notice several main features.

1. A “youth peak” in the Moscow metropolitan area, where lower real estate prices in municipalities of the Moscow Region, directly adjacent to the Moscow Ring Road, attract migrant workers from all over the country. Examples of such municipal districts and urban districts are Mytishchi, Leninsky, Shchelkovsky and Krasnogorsk districts, urban districts of Odintsovo, Ivanteyevka, Reutov, Balashikha, Domodedovo, Lobnya, Bronnitsy, Dzerzhinsky, Kotelniki (the proportion of people over retirement age is 15-23%).
2. "Young" regional centers. The capitals of the constituent entities of the Russian Federation are the focus of intra-regional migration of a younger population. Most often, lower values for the proportion of elderly are observed in municipalities surrounding regional centers (urban districts). A similar phenomenon is associated with the formation of small-scale clusters of satellite settlements of the regional center, where active housing construction is sometimes carried out. Examples of such municipalities are the Vologda urban district and the Vologodsky district, Smolensk and Smolensky district, Penza and Penzensky district.
3. Azonal "islands of youth" where penitentiary facilities are located. The most illustrative example is the west of the Republic of Mordovia - the Zubovopolyansky district (20.7%), where about 15 institutions of the Federal Penitentiary Service are located (the legacy of the famous Dubravny Gulag Labour Camp). According to rural researchers, about 21% of the population in this region are people serving prison sentences (Averkieva 2015). The low rate of demographic old age in the Tonshayevsky district in the extreme north-east of the Nizhny Novgorod oblast (20.5%), on the territory of which there are also 3 correctional colonies, has a similar nature.

   Also in this category are the municipalities of the Kaliningrad oblast, which is a semi-exclave surrounded by the territories of Poland and Lithuania. The relative “youth” of the region’s population is associated with a positive migration growth of the young population practically throughout the entire post-war period from the beginning of the settlement of East Prussia by Soviet citizens, as well as with the deployment of military units on the territory of the outpost region.

4. The "young" south-west of the Bryansk oblast. A relatively low proportion of pensioners is observed in the zone most affected by the consequences of the Chernobyl accident (Gordeyevsky, Novozybkovsky, Zlynkovsky districts). Such values are associated with a relatively high fertility and characteristics of migration processes (Rybakovsky 1992: 45-48): after the accident, the majority of those most vulnerable to radiation exposure (children, the elderly) left the settlements, but over time, many (mostly young) residents returned to their place of residence (a zone with the right to resettle). Also, against the background of a significant decrease in fertility in the first 10-15 years after contamination of the territory with radionuclides in the late 2000s and early 2010s, there was a compensatory growth, expressed in a positive natural increase in certain years.
5. The demographically “old” periphery of the regions. This type includes the underdeveloped marginal territories, where the migration outflow began earlier. These are above all regions of the western sector which at first served as a resource for the spasmodic growth of the Moscow and St. Petersburg urban agglomerations in the late 19th - first half of the 20th century, and then were devastated by the Great Patriotic War (Smolensk, Pskov, Novgorod, Tver oblasts).

The highest share of elderly people is observed in municipalities far from transport routes that do not have any significant centers of economic activity on their territory: the Smolensk borderland (Shumyachsky, Monastyrshchinsky districts), the periphery of the Yaroslavl, Tver and Novgorod oblasts, caught between the St. Petersburg – Urals and Moscow– St. Petersburg highways (Vesyegonsky, Breytovsky districts). Separately, it is worth mentioning the periphery of the Vladimir, Ivanovo, Nizhny Novgorod, Ryazan and Tambov oblasts, where the "oldest" areas are located in areas of relatively lower density and shallow settlement, which is directly related to the higher forest cover of these territories (lower and wetter areas with less fertile soils - for example, the Meshchera lowland).

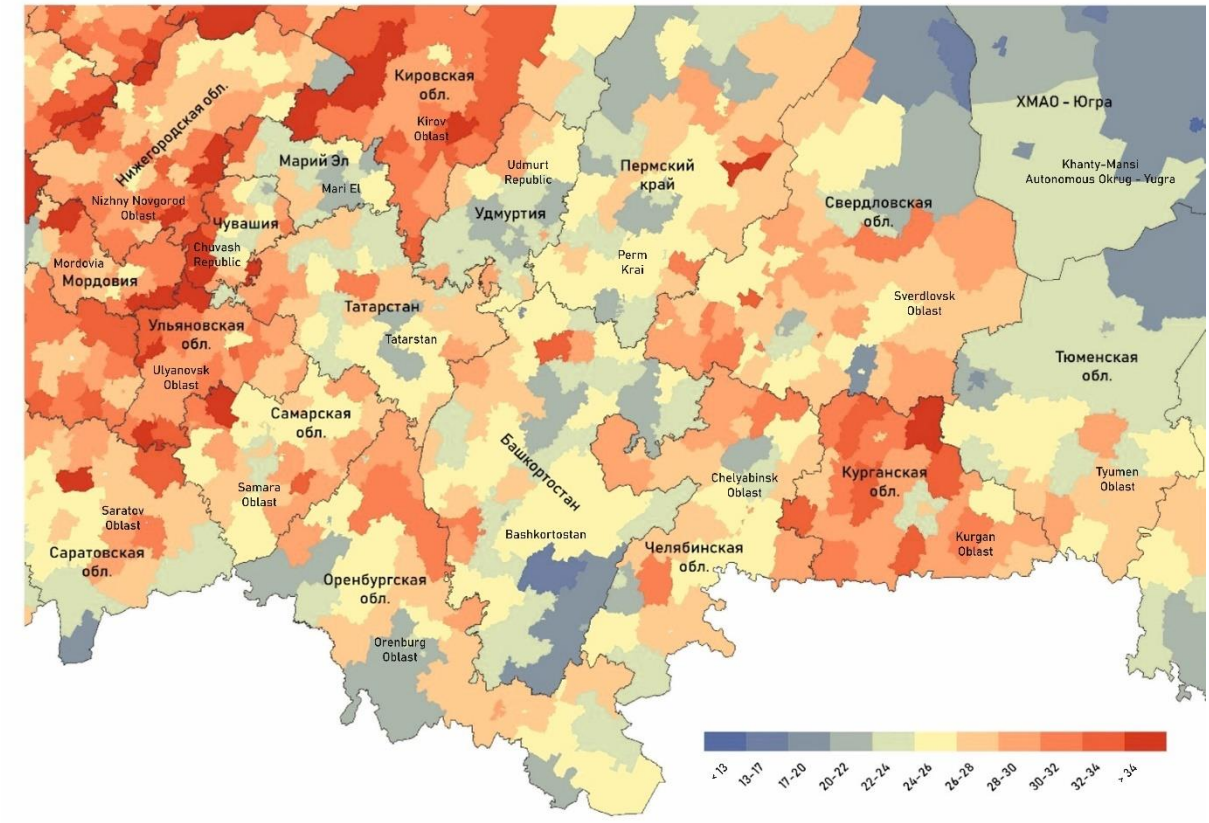

Figure 14. The proportion of people older than retirement age (men 60+, women 55+) by first-level municipalities, Volga and Ural, 2016,%

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

The Volga-Ural region (Figure 14) is one of the most multi-ethnic in the Russian Federation. The different rate of the demographic transition among representatives of different ethnic groups is the main reason for the mosaic pattern of demographic ageing in the macroregion. Another significant factor is the greater importance of rural areas in comparison with Central Russia both in the settlement system and in economic activity in the territory of these constituent entities of the Russian Federation.

Among the main spatial patterns of the age structure of the population, the following can be distinguished.

1. A less old population in “ethnic” municipalities. Within the republics, the differentiation between the older, predominantly Russian regions (West Mari El, Southwest Chuvashia, areas along the Kama and Volga rivers in Tatarstan) and the younger, populated representatives of titular ethnic groups is pronounced.
2. However, such a relationship is not universal. Thus, the municipalities of Mordovia are characterised by approximately the same level of old age. The main reasons for the lack of differentiation are the high degree of overlap in the resettlement of representatives of the Erzyan, Mokshan, Tatar and Russian ethnic groups in the region, as well as the high degree of assimilation of the titular peoples.
3. A “young” borderland. A relatively low proportion of pensioners is also observed in the municipalities of the Orenburg (Sol-Iletsky, Dombarovsky districts) and Saratov (Aleksandrovo-Gaysky, Novouzensky districts) regions along the border with Kazakhstan, where the ethnic composition underwent significant changes in the post-Soviet period due to a much higher birth rate of Kazakhs.
4. The demographically oldest regions are represented by the territories of the early Russian colonization of the Urals and the south of Western Siberia (the south of the Sverdlovsk and Tyumen, Chelyabinsk and Kurgan oblasts).

The North Caucasus is characterised by minimal demographic old age at the level of individual regions (Chechnya, Ingushetia, Dagestan). When considered at the municipal level (Figure 15), the macroregion is characterised by much less mosaicity in contrast to the Volga and Cis-Urals, which is associated with a higher compactness of local ethnic groups. Among the geographical features of the level of demographic old age, the following can be distinguished.

1. Less elderly “ethnic” municipalities outside the republics of the North Caucasus Federal District. An example is the areas of compact residence of the titular population in the Republic of Adygea (Kuban lowland - Teuchezhsky, Koshekhablsky and Shovgenovsky districts). Yet another example is the regions of the east of the Astrakhan borderland (Volodarsky, Krasnoyarsky) predominantly populated by Kazakhs, as well as the eastern regions of Stavropol Krai, to which there has been an intensive migration flow from Dagestan and Chechnya in recent years (Kursky, Levokumsky, Neftekumsky districts). Municipalities of the Republic of Crimea, where Crimean Tatars compactly live (Belogorsky, Simferopolsky, Sovetsky districts), are also characterised by a younger age structure. A relatively younger population is also observed in areas of low population density in the Volgograd region (Olkhov district, where there is a significant Romani community).
2. The “younger” Krasnodar, Rostov and Stavropol urban agglomerations, which have experienced significant migration growth of the working-age population. Unlike urban agglomerations in other parts of the country, these cities also attract older migrants; for this reason, the proportion of people over retirement age is higher than in the Moscow and Yekaterinburg urban agglomerations.

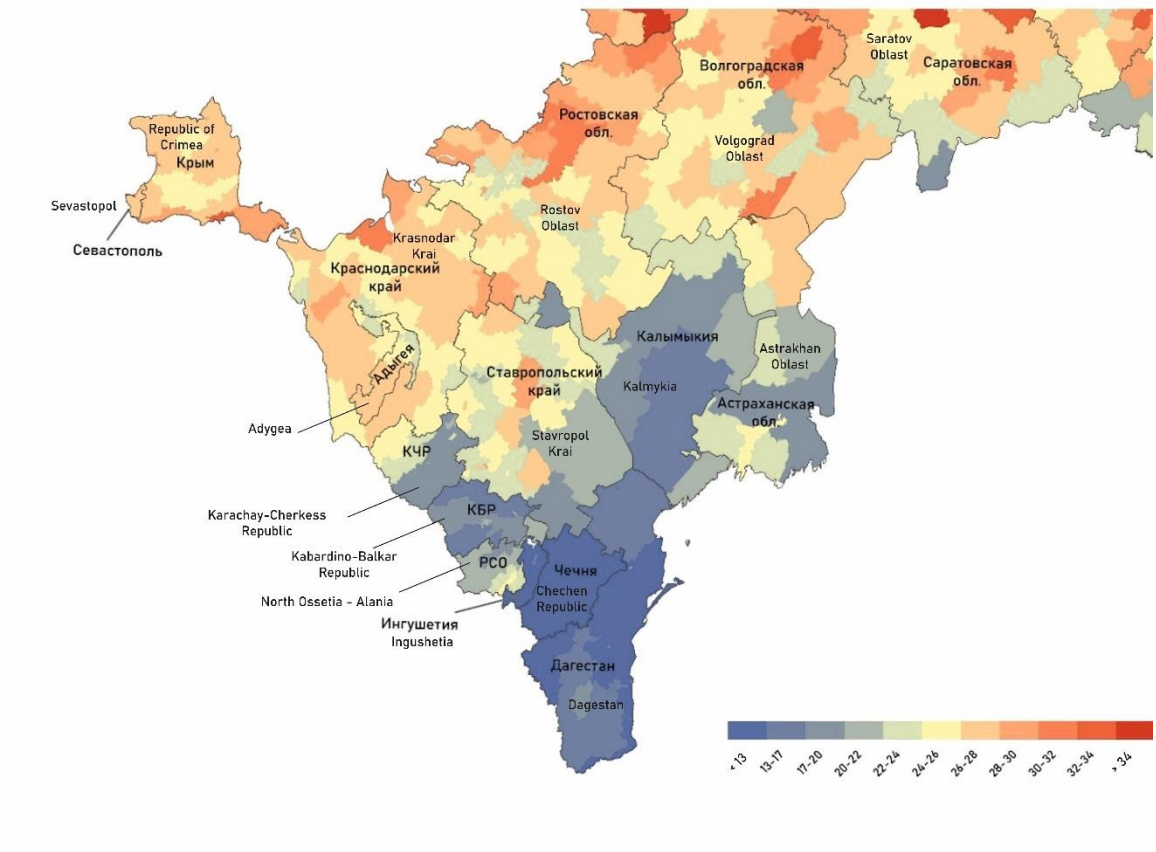

Figure 15. The proportion of people over retirement age (men 60+, women 55+) by first-level municipalities, South, North Caucasus and Crimea, 2016, %

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

3. The peripheral regions of the "Russian" regions that have experienced significant migration outflows. Above all, it is the Rostov part of the Donets coal basin (Donbass) (Oktyabrsky, Krasnosulinsky and Kamensky districts, urban okrugs Kamensk-Shakhtinsky, Zverevo, Donetsk, Gukovo, Shakhty, Novoshakhtinsk) which stands out. Also standing out in the Krasnodar Krai are the northwestern and northeastern territories, which, like the Russian Donbass during the transformation crisis, lost their monospecialization (fish farming in the Primorsko-Akhtarsky district of the Kuban, areas of risky farming in the dry steppe - Novopokrovsky, Beloglinsky district of the Krasnodar Krai, Peschanokopsky district of the Rostov Oblast).

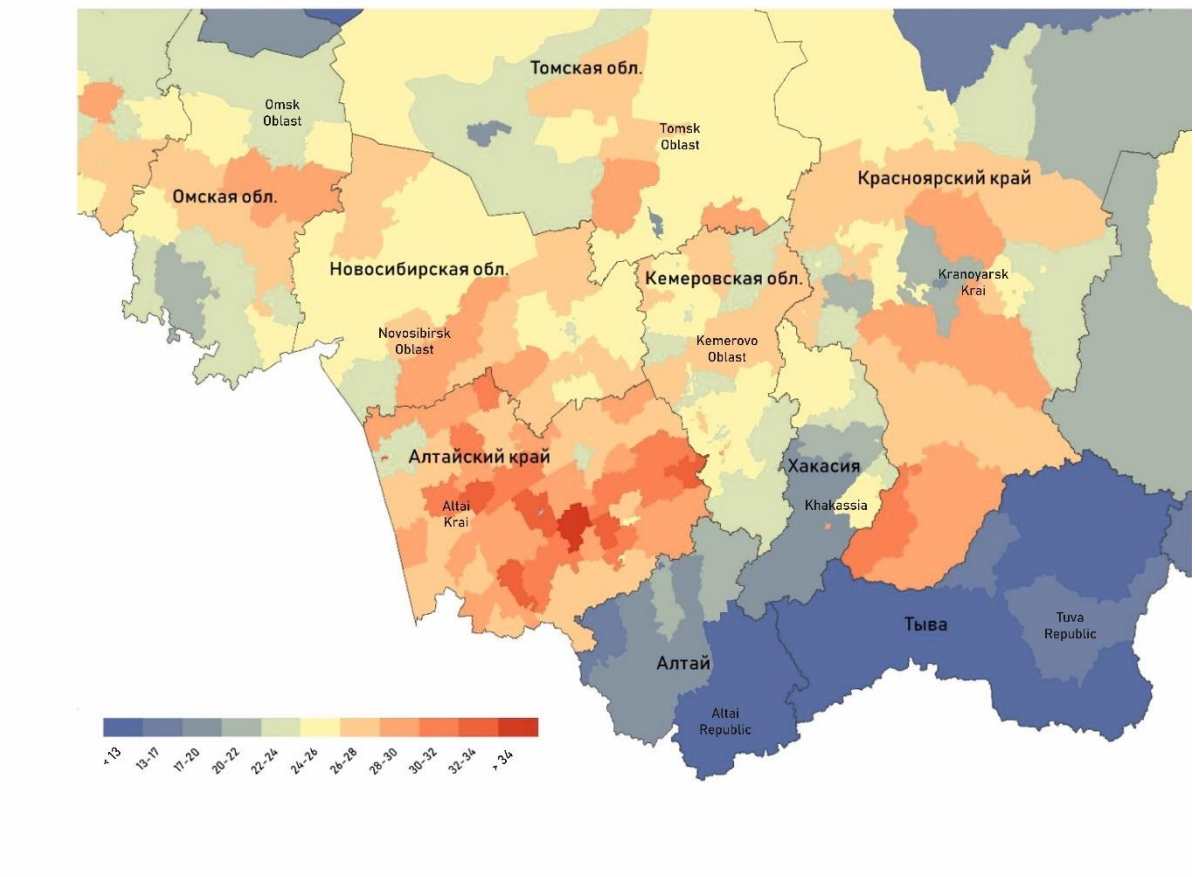

Figure 16. The proportion of people over retirement age (men 60+, women 55+) by first-level municipalities, South Siberia, 2016, %

Source: Compiled by the authors on the basis of the Database of municipalities (Rosstat 2018a).

South Siberia is another polarised macroeconomic region in terms of demographic ageing (Figure 16). The age composition of the population of municipalities is characterised by the following features:

1. a student center on a federal scale - the urban okrug of Tomsk, where the proportion of pensioners is lower than in other regional centers;
2. relatively “older” territories of early agricultural development with a high density of rural population (Altai Krai, the south of the Novosibirsk Oblast, the Minusinsk Hollow in the Krasnoyarsk Krai and the Republic of Khakassia).

CONCLUSION

An analysis of the possible relationship between the pace and level of ageing of the population, on the one hand, and an increase in the retirement age, on the other hand, indicates the absence of such a connection. The reason for this is the use of other measures to increase the reliability of the pension system (for example, stimulating investments in non-state funds) and the individuality of demographic scenarios in different countries. The raising of the retirement age could be determined more by the current socio-economic situation of countries than by the demographic context, and be a measure designed to solve the financial problems of the state, not to increase the

reliability of the pension system (Roik 2011).

A universal dependence that would indicate a definite slowdown in the ageing of the population when a high proportion of the elderly is reached has not been identified, which is associated with a variety of demographic transition scenarios and the peculiarities of the migration regime in different countries and regions. Nevertheless, in the Russian Federation, which so far continues to age mainly due to a decrease in fertility, a high level of ageing is associated with the late completion of the demographic transition at the regional level. The existence of such a pattern is connected mostly with the ethnic-political principle of administrative territorial division inherited by Russia from the Soviet Union, which preserves at the statistical level ethnic and urban-rural differences. Thus, the basis for regional differentiation in the future will be the long-term preservation of traditionalist demographic attitudes in the "ethnic" constituent entities of the Russian Federation.

An analysis of the prospects of the pension burden for the period until 2036 shows only a temporary effect of raising the retirement age to solve the problem of imbalance in the joint pension system: an increase in the burden of pensioners after 2028 will be observed in almost the majority of regions. Given the fact that in Russia there is a federal pension system that is independent of the imbalance at the level of individual entities, raising the retirement age will temporarily solve the problem of a pension fund deficit. In the future, however, the government will again face a choice: to raise the retirement age against the background of a continuing increase in the survival age at older ages or to apply more advanced measures.

According to the current version of the demographic forecast, the regional heterogeneity of the processes of demographic ageing in Russia will decrease. With the completion of the demographic transition, differences in the migration situation will come to the fore, the driver of which becomes the local level of socio-economic development of territories. This fact is confirmed by considering the territorial ranges of extreme values of the share of persons of retirement age in Russian municipalities. When moving to a more granular level, the coefficient of variation increases (from 18.9% for 85 regions to 21.4% for 2,312 municipalities and cities of federal significance): intra-regional rather than inter-regional differences come to the fore, which reflects the ongoing concentration of the population in the centers of economic growth (regional centers, federal cities and clusters of settlements surrounding them - urban agglomerations).

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MODELS OF TRANSITION TO ADULTHOOD OF DIFFERENT RUSSIAN GENERATIONS

EKATERINA MITROFANOVA

This paper is devoted to the analysis of the starting events marking the transition to adulthood, such as completion of education (vocational and higher), first employment, first separation from parents, first partnership, first marriage, and first childbirth.

The dataset of the research is the Russian part of the Generations and Gender Survey (GGS). We prepared a harmonised dataset of the three waves (2004, 2007, and 2011), which included 5,451 respondents born between 1930 and 1986. We used two complementary approaches to study the transition to adulthood: the analysis of the starting sociodemographic events separately and the analysis of all of them as a part of one process. We depicted the results of the analysis on a demographic Lexis grid, which allowed us to observe the influence of the historical and institutional context on people's behaviour.

The research revealed three models of transition to adulthood in Russia: "Soviet" (generations of 1940-49, 1950-59, and 1960-69), "Transitional" (generations of 1930-39 and 1970-79), and "Post-Soviet" (the generation of 1980-86). Our classification is similar to the idea of the convergence of the patterns of the starting events' occurrence which assumes a change from the "traditional" model ("early, contracted and simple") to the "modern" model ("late, protracted and complex"). The similarity of the changes in Russian and European models confirms the stadiality of the modernisation process. The study also confirms the assumption of the Life Course Approach about the individualisation of the life course.

***Key words**: Russia, transition to adulthood, generations, starting life-course events, demographic events, socioeconomic events, demographic transition, marriage, childbearing, partnership, employment, education, leaving parents.*

INTRODUCTION

For many millennia the survival of human societies was threatened by constant risks, making the main focus of a society's adults the provision of livelihoods and the reproduction of the population. Because the average life expectancy was only 20-30 years for much of that time, it was necessary to use one's available time as efficiently as possible and begin to participate in labor activity and reproduction of offspring as early as possible.

Standard life schedules did not give much time to prepare for adulthood. In most traditional societies there existed short, well-regulated rites of passage into adult status. These were formal, mandatory and achievable by almost all members of society. They played an important role, since they publicly and explicitly marked the moment at which individuals made the transition from the group of children or adolescents to the group of adults. Also, these rituals reduced the tension and uncertainty arising from changes in both an individual's social status and the organization of his life as he transitioned to a new age group (Remschmidt 1994). Initiation ceremonies ensured the continuity of generations and the invariability of the social structure which had been recreating the past of parents into the future of their children (Mead 1988).

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THIS ARTICLE IS THE PRODUCT OF A RESEARCH PROJECT IMPLEMENTED AS PART OF THE BASIC RESEARCH PROGRAMME AT THE NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS (HSE) 2019.

THE ORIGINAL ARTICLE IN RUSSIAN WAS PUBLISHED IN DEMOGRAPHIC REVIEW 2019. 6(4): 53-82.
DOI: 10.17323/DEMREVIEW.V6I4.10427

Over the past one and a half to two centuries, the life of society and the individual has undergone serious quantitative and qualitative transformations. Lives in developed countries have become not only two to three times longer, but also significantly healthier and full of amenities and technologies. In a postindustrial society, the basic needs of most people are satisfied, so that the task of survival and the need for early and universal childbearing associated with it are no longer as acute as before. As a result, the focus of the members of developed countries has shifted from survival to the improvement of the quality of life, individual development and investment in human capital.

Studies of modern Western societies show that the doubling of life expectancy leads to "age inflation" (Shoven, Goda 2011) and shifts the age boundaries of different stages of life. It is no longer necessary to grow up fast, and due to the many complications of the socio-economic and political structure of society, as well as to the emergence of professions that require a long preparation, there is a marked trend towards a slowing down and lengthening of the transition to adulthood.

The process of preparing an individual for adulthood is becoming so complex and multidimensional that it no longer fits into a system of simple rituals and rigid schemes. Generalization of the experience of developed countries (Billari, Liefbroer 2010; Arnett 2012) shows an erosion of age boundaries and the criteria of adulthood, as well as a replacement of external regulation of the transition to adult life with an internal one, one which is more varied, individual and reflective. That is, both quantitative and qualitative aspects of the transition to adulthood are changing.

At the same time, we still know little about how the transition to adulthood in Russia is changing, since there are few large comprehensive studies devoted to the study of this issue. Yet both demographers and sociologists report that, since the collapse of the USSR, the onset of certain demographic and socioeconomic events in people's lives has begun to change (Arkhangelsky 2013; Blum, Lefebvre et al. 2010; Gimpelson, Zudina 2017; Zakharov 2009; Zdravomyslova, Shurygina 2001; Konstantinovsky 2008; Magun, Engovatov 2006; Mills 2004; Potârcă, Mills, Lesnard 2013).

The onset of starting events in the aggregate (the holistic approach), rather than separately (the event approach), is rarely studied based on Russian data, and most often suffers from limitations on the number of events included and the angles of analysis. For example, a 2010 work (Blum, Sebiy, Zakharov 2010) compares the transition to adulthood of generations of Russians and French, but pays no attention to gender and other important types of differentiation. In another study (Zakharov 2009), only the transition to adulthood of women was studied. In another publication, both sexes are considered, and the case of Russia is taken into account, but it is not analyzed in detail (Zsolt, Murinkó, Settersten 2014).

In this study, we take into account world experience in the study of the transition to adulthood, as well as empirical evidence of the transformation of demographic and socioeconomic behavior in Russia. The empirical analysis presented in the work makes it possible to get a comprehensive picture of the transition to adulthood in Russia and to compare the observed trends with examples of European countries.

THE THEORETICAL FRAMEWORK

Transition to adulthood as a process, as a specific stage of life, is a relatively new phenomenon for humanity, and has been studied by science for only about a hundred years. A variety of disciplines - philosophy, psychology, sociology, demography, anthropology and other sciences – have shown interest in this stage of life, each with its own approach, but so far no unified concept of transition to adulthood and comprehensive methodology for analyzing this process have been proposed.

One can give the following generalized definition of *transition to adulthood*: it is the complex process of a person's transformation and acquisition of experience and statuses that allows him or her to take an independent position in society. Transition to adulthood is a multi-component and multi-level process. It includes chronological, biological, legal, psycho-emotional, social and demographic components and proceeds on macro, meso and micro levels.

At the *macro* level, transition to adulthood is a process thanks to which one generation succeeds another. It embodies adaptive social practices, normative models of behavior and normative scenarios which constitute the socially and gender-differentiated sequences of life path events.

At the *meso* level, transition to adulthood is a process of physical, economic, and psychological separation of children from their parents, i.e., of children gaining independence.

At the *micro* level, transition to adulthood is a process by which an individual integrates into an existing social structure by internalizing norms existing in society regarding his or her own preferences.

There is still no consensus in the scientific community about how and what components of transition to adulthood need to be analyzed in order to get the most complete and objective picture of this process. Psychologists mainly use qualitative methods of analysis and study the attitude of individuals to the process of becoming adults, as well as a set of personal competencies that mark transition to adulthood (Arnett 2012). Demographers and sociologists most often study the factual layer - i.e. objective, observable events marking transition to adulthood. Such events usually include the following: completion of education, first job, first separation from parents, first partnership (cohabitation without registration of a relationship), first marriage, birth of a first child (Billari et al. 2005; Billari, Liefbroer 2010; Buchmann 1989; Liefbroer 1999).

The conceptual framework of an interdisciplinary study of the organization of people's lives is outlined by the *the life course approach* (LCA), which posits that modern life paths have ceased to be "standard", institutionalized, the same for everyone, and have become individualized or "customizable" (choice biography) (Giddens 1994; Heinz, Marshall 2003; Huinink 2013). LCA pays special attention to the study of the transition to adulthood, since this stage of life is marked by the highest concentration of significant events that change a person's social status and organization of life (Billari, Liefbroer 2007; Rindfuss 1991).

Another theoretical approach that systematizes knowledge about the onset of biographical events, including starting events, is the *theory of demographic transition* (TDT). TDT mainly studies the onset of demographic events, but the combination of LCA and TDT provides a more comprehensive picture of transition to adulthood. Changes in transition to adulthood are closely

associated with the demographic transition and represent an important part of the demographic modernization of society.

The theory of demographic transition suggests that there are several stages of demographic modernization. At the first stage, the quantitative indicators of the main demographic processes change: the balance of high mortality and high fertility is replaced by the balance of low mortality and low fertility (Lesthaeghe 1995). At the second stage of the demographic transition, changes take place in the organization of family life and the separation of sexual, reproductive and matrimonial behavior (Vishnevsky 1976: 158). This second phase is often called the "second demographic transition" (van de Kaa 1987).

The demographic transition in different countries begins at different historical times and proceeds at different speeds. Among European countries, signs of demographic modernization first appeared in Western Europe, and then in Eastern Europe (Frejka, Zakharov 2012; Puur et al. 2012a; Puur et al. 2012b). The main signs of the second demographic transition are: the postponement of marriage and childbirth; the growing popularity of partnerships and the declining popularity of marriages; a decrease in the total number of children and an increase in the number of children born outside of a registered marriage (Lesthaeghe, Neels 2002; Vishnevsky 2006; Zakharov 2008).

Combining the ideas of LCA and TDT, sociologists and demographers have formed three main hypotheses interpreting the changes that occur with the transition to adulthood: some researchers believe that there is *convergence* between countries (a similarity of the patterns of transition to adulthood); others, that there is a *divergence* (a growth of regional differences); and the *third group* believes that a general movement of the modernization process is occurring in different countries in a similar way but with different speed, and some countries deviate from the normative model due to the specific socio-cultural features.

The assumption of the divergence of patterns of transition to adulthood and of individual behaviors marking the transition to adulthood is supported by Hajnal's study describing and explaining the historical differences in West and East European marriages (Hajnal 1965), as well as by more modern works: classification of the patterns of transition to adulthood in European countries (Cavalli, Galland 1993); clustering of European countries depending on the types of family policy (Ejrnœs, Boje 2008); classification of social policy regimes in European countries (Esping-Andersen 1990; 2007); the relationship between the characteristics of the transition to adulthood and the limitations and opportunities created by social policy regimes, the functioning of the labor market and family structure (Vogel 2002). The main conclusion of these studies is as follows: the most rapid transformation of models of transition to adulthood is found in the western and northern countries of Europe with more liberal social norms regarding the organization of family life and a more gender-balanced family and social policy of the state, while the preservation of previous, more traditional norms and patterns of behavior is typical of the eastern and southern countries of Europe with more family-oriented and gender-asymmetric state policies.

Explanatory concepts involving the *convergence* of models of transition to adulthood do not reject cultural, national and regional differences, but argue that over time these differences are weakening and a general movement toward modernization of demographic and socio-economic behavior is occurring. The idea of convergence is supported by a study of F.C. Billari and

A.C. Liefbroer (Billari, Liefbroer 2010), who examined the change in the following characteristics of the onset of starting events in European countries: age of events (timing), intensity or speed (tempo) and order of events' occurrence (sequencing). They described the "traditional" model of transition to adulthood as *"early, contracted and simple"* (events occurred early, with small intervals and in the same order for almost everybody), and the modern one as "*late, protracted and complex".* The results of this study coincide with the assumptions of the theory of the second demographic transition and show that the age of the onset of starting events, especially demographic ones, is increasing in modern societies. The age of the occurrence of socio-economic events is changing less, so the transition to adulthood begins at about the same age as before, but ends later due to the postponement of demographic events. As result, the transition to adulthood stretches out over time. The sequence of events is also changing: it is becoming more mosaic, individualized and less predictable.

The idea of a convergence of transition to adulthood models is supported by comparative studies of family formation in France, Romania and Russia (Potârcă et al. 2013); in Canada, the Netherlands and Russia (Mills 2004); by the study of transition to adulthood in Belarus (Lapeto, Tereshchenko, Shaverdo 2018) and a review of works on transition to adulthood in Europe (Buchmann, Kriesi 2011).

The third point of view occupies a middle position between the hypotheses of divergence and convergence. It posits that the general direction of changes in the patterns of transition to adulthood in most countries coincides, but some countries retain a number of specific regional features.

A study of girls' transition to adulthood in different countries of Europe (Zakharov 2009) showed differences not only in timing and sequencing of starting events occurrence, but also in what events people in different countries consider as indicators of adulthood (idea of divergence). In Eastern European countries, as well as in Portugal, France and Cyprus, a woman's acquisition of adult status is more associated with starting a family and motherhood (which is often combined with full employment). In Western and Northern European countries, respondents consider that in order to grow up it is important to find a job and leave the parental home. S.V. Zakharov agrees that, on the whole, there is a *convergence* of transition to adulthood models as a result of "a common to developed countries transition to a certain "new" schedule of human life" (Zakharov 2009). Meanwhile, he confirms that some countries preserve *regional differences* due to their historical and cultural backgrounds.

A. Puur and co-authors in their study (Puur et al. 2012a; Puur et al. 2012b) found confirmation of both the *stadiality* of changes in matrimonial behavior (convergence) and the presence of *regional differentiation* (divergence): the transition to the new marriage model in Eastern Europe began several decades later than in Western Europe. Among Western countries, East Germany and Estonia started the transition first (15-20 years later than Eastern countries), and then Bulgaria, Hungary, Lithuania, Russia, and Romania (20-25 years later). The authors revealed that the process of modernization of demographic behavior does indeed go through certain stages, but the cultural and historical norms in different countries can have a significant impact on the content and speed of the modernization process.

Let us summarize the main ideas of all these approaches. Today, in a number of countries, regional characteristics in the transition to adulthood are still observed, but some signs of a demographic transition and the convergence of transition to adulthood models are found in all European countries, including Russia (Arkhangelsky 2013; Dolbik-Vorobey 2003; Zakharov 2007; Chernova 2012; Shabunova, Kalachikova 2015).

In this paper, we carry out two analytical tasks: diachronic (comparing different generations of Russians among themselves) and synchronous (comparing the most recent Russian generations with their European peers and the trends they demonstrate). We study whether the patterns of transition to adulthood of modern youth are following in the tracks set by Western European countries (the idea of convergence) or are the models of transition to adulthood inherited from the Soviet generations (the idea of divergence, preserving regional differences). Using the explanatory concepts presented, we assume that, in general, the transition to adulthood of young Russians is modernizing, but, depending on the individual characteristics of the respondents (gender, generation, educational level, etc.), the difference between Soviet and modern generations will be either weaker or stronger.

DATA AND ANALYSIS METHODS

In our study, we examine the biographies of Russians and operationalize transition to adulthood through the presence of the starting events marking this process. We divide the starting sociodemographic events into two groups: *socioeconomic* (completion of education, first job, first leaving the parental home) and *demographic* (first partnership, first marriage, birth of the first child).

As a database we took the results of the Russian part of the international program supported by the United Nations Economic Commission for Europe "Generations and Gender Survey" (GGS). The survey was conducted in Russia 2004, 2007 and 2011, using a uniform questionnaire for all countries. For the purposes of this study, we created a panel sample of respondents who participated in all three waves of the survey (5451 respondents). All biographies are taken as of 2011. The sample included representatives of generations born between 1930 and 1986. A generational step is a 10-year interval. The last generation is truncated due to the panel nature of the data: in 2004, the youngest respondents were those born in 1986.

The onset of starting events was studied using methods of descriptive statistics such as frequency analysis, contingency tables, and the calculation of median ages of events occurrence. To assess the significance of the differences revealed, the chi-square criterion was used for the onset of events and the Kruskal-Wallis test for independent events - to test differences in median ages.

We used two complementary approaches to study the transition to adulthood: the *event approach* (analysis of the onset of starting events separately) and the *holistic approach* (analysis of transition to adulthood as a cumulative process). The first approach, found in most studies of demographers and sociologists, gives a full idea of certain areas of life, for example, the marital or educational sphere. However, when studying transition to adulthood, we are dealing with a holistic process characterized by several events (in our case, six), which can occur on individual

life paths in a variety of combinations. In order to determine with what event and at what age transition to adulthood begins, it is necessary to sort all the starting events chronologically and to determine which of them was the first and at what age it occurred. The same goes for the second, third, and so on, right up to the last event that occurred. Thus, the event and holistic approaches differ methodologically: in the first case, we compare events of the same type, and in the second, we depersonalize the events, leaving only their order numbers and the ages at which they occurred.

The holistic approach is very informative in the analysis of transition to adulthood, as it takes into account the order of events in an individual biography. But this approach is very sensitive to the set of events that researchers define as marking adulthood. Thus, our previous studies showed that a partnership was not a common and approved starting event in the USSR (Artamonova, Mitrofanova 2014; Artamonova, Mitrofanova 2018), so it would be incorrect to include it in the normative set of adult markers for all generations.

Based on the foregoing, the methodological design of this study is as follows:

1. Event analysis: analysis of the facts and ages of the onset of each of the six starting events.
2. Holistic analysis: analysis of the facts and ages of the onset of events in their chronological sequence, highlighting of the first and last events in the chain of starting events. Partnership is excluded from the normative set of events as not typical for the Soviet era.

To visualize the results of the analysis, an instrument well known to demographers, the *Lexis grid*, was used. Its advantage lies in the possibility of operating simultaneously with three time coordinates: the calendar year (X axis), the age of people at each moment of time (Y axis) and the birth years forming generations (diagonal). This diagram is used to display simultaneously the totality of demographic events in the life of generations.

DATA ANALYSIS

The visualization of the data on the Lexis grid was preceded by an analysis of the facts of the occurrence of all the events one by one (Appendix 1) and of their median ages (Appendix 2). Then we revealed what event was the first and the last in each biography and calculated the median ages of these events (Appendix 3). The Lexis grid allowed us to visualize all the results and correlate them with the historical context associated with the period of the transition to adulthood of each generation (see the figure below).

The axis of calendar time (X axis) gives an idea of the historical context in which each generation has grown up. In the area under the X axis, we entered some historical events that could have influenced the onset of starting events. We will describe these events and their influence in more detail in the following sections of the article.

The age axis (Y axis) begins at the point where respondents reach 15 years of age and ends at the time of their 30th birthday, since the median values obtained are limited to this age.

The diagonal axis contains information about each generation. Color icons represent the results of event analysis and are located according to the median ages of the onset of starting events (Appendix 2). Pictograms of men are marked in blue, of women - in red. The degree of opacity of the pictograms shows what share of the generation has a specific event. The intervals between the earliest and the latest starting events are combined by a shaded color "corridor". Thus, both the pictograms and the shaded corridors reflect information on the occurrence of the starting events separately (event approach).

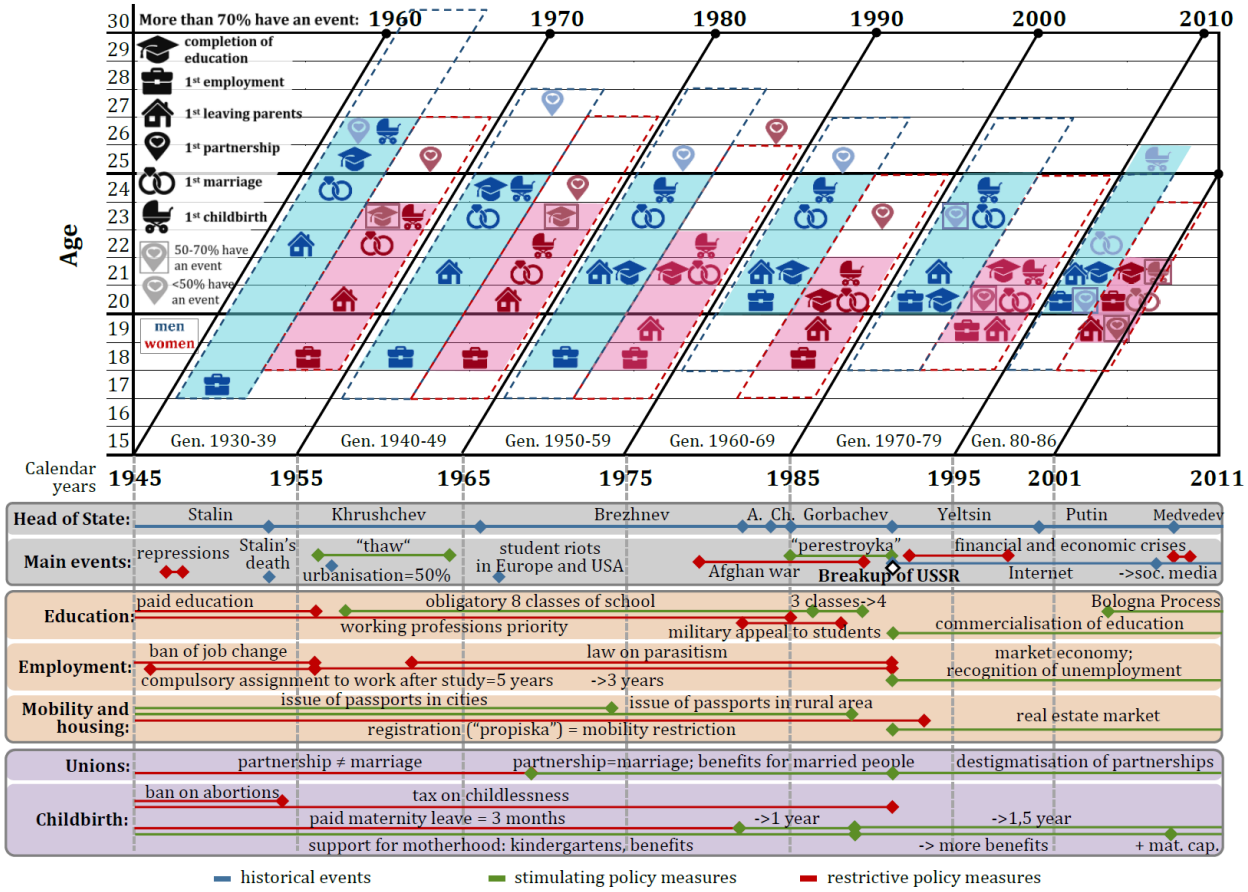

Figure. Visualization of the process of transition to adulthood for different generations of Russians in the existing historical context

Source: Made by the author based on the panel data of the Russian part of GGS for 2011.

Notes: A. - Andropov; Ch. - Chernenko; 3 classes-> 4 - the opportunity to skip the 4th grade of school; -> 1 year - increase in parental leave up to one year; -> 1.5 years - an increase in parental leave up to 1.5 years; matcap - maternal capital.

Notes on the Lexis grid: pictograms indicate the median ages of events; shaded color corridors indicate the boundaries of the occurrence of events separately (event approach); dashed corridors - the intervals between the first and last event of transition to adulthood as a single process (holistic approach); partnerships are not included in the corridors, as they were not mandatory for transition to adulthood in Soviet times.

Information about the onset of all starting events as elements of a single process (holistic approach) is contained in dashed "corridors" that do not coincide with the shaded ones. The lower boundary of such a corridor is defined by the first event (the one with which transition to adulthood begins), and the upper one by the event that occurred last (Appendix 3).

Neither the shaded nor the dashed corridors include partnership, since it was not part of the normative scenario of transition to adulthood in Soviet times.

The table, compiled on the basis of the described scheme and data on the facts and median ages of the onset of events, summarizes information on six key parameters of transition to adulthood. The indicators in the table do not include partnership. Based on the data on the duration of transition to adulthood and the number of events that have occurred, the "speed", i.e. the average number of events per year, has been calculated (Appendix 4)[1].

Table. Classification of the models of transition to adulthood in Russia

Generation	Age boundaries of transition to adulthood	Duration of transition to adulthood, years	Number of events out of 5	Number of events per year	Sequence of the first events occurrence **	Calendar years of transition to adulthood	Models of transition to adulthood
1930-39	17-27	10	4.46	0.69	1. Employment	1947-1966	«Transitional»
1940-49	17-26	9	4.57	0.80	2. Separation from parents	1957-1975	
1950-59	17-26	9	4.66	0.81	3. Marriage and childbearing	1967-1985	«Soviet»
1960-69	17-25	8	4.63	0.95	4. Professional education 5. Partnership	1977-1994	
1970-79*	18-25	7	4.51	1.06	1. Employment 2. Separation from parents 3. Professional education	1988-2004	«Transitional»
1980-86*	18-23	5	3.60	1.23	4. Partnership 5. Childbearing 6. Marriage	1998-2009	«Post-Soviet»

Source: Made by the author based on the panel data of the Russian part of GGS for 2011.

*Notes: * - For generations that have not completed the transition to adulthood, preliminary results are presented; ** - Designations of universality of occurrence of events: universal events (more than 70% of respondents have it); semi-universal events (50-70% of respondents have it); non-universal events (less than 50% of respondents have it).*

Here are the main conclusions for each of the parameters of transition to adulthood presented in the diagram and table.

The *boundaries of transition to adulthood* are changing very slowly. On average, Russians are characterized by an onset of starting events in the range from 17-18 to 25-27 years. Men begin the transition to adulthood before women and mainly with socio-economic events. Due to the fact that women gain experience more intensively in the demographic sphere and quickly catch up with men in terms of socio-economic events, the transition to adulthood of women is faster. On average, by the age of 25, both sexes already have experience in two of the three socioeconomic events; the number of demographic events for women is already 1.5 - 2, while for men it is only 1.3. By the age of 35 both sexes have 2.5 socioeconomic events, while the number of demographic events is more than two for women and less than two for men.

[1] The speed of transition to adulthood is obtained by dividing the number of starting events in the life of a particular individual by the duration of his transition to adulthood. Then, on the basis of individual "speeds" of transition to adulthood, the average "speed" for each generation was calculated. This calculation method gives more accurate results than simply dividing the column "Number of events out of 5" by "Duration of transition to adulthood".

On average, the completion of transition to adulthood among Soviet men occurred by the age of 26-28 years; among Soviet women – about a year earlier. That is, the *duration of transition to adulthood* was approximately 9-10 years. At the time of the survey, the youngest generation of Russians was at the ages of 25-31, and by that time they had accumulated only 3.6 out of five events, so it is still impossible to calculate the average or median age of completion of transition to adulthood for them.

Since at the time of the survey the respondents were of different ages, they had different chances of starting events. To neutralize this effect, we calculated the relative indicator of the *"speed" of transition to adulthood*: for each respondent we divided the duration of transition to adulthood by the number of completed events, and then we calculated the average number of events for each generation. The "speed" of transition to adulthood shows that the oldest generation grew up the most "slowly" of all (0.69 events per year). The youngest generation, which began the transition to adulthood just a few years ago, shows an almost 2 times higher growth rate (1.23 events per year). Of course, this is due to the effect of age: the older the generation becomes, the lower the growth rate will be.

Having arranged the starting events in chronological order within each biography, we determined the averaged sequence of their occurrence. Calculations confirm the empirical evidence already available that the *prevalence and sequence of the onset of starting events* among Russians is changing (Mills 2004; Zakharov 2009; Potârcă et al. 2013).

In *Soviet times*, the universal events were employment, separation from parents and the creation of a family, and they occurred mainly in this sequence. Getting a professional education was to a greater extent the prerogative of men. For women, this event is included in the normative scenario of transition to adulthood starting only from the generation born in 1950-59. Entering a partnership (an unregistered union) in Soviet society was not encouraged, so it is rare. And if this event did take place, it was mainly after a first marriage and subsequent divorce. That is, in Soviet times, partnership did not fulfill the role of a marker of the onset of adulthood, but rather was an acceptable event within it.

The onset of starting events in the context of other individual characteristics did not differ much. For the vast majority of respondents, the first event was employment, and the last was procreation. For highly educated respondents and residents of regional centers, the first event often became separation from parents, most likely related to educational or labor mobility. And the last event (along with childbearing) was getting a professional education. For women, the appearance of a child reduced the chances of finding a job and getting a professional education.

In the *post-Soviet era*, partnerships and professional education became part of the normative scenario of transition to adulthood. Adding these two events to the list of mandatory and/or desirable ones has increased the diversity of combinations of starting events. Today's young people, who have a high level of education and live in regional centers, begin their transition to adulthood with socio-economic events, that is, with investments in their human capital and the gaining of financial independence. Only after this do the young generations start a family. Moreover, their family life most often begins with a partnership that does not always turn into marriage, even with a child. The sequence of events for those who live in less urbanized areas and have a lower level of education varies by gender: the beginning of the transition to adulthood in

men is now associated more with getting an education (often in combination with employment), and for women, with a partnership or marriage.

CALENDAR YEARS: LOCATING A GENERATION'S TRANSITION TO THE PERIOD OF ADULTHOOD IN A SPECIFIC HISTORICAL CONTEXT

For *the generation born in 1930-39,* the most active period of accumulation of starting events was in the period from 1947 to 1966. These respondents began transition to adulthood in a pivotal era, when the latest wave of post-war repressions and intensification of restrictive measures gave way to a "thaw", a liberalization of socio-economic, educational, labor, migration and family policy. At the same time, liberalization was inconsistent and far from complete: the obvious features of universal labor mobilization persisted, and a policy of "workerfication", with mandatory job placement after completion of studies and the prohibition of quitting or changing jobs, was in effect. Nor should we forget about paid tuition in high school, secondary special and higher educational institutions (in effect in 1940-1956), and longer military service in the army. The generation under consideration began the transition to adulthood precisely with employment and postponed other events to later ages.

During this period, there were still no standards for the duration of compulsory schooling, so in this generation there are those who finished only a few grades of school and did not receive a higher education, or who received one, but late, as one of the last events in the chain of events marking transition to adulthood.

The post-war imbalance of the sexes, leading to an imbalance in the marriage market, contributed to a serious discrepancy in the median ages of the onset of demographic events for men and women. Demographic events in this generation came later than in subsequent generations. Among other things, this was caused by the intense competition for time between family and work life, as well as by the newly formed and not yet well-functioning institutions of state welfare (nurseries, kindergartens, short maternity leave, etc.).

The *generations born in 1940-49 and 1950-59* transitioned to adulthood in a more stable period of Soviet history (1957-1985). Public life was still highly regulated. There were quite a few restrictive measures, but state support for family, education and other spheres of life grew and gave confidence that state institutions would help to bring about the necessary events and successfully master new social roles. Existing "Soviet" norms and rules had already been mastered by previous generations, which facilitated the transmission of normative behavior scenarios.

Respondents born in the 40s and 50s made the transition to adulthood early and fast. The onset of starting events in men occurred at the age of 27 years, in women - at 25-26 years. The average sequence of their onset looked like this: first, employment and separation from parents, then starting a family and completing one's professional education. The relationship between getting married and having children was very strong (the protogenetic interval – the time between getting married and having a first child - was less than a year). This uniformity of the onset of starting events reflected the uniformity of views, living conditions and income, and the existence of uniform social and legislative norms governing the time and sequence of occurrence of events.

The *generation born in 1960-69* began the transition to adulthood in stable Soviet times (1977), and ended it during the period of perestroika and the collapse of the Soviet Union (1994). As a result, the process of transition to adulthood (the sequence and timing of the onset of events) for this generation looks outwardly very similar to its predecessors, but a more detailed examination of, in particular, gender differences allows us to see emerging changes, largely due to situational factors (changes in socioeconomic and demographic policies).

For men of this generation, starting events occur later than for their predecessors. To some extent, this is due to the fact that in the 1960s the size of birth cohorts decreased, which means that 18 years later the number of draftees also became smaller than in previous years. In order to compensate for the reduction in the contingent of conscripts for military service, in the 80s a number of deferments for those entering institutions of higher education were suspended, and the number of ministries able to grant deferments to graduates of vocational schools for the duration of their work in the national economy was limited [Gradoselsky, 2005]. After completing military service and returning home, men began to "catch up" with what was lost and completed transition to adulthood even a year earlier than previous generations.

Women of this generation also demonstrate an earlier completion of transition to adulthood, due to a decrease in the age at birth of a first child. In 1982, the government increased paid parental leave to 1 year, and in 1989 to one and a half years. These measures stimulated fertility among women born in the 60s, while at the same time lowering their chances of receiving a higher education and employment.

The *generation born in 1970-79* entered adulthood in a very turbulent time (1988-2004), with blurry guidelines regarding desirable, undesirable and mandatory patterns of behavior. Along with the tremendous expansion of freedom of choice of behavioral practices, the ability to try new things and experiment, the level of uncertainty, tension and risks also grew: this generation was faced with economic crises, military operations in Chechnya and inter-ethnic conflicts, and the instability of social institutions throughout the transition to the adulthood period – with, that is, the inevitability of adjustments of their plans for the future.

The abolition of restrictive norms in the socioeconomic and demographic sphere allowed this generation to organize their life more freely, but in conditions of rather high turbulence and uncertainty: a number of professions and specializations ceased to be in demand, and key enterprises and organizations closed and/or changed their form of ownership, which caused disorientation and often unemployment, especially among the younger generation, who did not yet have experience in employment and social relations. As a result, there was a postponement of the age of first employment in this generation.

The increase in the accessibility of higher education, including through its commercialization, caused a sharp increase in the supply and demand for educational services. As a result, an increasing number of young people were able to afford a "psychosocial moratorium" (Erikson 1995) as students, higher education for them being not so much an investment in human capital as a way of "waiting out" the next economic crisis and period of uncertainty.

The age of leaving the parental home for those born in the 70s coincides with the timing of previous generations, since the state continued, by inertia, to fulfill a number of social obligations, in particular, by providing housing for those who had been on a "waiting list for improved housing conditions" since Soviet times. During this period, older ways of obtaining housing (for example, hostels, apartments of a "hotel type" from employers) were dying out, and were being replaced by new ones as a result of the increasing development of a flexible housing market, as well as to the weakening of socio-regulatory and legislative restrictions on living with "outsiders" (i.e. with partners).

The age of entry into the first partnership of this generation decreased markedly, and the number of such unions in the course of life, in comparison with previous generations, increased. The gradual destigmatization of premarital sexual relations allowed this generation to master new ways of living together. However, a lack of knowledge about family planning and contraception often led to premarital conceptions. Previous generations in this situation either got married after a pregnancy – "shotgun weddings" - or aborted. Generations of the 70s, however, were less likely to resort to abortion, choosing instead to keep the child, but the practice of marriage after conception continued to be reproduced. Therefore, the protogenetic interval remains at the level of previous generations (less than a year).

The *generation born in 1980-86* is the only one of all the generations under consideration which began the transition to adulthood some time after the collapse of the USSR (they reached the age of 15 in 1995 or later) and for which the expanded freedom of choice and the new information environment were natural components of life. The economically fairly stable aughts, the restoration of institutions of state support for the family, the openness of state borders, the possibility of renting and buying housing - these and other factors created the conditions for a more varied, but at the same time protected entry into adulthood. The emergence of the Internet, social networks, the possibilities of remote work or a freer schedule, the development of the pharmacological market allowed this generation to successfully master new skills in life and family planning, to study various options for forming a life path based on the principles of time management and informed choice. The absence of a unified and rigidly fixed pattern of behavior has led to an increase in the diversity of life strategies, in particular, demographic ones, to the possibility of rejecting some events, for example, childbearing (Vildanova et al. 2017; Salyakhieva, Saveleva 2017), or delaying them, or, on the contrary, more effectively combining events from different spheres of life, for example, parenthood and employment (Billari, Giuntella, Stella 2019).

Standard socioeconomic events for the generation born in the 80s occur at about the same ages and with the same intensity as in the previous two generations. The age of the first employment is somewhat delayed, but this is due to the longer professional education. Among the first demographic events, partnerships are more often preferred, while events requiring a more long-term responsibility (marriage and childbearing) are postponed to later ages. While for men a slowdown in the pace of demographic transition to adulthood is very clearly visible, the life paths of women are still very "compressed" (less than for women of the previous generation, but much more than for their male peers).

Young people are not shying away from transition to adulthood; rather, by becoming an active participant in this process, they are beginning to change its structure and calendar. Due to the wide accessibility of higher education, it has become possible to include student years in a young Russian's typical life scenario. And this, according to E. Erickson (Erikson 1995), gives individuals the opportunity to take a break between ending their childhood and reaching adulthood (a "psychosocial moratorium") and devote this time to finding themselves and planning a career.

THE CLASSIFICATION OF TRANSITION TO ADULTHOOD MODELS

The proposed method for visualizing the process of transition to adulthood on the Lexis demographic grid allows us to conclude that *the era in which a generation actualizes the starting events of adulthood influences the formation of models of growing*. The transition to adulthood is a changing stage of life, *adapting* to specific environmental conditions and helping the young generation to most effectively and quickly integrate into the existing social system.

The organization of the process of the transition to adulthood among the generations of *1940-49*, *1950-59*, and *1960-69* can be called the most stable and typical model. We call this model "*Soviet*". A typical transition to adulthood appeared only as a result of the unification of the work of social institutions in the late Soviet era. In the era of a planned economy and a planned organization of life, the normative life scenario was very clearly defined. It was easy to follow, since all the institutions worked in concert and focused on this particular model.

In periods of change and instability, individuals delay the onset of some events and prioritize the onset of others. For example, the generation born in *1930-39*, faced with the post-war devastation and the economic difficulties associated with it, was forced to make labor a priority, postponing other events to later ages. For the generation born in *1970-79*, the opposite occurred: in a period of rapid social and political transformations and an inability to make reliable plans for the future, it actualized key starting events "in an accelerated mode", either "making reserves for the future" or striving to try everything at once in conditions of unprecedented freedom. Such models of transition to adulthood can be called "*Transitional*" (or adaptive, responsive). They best demonstrate the adaptive nature of the transition to adulthood process.

The model of transition to adulthood which is developing among today's youth (those born in *1980-86*) we will call "*Post-Soviet*". We are now seeing a slowdown in the process of transition to adulthood due to the postponement of the onset of demographic events, which was made possible thanks to access to information and technologies (family planning and contraception; expansion of the set of regulatory models broadcast through the media). Other important changes include the addition of a new normative event (partnership) and the prioritization of an event that was previously less important and affordable (getting a higher professional education). This leads not only to a change in the timing and sequence of occurrence of events, but also to an increase in the number of starting events and the variety of sets of possible life scenarios. The vector of changes chosen by Russian youth corresponds to the path of transformation of adult models in Western countries described by authoritative foreign authors (Billari, Liefbroer 2010): transition to adulthood is no longer "*early, contracted and simple*" and becomes "*late, protracted and complex*".

DISCUSSION OF RESULTS

The comprehensive analysis and classification presented by us confirm the ideas of Billari and Liefbroer (Billari, Liefbroer 2010) on the convergence of transition to adulthood patterns in developed countries. Modern Russian generations that began the transition to adulthood after the collapse of the USSR have moved away from the typically "Soviet" model of transition to adulthood, which can be called "*early, contracted and simple*" (the "traditional" model) and are approaching the model that is becoming more common in Western countries: "*late, protracted and complex*" (the "modern" model). Transition to adulthood is beginning *later*, as young people postpone the onset of all events, and especially demographic ones. Transition to adulthood is becoming more *protracted*, as socio-economic events are realized only a year or two later than in previous generations and demographic events are postponed for several years, which causes an increase in the overall duration of the transition and a slowdown in its speed. Transition to adulthood is becoming more *complex* due to the increase in the variability of time and sequence of occurrence of events and the inclusion of two formerly unpopular events in the normative life scenario: professional education and partnership.

The transition from the "traditional" "Soviet" model of transition to adulthood among Russians to a "modern" "Post-Soviet" one confirms the historical *stadiality* of changes in the process of transition to adulthood and of demographic behavior as part of it (Frejka, Zakharov 2012; Puur et al. 2012a; Puur et al. 2012b). We found that changes in the timing and tempo of the onset of starting events began in the generation born in 1960-69, but that these transformations were linked with historical and political events of the period: the war in Afghanistan, the activation of family policy and the stimulation of fertility in the 1980s. The first sustainable, generational changes begin with the generations born in 1970-1979, whose members began to change not only the timing and tempo of the onset of events, but also their sequence and priority relative to each other. The generation born in 1980-1986 demonstrates a fundamentally different approach to organizing the process of transition to adulthood, highlighting those events that provide more benefits than obligations, and putting off events requiring long-term responsibility.

The study also confirms the estimates made by the above authors of the difference between the beginning of demographic modernization in Europe and in Russia: while in Western European countries changes in matrimonial behavior began in the generation of those born in 1960–69, in Russia they began 20–25 years later, in the 1980-86 generation. The cluster of three types of behavior - sexual, mating and reproductive - is gradually breaking up: the debuts of each of them not only turn out to be separated by longer intervals, but also occur in an increasingly arbitrary sequence. The first partnership among young Russians is increasingly becoming the first demographic event, childbearing is the second, and marriage either occurs shortly after the conception of a child or may not occur at all, which leads to an increase in extramarital births and a decrease in marriage.

An increase in the diversity of life strategies, a change in the sequence of events and the intervals between them, the emergence of the opportunity to organize your life path in accordance with your own interests - all this is observed in the younger generation of Russians and is consistent with the assumptions of the concept of a life course (Giddens 1994; Heinz, Marshall 2003; Huinink 2013).

CONCLUSIONS

The study showed that the historical and institutional context accompanying the transition to adulthood of young people sets the boundaries and guidelines for possible models of transition to adulthood (Berger, Luckmann 1966; Kiernan 2002; Sobotka, Toulemon 2008). The greater the support of the state, the earlier and more intensive transition to adulthood occurs, which is consistent with existing studies (Cavalli, Galland 1993; Vogel 2002; Esping-Andersen 2007; Ejrnœs, Boje 2008). The narrower the corridors formed by social and legislative norms, the fewer differences in the structure, timing, tempo and sequence of occurrence of starting events (examples are the generations born in 1940-49, 1950-59, 1960-69). With the expansion of freedom of choice in organizing life paths, young people begin to demonstrate variability of all types of behavior (for example, generations born in 1980-86).

We have identified three models of transition to adulthood of Russians: “Soviet” (typical for generations of 1940-49, 1950-59, 1960-69), “Transitional” (generations 1930-39 and 1970-79) and “Post-Soviet” (generations 1980-86). The proposed models fit into the classification of Billari and Liefbroer (Billari, Liefbroer 2010): the "Soviet" model corresponds to the "traditional" one (timing - events occur at young ages; tempo - small intervals between events; sequence of events is simple and predictable), and the "Post-Soviet" one is approaching the "modern" (timing - postponing events to later ages; tempo - increasing intervals between events; the sequence of events is complex and unpredictable). Thus, there is a convergence of the features of the transition to adulthood in Russia and in countries that are at more advanced stages of the demographic transition, which confirms the stadiality of the modernization process (Frejka, Zakharov 2012; Puur et al. 2012a; Puur et al. 2012b).

The average “modern” model of transition to adulthood in Europe looks like this: relatively early leaving of the parental home, followed by a short time without a partner, then entering into a partnership, conception of the first child at a relatively young age and registering a marriage shortly before the birth of the child or even choosing not to register the marriage at all (Billari, Liefbroer 2010). Our analysis showed that the sequence of starting events for Russian youth is approaching the modern European one, but demographic events in Russia occur at earlier ages and with shorter intervals. That is, the composition of transition to adulthood in Russia is becoming similar to the European model, but the dynamics are still different.

The inclusion of student years in the normative life scenario of a modern Russian has made it possible for young people to use their student years and the subsequent period of starting a career as a pause in the transition to adulthood (so called “psychosocial moratorium” (Erikson 1995)). During these several years, young Russians are in a “half-grown-up” state: they have already acquired socioeconomic statuses and experience living with a partner, but have not yet created a family. Marriage and childbearing are perceived by them as the most “irreversible” events, requiring a certain psychological maturity and financial stability. We believe that this lengthening of the period of transition to adulthood is a consequence of the postponement of demographic events to later ages, and not a complete rejection of them.

The present study helps to better understand what modern youth is and in what age segment it is localized. Given the desire of young people to achieve financial independence before marriage and childbearing, as an effective measure might be proposed the expansion of financial instruments

and career opportunities that will allow young people not to linger in the "half-grown-up" period. A more flexible system of combining parenthood and employment will also help achieve a balance between the socioeconomic and demographic spheres. By turning to the available examples of the transformation of transition to adulthood models in European countries, we can predict further changes in transition to adulthood in Russia and, by anticipating them, prepare society and institutions for new challenges.

ACKNOWLEDGMENT

This paper is an output of a research project implemented as part of the Basic Research Program at the National Research University Higher School of Economics (HSE University).

I would like to thank some colleagues for their many years of support which helped this research to come to fruition. First and foremost, I express heartfelt gratitude to S.V. Zakharov for his continual scientific advising, insightful recommendations and openness to new ideas.

I thank the teams of the HSE Research and Study Groups "Fertility, Family Formation and Dissolution" and "Models and Methods of Demographic Sequence Analysis", especially A.O. Makarentseva, D.I. Ignatov, T.H. Espy, A.V. Artamonova, A.A. Muratova, D.K. Gizdatullin, O.V. Sinyavskaya, S.S. Biryukova and A.A. Dolgova.

I express genuine thanks to Russian and foreign colleagues for their consultations and reviews of the different parts of my research: A.G. Vishnevsky, M.B. Denisenko, V.S. Magun, A. Puur, A. Blum, F.C. Billari, M. Mills, L. Sakkeus, L. Rahnu, G. Ritschard, M.S. Fabrykant, A.A. Avdeev, P. Blanchard, R. Leu, L. Toulemon, E. Lelièvre, M. Bouchet-Valat and L. Moulin.

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APPENDICES

Appendix 1. The number of respondents for whom each of the starting events occurred or did not occur, by gender and generation

Events	Generations	Men						Women					
		0-14	15-24	25-34	35+	No events	total	0-14	15-24	25-34	35+	No events	total
Graduation from school	1930-39	52	141	0	0	0	193	144	444	0	0	1	589
	1940-49	32	184	0	0	0	216	56	498	0	0	0	554
	1950-59	16	377	0	0	0	393	37	903	0	0	0	940
	1960-69	23	410	0	0	0	433	32	740	0	0	0	772
	1970-79	49	293	0	0	0	342	53	552	0	0	0	605
	1980-86	19	162	0	0	0	181	13	220	0	0	0	233
Professional education	1930-39	0	79	50	30	34	193	0	203	93	51	242	589
	1940-49	0	98	47	28	43	216	0	246	102	42	164	554
	1950-59	0	227	83	15	68	393	0	566	152	65	157	940
	1960-69	0	276	65	25	67	433	0	523	84	42	123	772
	1970-79	0	244	54	5	39	342	0	390	125	21	69	605
	1980-86	0	136	20	0	25	181	0	173	32	0	28	233
First job	1930-39	23	160	9	1	0	193	57	488	39	5	0	589
	1940-49	11	194	9	2	0	216	16	511	24	3	0	554
	1950-59	4	367	20	1	1	393	5	907	25	1	2	940
	1960-69	8	405	18	2	0	433	8	723	26	1	14	772
	1970-79	6	310	23	1	2	342	4	533	50	0	18	605
	1980-86	1	164	10	0	6	181	0	205	10	0	18	233
First separation from parents	1930-39	3	130	40	20	0	193	18	458	74	39	0	589
	1940-49	8	156	36	16	0	216	5	442	71	35	1	554
	1950-59	3	288	76	22	4	393	10	757	112	47	14	940
	1960-69	4	324	75	14	16	433	10	642	89	17	14	772
	1970-79	2	266	53	3	18	342	13	490	66	4	32	605
	1980-86	5	112	19	0	45	181	5	181	10	0	37	233
First partnership	1930-39	0	29	12	22	130	193	0	95	43	61	390	589
	1940-49	0	29	17	23	147	216	0	107	46	54	347	554
	1950-59	2	62	41	42	246	393	3	187	121	112	517	940
	1960-69	0	99	69	30	235	433	0	212	90	68	402	772
	1970-79	1	126	72	3	140	342	2	263	92	6	242	605
	1980-86	0	111	14	0	56	181	0	149	16	0	68	233
First marriage	1930-39	0	93	82	9	9	193	0	387	105	17	80	589
	1940-49	0	137	64	6	9	216	0	391	85	12	66	554
	1950-59	0	261	91	16	25	393	1	686	140	20	93	940
	1960-69	0	261	115	12	45	433	0	593	86	8	85	772
	1970-79	0	191	68	3	80	342	0	460	45	4	96	605
	1980-86	0	41	14	0	126	181	0	106	12	0	115	233
First child	1930-39	0	62	105	11	15	193	0	370	164	11	44	589
	1940-49	0	110	96	2	8	216	0	366	134	12	42	554
	1950-59	0	202	141	14	36	393	0	633	229	26	52	940
	1960-69	0	218	160	16	39	433	0	573	146	7	46	772
	1970-79	0	152	120	4	66	342	0	463	94	3	45	605
	1980-86	0	36	38	0	107	181	0	140	22	0	71	233

Source: Made by the author based on the panel data of the Russian part of GGS for 2011.

Appendix 2. Median ages of the onset of starting events

Generation	Graduation from school	Professional education	First job	First separation from parents	First partnership	First marriage	First child
			Men				
1930-1939	16	25	17	22	26	24	26
1940-1949	17	24	18	21	27	23	24
1950-1959	17	21	18	21	25	23	24
1960-1969	17	21	20	20	25	23	24
1970-1979	16	20	20	20	23	23	24
1980-1986	17	21	20	19	20	22	25
Всего	17	21	19	20	23	23	24
			Women				
1930-1939	16	23	18	20	25	22	23
1940-1949	17	23	18	20	24	21	22
1950-1959	17	21	18	19	26	21	22
1960-1969	17	20	18	19	23	20	21
1970-1979	17	21	19	19	20	20	21
1980-1986	17	21	20	19	19	20	21
Всего	17	21	18	19	23	21	22
			All				
1930-1939	16	24	18	20	25	23	24
1940-1949	17	23	18	20	25	22	23
1950-1959	17	21	18	20	26	22	23
1960-1969	17	20	19	19	23	21	22
1970-1979	16	21	19	19	22	21	22
1980-1986	17	21	20	19	20	21	22
Total	17	21	19	20	23	21	23

Source: Made by the author based on the panel data of the Russian part of GGS for 2011.

Appendix 3. Median ages of the onset of the first and last events of the transition to adulthood, as well as the median duration of transition to adulthood

Gender	Generations	Median age of the onset of a first event	Median age of the onset of a last event	Median duration of transition to adulthood
Men	1930-39	17	30	12.8
	1940-49	17	27	9.7
	1950-59	17	27	9.3
	1960-69	18	26	8.3
	1970-79	18	26	7.7
	1980-86	18	24	5.7
Women	1930-39	18	26	8.3
	1940-49	17	26	7.8
	1950-59	17	25	7.9
	1960-69	17	24	6.1
	1970-79	18	24	6.5
	1980-86	18	23	5.2

Source: Made by the author based on the panel data of the Russian part of GGS for 2011.

Appendix 4. The number of starting events and the "speed" of transition to adulthood in the context of generations

Generations	The number of starting events in the context of generations			"Speed" of transition to adulthood in the context of generations		
	average	Number of respondents	Standard deviation	average	Number of respondents	Standard deviation
1930-39	4.46	782	0.685	0.69	695	0.792
1940-49	4.57	770	0.632	0.80	673	1.223
1950-59	4.66	1333	0.601	0.81	1105	1.069
1960-69	4.63	1205	0.675	0.95	999	1.064
1970-79	4.51	947	0.818	1.06	770	1.277
1980-86	3.60	414	1.161	1.23	276	2.391
Total	4.50	5451	0.776	0.89	4518	1.223

Source: Made by the author based on the panel data of the Russian part of GGS for 2011.

FAMILY TRADITIONALISM AND AGE-SPECIFIC NUPTIALITY PATTERNS: WHAT DOES THE EXAMPLE OF KARACHAY-CHERKESSIA POINT TO?

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The paper deals with the relation between traditional family norms and women's age at first marriage. The study is based on data from Karachay-Cherkessia, a republic of the North Caucasus (Russia), and uses results of a survey among women of reproductive ages conducted there in 2018. It has been demonstrated that traditional family norms, including those empowering elder generations and limiting women's social role to housework and bringing up children, are rather strong in that region. It is currently assumed that these norms generally correlate with women's younger age at first marriage. However, our analysis of the data from Karachay-Cherkessia, which used proportional hazard models and logistic regressions, does not fit this assumption. Specifically, it turns out that precisely that ethnic group of Karachay-Cherkessia which shows a higher concentration of traditional family norms also demonstrates a statistically significant tendency towards women's older age at first marriage. Thus the relation between traditional family norms and the timing of marriage appears to vary more across different societies than is supposed. The consequences of this result for the study of demographic transformations taking place in different countries and regions together with the breakdown of traditional family norms are discussed.

***Key words**: North Caucasus, nuptiality, age at marriage, traditional family norms, gender asymmetries.*

1. INTRODUCTION

The article is devoted to the relationship between the characteristics of the family structure and the age parameters of demographic events. We focus on those characteristics of the family structure which are usually assumed under the concept of "traditional family", meaning, first of all, family norms that reinforce the authority of the older generation over the younger and limit the woman's role to raising children and to housework. A common belief among researchers is that the more "traditional" in this sense the family structure in a society is, the lower will be the age at which a woman marries, the age at birth of her first child, etc. This view is confirmed by data from numerous countries, most of them outside Western Europe and North America (see section 3).

Based on data from a quantitative field study conducted in one of the regions of the North Caucasus (Karachay-Cherkessia - KCR), the article shows that such a pattern is not, however, necessary. We focus on the influence of "traditionalism" in the family structure on the age at which a woman marries. Analysis shows that the situation in the region we are studying is in many ways the opposite of typical expectations: the indigenous peoples of Karachay-Cherkessia differ in age models of marriage, but an older age of marriage for a woman is characteristic of precisely that ethnic group (the Karachais) which today has more norms of the traditional way of life.

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THE ORIGINAL ARTICLE IN RUSSIAN WAS PUBLISHED IN DEMOGRAPHIC REVIEW 2019. 6(3): 98-127.
DOI: 10.17323/DEMREVIEW.V6I3.9857

The preservation of the norms of a traditional family implies adherence to certain age standards of marriage, but these standards may be different for different peoples even within the same region and do not necessarily imply an early age of marriage for a woman. Such a complication of existing ideas about the relationship between family "traditionalism" and the age-related characteristics of marital and reproductive behavior has important consequences for the analysis of the demographic transformations that are occurring today in various societies with a breakdown of the traditional family structure.

The article is structured as follows. Section 2 briefly introduces the concept of traditional family norms with which we operate during the study. Section 3 discusses the current understanding of the relationship between traditional family norms and the parameters of matrimonial and reproductive behavior. Section 4 is devoted to the general demographic characteristics of Karachay-Cherkessia. Section 5 describes the quantitative survey that formed the basis of our study and presents some of its descriptive results. Section 6 is devoted to a statistical analysis of factors affecting the age of marriage of a woman (based on survey data). Section 7 discusses the results of the analysis.

2. THE TRADITIONAL FAMILY APPROACH: THE CONCEPT AND MEASUREMENT METHODS

The concept of the traditional family structure used in this work is connected with the conceptual apparatus developed by the founder of the distinction between modern and traditional societies, the German sociologist F. Tönnis, who contrasted the *Gemeinschaft*, a community, with the *Gesellschaft*, a society of the modern type (Tönnis 2002). Among the basic features of the *Gemeinschaft*, according to Tönnis, is the presence in a family of strict gender and generational asymmetries, as well as an individual's great dependence on the family and the community. This can take the form of a strict distinction between the functional roles of spouses in the family, of the dependence of young people on older relatives when making important life decisions, and on close ties between relatives within the framework of an "extended family".

Numerous works have shown that the above-listed characteristics of the *Gemeinschaft* are to a large extent characteristic of today's North Caucasus (Pavlova 2012; 2013; Sabanchieva 2016; Molodikova, Watt 2014). It should be noted at the same time that the available research also reveals noticeable differences between different North Caucasian territories and ethnic groups in terms of the degree to which the traditional way of life of the family is preserved, in how much it has undergone erosion due to the social transformations of Soviet and post-Soviet times. (See, for example, (Karpov 2001) regarding such differences in the position and social role of women, and (Starodubrovskaya 2019) on the transformation of the system of generational and gender relations in some North Caucasian communities.) Researchers generally agree that the changes that took place in the North Caucasus in the last third of the 20th and the beginning of the 21st centuries, primarily the massive relocation of the local population to cities, have largely affected the family structure and, to one degree or another, caused its "modernization." However, this has not led to a leveling of differences between the North Caucasus and most other parts of Russia. Therefore, the question of the influence of the traditional family structure on the demographic behavior of the population, including matrimonial behavior, remains relevant for the modern North Caucasus.

The literature offers a large number of parameters by which the degree of rigidity of gender and generational hierarchies in a given society can be estimated. Various parameters related to the presence of gender hierarchies are systematically reviewed in (Mason 1987; Morgan et al. 2002; Agarwala, Lynch 2006). Almost all the parameters discussed there relate to the restrictions imposed on the role of women in the family and on the freedom of women to make certain decisions. Obviously, in the study of any particular society, some of the proposed parameters may be more, and some less applicable. Some of the parameters discussed in these works, relevant for other regions of the world, are hardly relevant for today's realities of the North Caucasus (for example, the maximum distance of a day trip that a woman can make alone; such severe restrictions, according to our field observations, are generally not characteristic of today's North Caucasus). On the other hand, a large number of parameters proposed in the literature relate to various aspects of relations within a married couple, primarily the opportunity for a wife to take various actions without the approval of her husband (from making large purchases to visiting her relatives). Our fieldwork experience shows that women respondents are unlikely to agree to answer questions about various aspects of their relationship with their spouses in many North Caucasian communities. Therefore, we limited the study of gender asymmetries to the most "objective" parameters relating to those aspects of a woman's life that are visible to others and about which she is unlikely to have difficulties reporting to the interviewer. Thus, for the study of gender asymmetries in the framework of a quantitative survey of women, we use the following parameters:

- the fact that a woman has received an education higher than that required by law;
- the existence of a woman's labor activity outside the household.
- a woman's contribution to family income.

These parameters show whether the role of the wife and mother is exclusively assigned to the woman in the family and to what extent the woman has the opportunity to go beyond this role. As for generational asymmetries, the parameters by which they can be detected relate to the freedom of the younger generation to make certain life decisions, regardless of the opinions of older relatives. We use three groups of such parameters.

First come parameters reflecting the role of the woman's elder relatives at the time of her marriage. Marriage on the initiative and with an active organizing role of elder relatives of the bride and groom (arranged marriage) is considered in the literature as one of the manifestations of generational asymmetries in family relationships and, in general, as an important component of family "traditionalism" (Ahearn 2001: 76, Collier 1997). At the same time, anthropological studies in different regions of the world have shown that the actual role of older relatives in marriage can be different, and that the binary contrast between a marriage organized by older relatives and a marriage concluded by future spouses without the participation of elders is not adequate (Hart 2007). With this in mind, as well as relying on the results of our qualitative field studies (in-depth semi-structured interviews) among residents of the North Caucasus, we consider the following parameters regarding the role of older relatives in marriage: 1) whether the future spouses met at the initiative of older relatives or independently; 2) whether the marriage was on the advice of older relatives or on the initiative of the future spouses (taking into account the variability of "marriage scenarios" actually witnessed in the North Caucasus, an "interim" alternative is also allowed, which corresponds to the answer option "they made the decision on marriage themselves,

but on the advice of the older relatives"); 3) whether at least one of the wife's parents originates from the same village as at least one of the husband's parents. All of the above parameters, of course, are determined only for women who are married or have been married (if a woman has married more than once, the questions in the questionnaire of our study concerned her first marriage).

Secondly, to assess the effectiveness of intergenerational asymmetries in a woman's family, we use parameters characterizing the opportunity for a woman to make various life decisions without receiving the approval of older relatives. Such decisions include the decision to apply for a job, to study and to change jobs, the decision to move for permanent or temporary residence in another region, the decision to change the place of residence within the same location and some others. A preliminary estimate using such criteria suggests that in today's North Caucasus significant diversity should be expected both between regions and between districts, ethnic groups, and even individual locations within regions (Kazenin, Kozlov 2017b). All these features are definable for adult women regardless of their marital status. Note that in the literature, the opportunity for a woman to make independent decisions on such issues is more often considered as a characteristic of her relationship with her spouse, i.e., of gender asymmetries in the family (Morgan et al. 2002). We explained above the decision not to use such parameters as indicators of gender asymmetries in our study, but we believe it is possible to use them to study generational asymmetries, focusing on the independence of women in these matters not from her husband, but from older family members.

Finally, as another "measure" of generational asymmetries, we use the parameter of living jointly with or separately from older relatives. The predominance of an "extended" family, including several generations of adults, with young families living together with their husbands' relatives is considered a key feature of "patriarchy", a concept actively used in one of the schools of modern research on family transformation (Kaser 2002; Gruber, Szołtysek 2012; Lerch 2013). The difference between the concept of "patriarchy" in these works and the concept of a traditional family described above consists mainly in the fact that "patriarchy" is determined not so much by the system of relations in the family as by the composition of households. We find it possible to consider the parameters of "patriarchy" along with other characteristics of the family structure that we use.

3. "TRADITIONALITY" OF THE FAMILY AND MARITAL AND REPRODUCTIVE BEHAVIOR

Existing studies of the relationship between the characteristics of the family structure that characterize it as traditional and the parameters of marital and reproductive behavior outside Western Europe and North America almost unanimously lead to the following conclusion: the more "traditional" the family structure, the higher the fertility and the lower the age at which a woman gets married and has her first child[1]. So, in (Malhotra, Vannemann, Kisher 1995) it is

[1] The reservation concerning the countries of Western Europe and North America is related to the asymmetry well known in world demography, usually called the Hajnal line (see: Hajnal 1979) and dividing European countries along the line St. Petersburg - Trieste . As was originally shown in (Hajnal 1965), relatively late marriages with a

shown that in those areas of India where available social statistics indicate a high degree of discrimination against women, fertility is higher than in other areas of the country. Similar conclusions are made for Albania in (Lerch 2013), where fertility is also examined in a territorial context. In (Morgan et al. 2002) a similar relationship between various parameters of the "traditional" family structure is argued for on the example of different communities in Southeast Asia.

Along with fertility, a number of works have also demonstrated a link between the age characteristics of marital and reproductive behavior, especially a woman's age at marriage, and the strength of gender and generational hierarchies in a woman's family. A well-known study (Dyson, Moore 1983) showed that those states of India where there is more severe gender discrimination are characterized by a younger age for women to marry. In (Gruber, Szołtysek 2012), the younger age of a woman at marriage is also considered as one of the correlates of the "patriarchal" family structure.

Studies of some post-Soviet countries and regions showed, based on sample surveys, that the factor "supporting" the birth rate there in the first decades after the collapse of the USSR was a partial renaissance of family "traditionalism," primarily a sharp contrast of gender roles and/or the authority of older generations in the family (see, e.g., (Dommaraju, Agadjanian 2008) for some countries of Central Asia). In (Kazenin, Kozlov 2017a), it was shown that a number of characteristics of the "traditional" family structure, along with a woman's personal religiosity, correlate with a mother's younger age at the birth of her first child in Dagestan.

4. KARACHAY-CHERKESSIA: SOME DEMOGRAPHIC FEATURES

Karachay-Cherkessia (KCR) is a republic in the western part of the North Caucasus. Its population, according to Rosstat, came to 466,305 people as of January 1, 2018. The shares of the most populous peoples in the republic's population, according to the 2010 All-Russian Population Census (VPN), were: Karachais - 41.0%, Russians - 31.6%, Circassians - 11.9%, Abazins - 7.8%, Nogais - 3.3%. The republic is characterized by a very low share of the urban population compared with the Russian Federation as a whole: as of January 1, 2018, city-dwellers made up 42.7% of all residents of the republic. As shown in (Belozerov 2005), the most noticeable increase in the urban population in the region took place in the 1960s and 1970s, primarily due to the migration of the rural population to cities. The percentage of the urban population according to the 1959 All-Union Population Census was only 23.6%, while according to the 1979 census it was already 43.5%, i.e., close to today's level. In the 1960s and 1970s it was the Russian population which prevailed among

high proportion of never married by the end of reproductive age historically predominated to the left of this line, and early marriages with a low proportion of never married historically prevailed to the right of it. The two historical types of marriage identified by J. Hajnal were called respectively "Western European" and "Eastern European." It is significant that Hajnal pointed to the great "age" of this opposition, to its existence even before the large-scale social changes that took place in Western Europe in modern times. Thus, for the countries of Western Europe, the marriage model of which was largely reproduced by the population of West European descent in North America, the late age of marriage of women can be considered as an element of the traditional family life. However, for other continents, this possibility is practically not considered in the literature.

migrants from the village to the city, but afterwards there was an intensification of the migration to the cities of local ethnic groups along with the departure of part of the Russian urban population to other regions (Belozerov 2005: 108-130). This was reflected in the share of "autochthonous" ethnic groups among the residents of the capital of the Republic of Cherkessk (where in 2018 61% of the total urban population of the republic and 26% of all residents of the region are concentrated): according to census data, in 1959 the total share in the city of the four most numerous non-Slavic peoples of the region (Karachais, Circassians, Abazins, Nogais) came to 5.9%, in 1970 - 11.9%, in 1979 - 18.6%, in 1989 - 24.5%, in 2002 - 36% and in 2010 –39.3%.

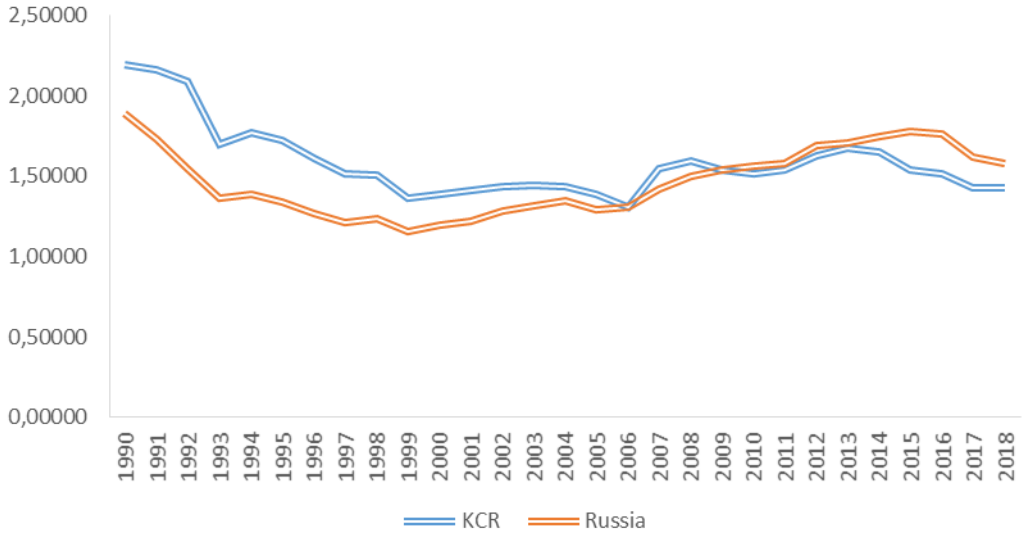

Figure 1. Total fertility rate, Russia and KCR, 1990-2018

Source: Rosstat data.

The region's fertility dynamics after the collapse of the USSR, according to official statistics, generally repeated the all-Russian one, declining in the 1990s and gradually recovering in the 2000s (Figure 1). The absolute value of the total fertility rate (TFR) from 1990 to 1999 in the KCR exceeded the national average by 25%; later the difference between the region and the country significantly decreased. The higher fertility in comparison with the rest of Russia in the 1990s can be explained, in particular, by the fact that among the non-Slavic peoples of the region the decline in fertility corresponding to the first demographic transition took place later than that among ethnic Russians. As shown in Figure 2, according to the 2010 census, among Karachais, Circassians, Abazins, and Nogais over the age of 40-44, the number of children born per 1,000 women exceeded 2,000, while among the region's Russian population the figure was below 2,000 in all age groups under 70 years old. Fertility among non-Slavic ethnic groups, as can be seen in Figure 2, was higher than among Russians also for those age groups that were of reproductive age in the 1990s. However, in the age groups younger than 30 years, the 2010 census no longer recorded the Russians' lag behind non-Slavic ethnic groups in accumulated fertility: Figure 2 shows a significant interethnic convergence in birth rates at these ages. That is, the KCR's lag behind the Russian Federation as a whole in terms of fertility, which began after 2009, continued under conditions when the ethnic composition of the region ceased to be a factor contributing to a higher level in the KSR compared to the country as a whole. It is interesting to note that the high proportion of the rural population in the KCR also did not lead to a higher fertility rate in the 2000-

2010s compared to the all-Russian one. The increase in the share of non-Slavic indigenous ethnic groups in the population of the republic, caused by the departure of the Russian population from the KCR, did not lead to it either[2].

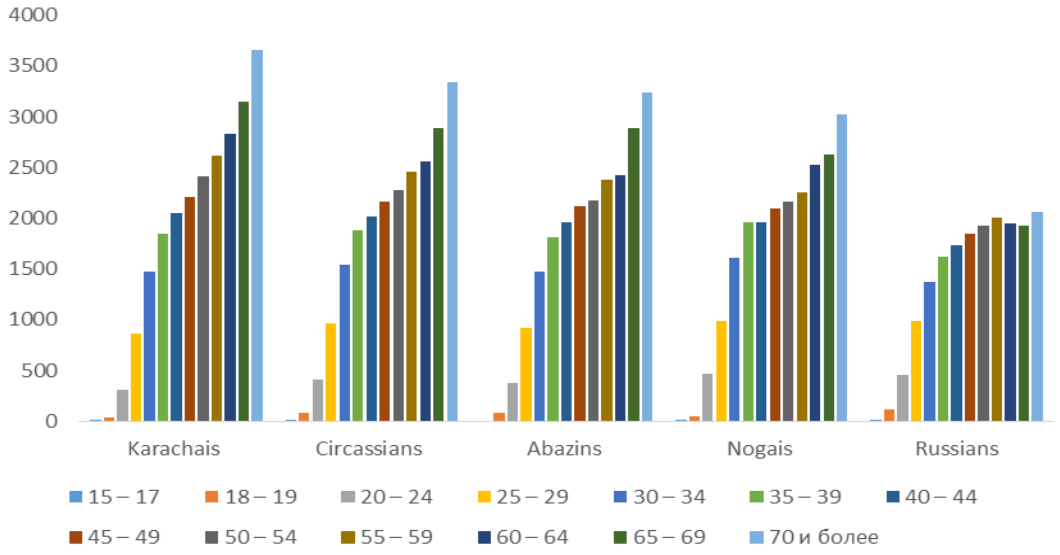

Figure 2. The number of children born per 1000 women in the main nationalities of the KCR by age group, 2010

Source: VPN-2010 data.

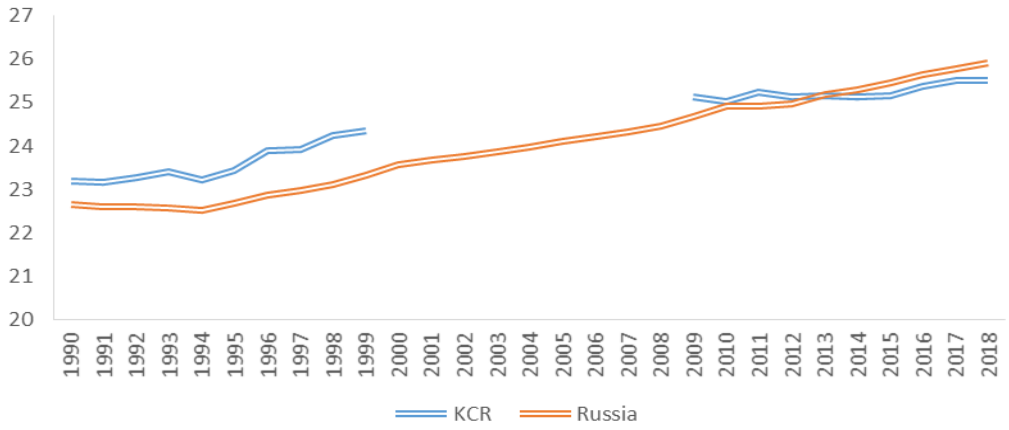

Figure 3. The average age of the mother at the birth of the first child, RF and KCR, 1990-2018

Source: Rosstat data.

[2] A.I. Raksha drew the author's attention to the fact that the low values of the TFR for the KCR in the 2010s can be associated with overstated data on the number of women in reproductive ages. The possibility that the low fertility recorded by official sources in the region during this period may partly be an "artifact" of population counting is hinted at by the extraordinarily low TFR value for first children: according to Rosstat, in 2015 this indicator in the KCR came to only 0.53, in 2016 - 0.51, in 2017 - 0.48; these values are almost a third lower than the national figures for the same years. Such a low fertility rate of first children could be explained by the mass postponement of first births, but the dynamics of the average age of the mother reflected in the data of the Federal State Statistics Service at the birth of the first child in the KCR for 2015-2017 do not indicate this (Figure 3).

From the age-related characteristics of fertility we consider the dynamics of the mother's age at the birth of the first child in the KCR compared with the national one (Figure 3; data on the KCR are not available for 2000-2008, when statistics on order of births were not developed in the region). The age of the "start" of motherhood at the time of the collapse of the USSR in the KCR was slightly higher than in the Russian Federation as a whole, and then it mainly grew, but more slowly than the national indicator, and in recent years has even fallen somewhat behind it.

5. QUANTITATIVE RESEARCH IN THE KCR: CHARACTERISTICS AND SOME DESCRIPTIVE RESULTS

A survey of women aged 15-39 was conducted in May-June 2018 in all urban districts and municipal districts of Karachay-Cherkessia (there are two urban districts in the republic - Cherkessky and Karachayevsky - and ten municipal districts). A total of 756 women were interviewed. The survey was conducted by going around households with local female interviewers who had received the necessary training, followed by telephone control.

The number of respondents in each district or urban district was proportional to the share of its inhabitants in the total number of residents of the KCR (in the absence of official data on the current age and sex structure by municipalities, it was not possible to take into account only the share of women included in the age survey in their total number in the KCR). In each municipal district, the settlements were divided into two groups according to the number of inhabitants ("large" and "small" villages), and from each such group in each district two villages were randomly selected for the survey. In urban districts, four neighborhoods were randomly selected for the survey. In each household no more than one respondent was interviewed. Quotas according to age groups within villages and towns were not used. This was due to the already mentioned lack of relevant official data on the gender-age and ethnic structure of the population for the municipalities of the KCR which could serve as the basis for such quotas. Table 1 shows the distribution of respondents by five-year age groups in comparison with the Rosstat data on the share of these age groups among all women age 15-39 in the KCR on January 1, 2017[3].

Table 1. Distribution of respondents by age group

	Number	%	The share of this age group among all women age 15-39 in the KCR as of January 1, 2017 (Rosstat).%
15-19	153	20.2	14.9
20-24	164	21.7	16.8
25-29	161	21.3	23.6
30-34	144	19.0	23.9
35-39	134	17.7	20.8
Total	756	100.0	100.0

As one can see, in our survey there was a higher, compared with official statistics, percentage of respondents of young ages, for which there could be at least two reasons. Firstly, a

[3] Unfortunately, a number of problems in registering refusals to participate in the survey during the study make it impossible to accurately determine the number of respondents who did not agree to the proposal to answer the questionnaire. One can, however, speak of a higher percentage of failures in cities than in rural areas. Among cities, the highest failure rate was observed in Cherkessk.

"bias" towards young ages could arise due to the large proportion of respondents in Cherkessk among all respondents in our sample (this large proportion was, in turn, due to the high share of the population of Cherkessk among the inhabitants of the region; see above). In Cherkessk, the concentration of young people is higher due to greater educational and job opportunities compared to rural areas and the town of Karachayevsk. Secondly, the proportion of women over 30 among the respondents could be less than indicated by official statistics due to the significant prevalence of labor migration of women of these ages outside the region.

In the distribution of respondents by ethnicities, a higher proportion of Karachais and a lower proportion of Russians compared to the percentage of these peoples among women aged 15-39 years according to the 2010 All-Russian Population Census (table 2) is observed, despite the fact that the shares of the three other most numerous ethnic groups in the sample correspond quite accurately to those of the census. This can be partly explained by the outflow of the Russian population that continued after 2010, and partly by the large percentage of young age groups in our sample compared to official sources. Due to the fact that the birth rate of Russians in the KCR in the last decades of the 20th century was lower than that of non-Slavic peoples (see section 4), it is natural to expect that today in the young age groups (15-19, 20-24) the proportion of Russians will be less than in a wider age range. This is also observed in the results of VPN-2010: among women age 15-24, the share of Karachais and Russians was 44.1 and 26%, respectively, that is, for Karachais the percentage at these ages was higher than among women 15-39 years old, and for Russians it was lower (the share of these ethnic groups among women aged 15-39 according to VPN-2010 is shown in Table 2). Consequently, the increased proportion of young ages compared to the census in our sample could have contributed to a decrease in the share of the Russian population in it.

Table 2. Distribution of sample respondents by nationality

	Number	% *	Share of women of this nationality among all women 15-39 years old according to VPN-2010, %
Karachais	416	56.4	42.8
Circassians	84	11.4	12.5
Abazins	65	8.8	7.8
Russians	112	15.2	29.3
Nogais	18	2.4	3.3
Total	737	100.0	95.7

*Note: * - of those indicating their nationality.*

Thus, the distribution of respondents by age and ethnic strata did not fully correspond to the expectations formed by official statistics. However, the differences can be explained by demographic processes in the region.

Since the sample used quotas according to municipalities, the proportion of urban respondents at the time of the survey is predictably close to the current official statistics: 44.5% versus 42.72% according to the Federal State Statistics Service as of January 1, 2018 (table 3). It is interesting to note that the proportion of women with an urban place of birth was almost 4.8 percentage points higher than the proportion of urban women at the time of the survey, which indicates a low intensity of rural-to-urban migration among women of the age groups studied. This assumption is consistent with the remark in Section 4 that the peak of this migration in the

KCR was in the 1960s and 1970s, i.e., had occurred even before the birth of the respondents included in the survey. The presence of "reverse" urban-to-rural migration revealed by the survey requires a separate study. As can be seen from the data in Table 3, the largest excess of the share of women of urban birth compared to the share of urban residents at the time of the survey was recorded for the youngest age group (15-19 years old).

Table 3. Distribution of respondents by the share of urban residents, urban natives and those graduating from an urban school, %

Age groups	Urban residents at the time of the survey	Women with urban birth	Graduating from school in an urban settlement
15-19	34.6	47.7	33.1
20-24	51.2	50.3	44.5
25-29	44.4	50.6	45.4
30-34	39.6	44.4	42.1
35-39	53.0	53.8	53.8
Total	44.5	49.3	43.7

Table 4. Distribution of respondents by marital status at the time of the survey, by age group, %

Age groups	Never married	Married	Divorced	Widowed
15-19	96.7	2.6	0.7	0.0
20-24	78.0	18.9	1.2	1.8
25-29	42.2	49.7	7.5	0.6
30-34	26.4	52.1	19.4	2.1
35-39	17.9	61.9	12.7	7.5

Table 4 provides data on the marital status of respondents at the time of the survey by age group, and table 5 on "accumulated marriage" (the proportion of those who have been married at least once) by the time of the survey and at different age thresholds. In general, a rather late age model of nuptiality appears. It should be noted that the marriage "history" of a woman can be established from the survey only in a rather abbreviated form: the only question related to the age characteristics of marriage was related to the age at first marriage in years.

Table 5. Distribution of respondents by accumulated marriage, by age group, %

Age groups	Share of those ever married at the time of the survey	Share of those who entered a first marriage at age 22 or earlier	Share of those who entered a first marriage at age 25 or earlier
15-19	3.3	-	-
20-24	22.0	24.2*	-
25-29	57.8	36.9	54.4
30-34	73.6	52.8	65.5
35-39	82.1	53.7	72.4
Total	46.3	43.3*	63.5**

*Note: * - share among those over 22 years old; ** - share among those over 25 years old.*

It was not possible to obtain information about the age in years and months at marriage, due to the incomplete synchronization of religious and civil marriage characteristic of the KCR. A religious ceremony is always performed on wedding days, while registration with the registry office can take place several months after (among married respondents, 91% reported that their marriage was registered with the registry office, but only 64.4% reported that registration took place "on the day of the wedding"). Under these conditions, respondents often found it difficult to

determine their age at marriage to the precise number of months. Such accuracy was required from them during the pilot survey, according to the results of which it was decided to limit the question to the age in full years at the time of marriage.

Table 6. Proportion of women who studied at a higher educational institution, by age group, %

Age groups	Studied at an institution of higher education
15-19	21.9
20-24	67.9
25-29	77.5
30-34	74.1
35-39	66.9
Total	61.9

Let us now turn to the answers to questions regarding the education of a woman, her position in the labor market and the material situation of the household to which she belongs (table 6). The level of education recorded in the sample is significantly higher than that reflected in the 2010 census (there the proportion of women with higher or incomplete higher education in the age group 20-24 years old was 37%, 25-29 years old - 33%, 30-34 years - 25%, 35-39 years - 18%). In connection with this discrepancy, two points can be made. On the one hand, the increase in the share of those with a higher level of education observed in the VPN-2010 from older to younger generations was likely to be continued in the years following the census. This is suggested by our "qualitative" field observations, according to which in the last 10-15 years in the KCR the idea that ensuring a young woman's studies at the university (at least by correspondence) is one of the parents' responsibilities has become increasingly widespread. In this sense, the higher level of education seen in the 2018 survey compared with VPN-2010 does not seem unexpected. On the other hand, such a high level of education as recorded in the survey still does not seem realistic. One of the probable reasons for its occurrence is the mass refusals of interviews noted by our interviewers among women for whom we can assume a low level of education (housewives, those living in remote villages, etc.). In addition, a large proportion of respondents living in Cherkessk (determined by quotas for municipalities - see above) could also increase the overall percentage of respondents with a high level of education, since in Cherkessk there are more higher educational institutions of the region, as well as institutions and enterprises hiring people with higher education. Thus, we have to admit a certain bias in our sample from the point of view of the educational level, which is partially explained by certain features of the survey (we cannot accurately assess the extent of this bias without alternative current estimates of the educational level of women by generations; in the statistical analysis presented in Section 6, the bias problem was partially solved by the obligatory introduction of the education parameter in the model as a control).

For an "external" verification of the reliability of the survey in terms of assessing demographic indicators, we made a comparison of the fertility data from the survey with the data of the largest population surveys conducted in the KCR over the past decade: VPN-2010 and the 2015 Rosstat microcensus (MP-2015). To do this, based on data on the year and month of birth of each woman interviewed and of each of her children, the number of children born by the time of MP-2015 and by the time of VPN-2010 was determined, and from these data the average

accumulated fertility for five-year age groups at the time of MP-2015 and VPN-2010 was calculated. Then, these "retrospective" survey indicators were compared with the indicators calculated for the same five-year groups in the KCR directly according to the data of MP-2015 and VPN-2010 (since our survey did not include women over 39 at the time of the survey, it was not possible to compare ages 30-34 and 35-39 at the time of VPN-2010 and for ages 35-39 at the time of MP-2015). The results are shown in table 7, where the values calculated according to the data of MP-2015 and according to the survey data are given with confidence intervals; coverage of the VPN-2010 population did not require the use of confidence intervals. As can be seen from table 7, there is a fairly exact match of the average number of children for VPN-2010, whereas for the time of MP-2015, the survey recorded lower birth rates than MP-2015 itself. Despite all criticism of the reliability of the VPN-2010 results for the North Caucasus, the closeness of the data from this largest population survey to our survey data seems to be a definite argument in favor of the latter's adequacy.

Table 7. Comparison of the average number of children per woman by age groups in the KCR according to VPN-2010, MP-2015 and according to the survey at the time of VPN-2010 and MP-2015

Age groups	Average number of children according to the survey at the time of VPN-2010, by age during VPN-2010*	Average number of children according to VPN-2010	Average number of children according to the survey at the time of MP-2015, by age at the time of MP-2015*	Average number of children according to MP-2015*
15-19	0.047(0.000;0.097)	0.037	0.023(0.000;0.049)	0.047(0.018;0.075)
20-24	0.372(0.274;0.469)	0.373	0.313(0.208;0.418)	0.476(0.393;0.559)
25-29	0.903(0.736;1.070)	0.919	0.927(0.762;1.092)	1.190(1.092;1.289)
30-34	-	1.587	1.358(1.161;1.556)	1.609(1.489;1.729)

*Note: * - average and boundaries of confidence intervals at a 95% significance level; MP - microcensus of Rosstat 2015*

Table 8. Shares of respondents who gave specific answers to questions about education, their situation on the labor market and their contribution to family income, by age group, %

Age groups	Studied after graduating from high school	Working at the time of the survey	Studied after getting married*	Worked after getting married*	Contributes to family income*
15-19	55.5	23.1	60.0	40.0	-
20-24	91.8	64.0	37.8	57.9	14.3
25-29	95.6	78.0	45.2	61.8	30.9
30-34	93.0	76.6	48.0	65.4	35.8
35-39	88.0	81.5	39.3	67.6	42.7
Total	85.0	64.5	43.6	64.0	33.3

*Note: * - share among those who are married.*

Let us now turn to the distribution among the respondents of the characteristics that in Section 2 we classified as indicators of the traditional family structure. In table 6 we have already seen the age distribution of women enrolled in higher education. Table 8 shows the distribution of other characteristics related to the education of a woman and her work outside the household. Unidirectional intergenerational dynamics have two characteristics that are specific only for married women: the proportion of those who worked after marriage and the proportion of those

who at the time of the survey contributed to family income. An increase in these indicators to younger ages may indicate a strengthening of gender asymmetries for younger generations, but it can also be explained by the deterioration of labor market conditions, as a result of which young women have difficulties in finding work.

Table 9 shows the age distribution of characteristics that we consider as evidence of the existence of generational hierarchies in a woman's family. Table 9 shows that marriage at the initiative of older relatives is not the predominant practice, but it is still quite common, at least at the stage of meeting future spouses, and unidirectional intergenerational dynamics are not observed.

Table 9. Proportion of respondents giving specific answers to questions regarding generational asymmetries, by age groups, %

Age groups	Met future spouse without participation of relatives*	Independently made decision to marry*	Lives with husband's elder relatives	Parents and/or husband's parents participate in raising children**	Considers it important to teach their children about the traditions of their people
15-19	60.0	60.0	84.0	-	34.0
20-24	60.5	89.2	77.2	69.6	39.0
25-29	77.4	95.7	61.0	76.1	36.2
30-34	68.3	82.5	50.3	64.1	47.6
35-39	71.0	85.0	38.9	55.3	33.8
Total	70.6	87.2	63.2	64.4	38.1

*Note: * - share among married women; ** - share among those with at least one child.*

Table 9 (continued)

Age groups	Needs approval of older relatives to move to another region	Needs approval of older relatives to get married	Needs approval of older relatives to change place of residence within same locality
15-19	90.5	69.4	88.5
20-24	83.0	60.1	79.6
25-29	75.2	54.8	72.6
30-34	69.3	56.3	65.9
35-39	72.9	56.3	64.1
Total	78.5	59.5	74.6

More than half of the respondents reported the participation of older relatives in raising their children, as well as cohabitation with older relatives of a husband, and the prevalence of both of these phenomena is growing from older generations to younger ones. This may be due to a certain "retraditionalization" of the family structure, but it can also be explained by the fact that young families are less "economically stable" and therefore more dependent on older relatives, and also experience significant difficulties in purchasing or renting separate housing. As for the dependence on older relatives when making certain life decisions, it, as can be seen from table 9, turned out to be very strong in general: over 50% of respondents expressed the need for older relatives to approve a move to another region or locality and to approve their decision to get married or divorced. Moreover, we can see a percentage growth of those in younger age groups requiring such approval relative to older age groups (which again can be seen as evidence of "retraditionalization", or as evidence of a late "separation" of the young generation from parents

and older relatives, a high level of "care" on the part of the elders due to the economic lack of independence of young people, or the difficulties that young people face in finding work).

Table 10. Interethnic differences of respondents related to family "traditionalism"

Characteristic	Differences between Karachais and other ethnic groups in the proportion of women who have a positive value for this attribute (significance at a 95% level)
Has steady job at time of the survey	Insignificant
Wife contributes to family income	Insignificant
Herself decided to marry her current spouse (and did not marry by the decision of relatives).	Among Karachais significantly lower
Met future spouse on her own	Among Karachais significantly lower
Among the parents of the woman and her husband there are fellow villagers	Insignificant
Received professional education after marriage	Insignificant
Considers it important to teach the children about the traditions of her people	Among Karachais significantly higher
Needs approval of older relatives to get married or divorced	Among Karachais significantly higher
Needs approval of older relatives to move to another region	Among Karachais significantly higher
Needs approval of older relatives to change place of residence within the same locality	Among Karachais significantly higher
Lives together with older relatives (her own or her husband's)	Among Karachais significantly higher

The distribution of characteristics that we consider to be indicators of the "traditional" family structure was studied not only in terms of age groups, but also in ethnic terms. It was found that one of the ethnic groups of the region (Karachais) according to the survey significantly differs from other peoples in a more traditional family way. Table 10 summarizes the comparison of respondents of Karachai nationality and respondents of all other nationalities according to the parameters of family "traditionalism". For respondents from Karachai and other nationalities, the average values of the dichotomous parameters given in the table were calculated separately, each of which received a value of 1 if the respondent had the corresponding attribute, and 0 if she did not. Comparison of the average values of most of these parameters revealed differences at a 95% significance level, and in all such cases the Karachais differ in the direction of greater "traditionality"[4]. A similar distribution of significant and insignificant differences was provided by the use of the non-parametric Mann-Whitney test (with the exception of the parameter of living with older relatives, according to which this test rated interethnic differences as insignificant; the results of the Mann-Whitney test are not shown here)[5].

[4] Obviously, with regard to married women, such a conclusion would have been more correct to draw, taking into account the nationality of not only the woman herself, but also her husband. However, the share of interethnic marriages among the respondents of Karachai nationality turned out to be only 11% (with 24% for the entire sample). Therefore, it would not be incorrect to consider that the differences between the answers of women of Karachai and those of other nationalities reflect the differences between the Karachai and non-Karachai families.

[5] It should be noted that the significant differences between the Karachai respondents and those of other nationalities towards greater family "traditionalism" cannot be explained by the contrasts between these groups in urban / rural living, since the shares of rural residents among Karachais and respondents of other nationalities were very close: 54.4 and 56.9%, respectively.

6. ANALYSIS

Our analysis focuses on the age of a woman's first marriage. Such a choice was dictated by the following considerations. First, as noted in section 3, a young age at marriage is considered in numerous studies to be linked to the traits of a traditional family structure, and it was of interest to test this link for the society here studied. Secondly, the age of marriage in the case of the KCR determines fertility to a greater extent than, for example, in today's Russia as a whole or in Western Europe. The reason is the region's extremely low level of extramarital fertility. According to the survey, only two respondents who have never been married had children. Under such conditions, the age at which a woman marries is a determining factor for the age at birth of her first child, and this age, in turn, is expected to affect fertility (Bongaarts 1999). Thus, it can be assumed that the age at first marriage in the case of KCR will be a "root" indicator that will significantly affect other characteristics of marital and reproductive behavior.

It is necessary to stipulate one important limitation associated with the choice of the age at first marriage as a dependent variable in the analysis. As already mentioned in Section 5, according to the results of the survey we only had information about a woman's age in full years when entering into her first marriage. This meant a coarsening of the statistical analysis, whose increments could be only annual, not monthly[6].

In analyzing the survey results, we tested two hypotheses.

- Hypothesis 1. Characteristics of traditionalism are significant for marriage age.
- Hypothesis 2. The Karachais differ from other ethnic groups in age characteristics of marriage.

Hypothesis 1 follows from the results of studies of different countries and regions that are briefly summarized in Section 3. Hypothesis 2 was put forward taking into account the results of the same studies, as well as the higher "traditionality" of Karachai families indicated by the survey (see above). Note that testing the second hypothesis with the most obvious "descriptive" method did not confirm it: there was no difference at the 95% significance level between the average marriage age of the Karachai respondents and those of other nationalities. However, this could be due to some other signs that were significant for the age at first marriage, for which respondents of different nationalities in our sample may differ; therefore, for a more reliable result, it was necessary to test Hypothesis 2 by including the ethnicity parameter in the model along with control parameters.

[6] One of the consequences of the fact that the analysis could include data on the age at which women entered into their first marriage only up to full years, was the difficulty of a statistical analysis of the factors affecting the woman's age at the birth of her first child. Although the data on this age parameter from the survey were available to the nearest month, the exact number of months that elapsed between marriage and the birth of the firstborn could not be determined. This posed a choice: either to analyze the factors affecting the age of birth of the first child, without taking into account the age of marriage (however, ignoring the length of marriage for such an analysis is incorrect), or to coarsen data on the age at birth of a child up to full years (but, given that the average difference between the number of full years at the birth of the first child and at marriage is less than 2.5 years, with such an analysis it would be difficult to obtain statistically significant results due to the small number of person-years that would be "left" after right-censoring). In such a situation, it seems more appropriate to investigate the age characteristics of fertility, using as the dependent parameter not the age of motherhood, but the number of children with different age ranges. Such an analysis will be undertaken in the course of further processing of the survey results.

Two types of models were built: proportional risk models (with Cox regression[7]), in which the modeled event was the woman's first marriage, and logistic models for the probability of marriage at different ages up to 25 years.

In the models of proportional risks, the dependent variable was the risk of marriage, defined for the age of respondents in full years starting from age 15 years and 0 months (i.e., for the 16th, 17th, etc. years of life). For women who were not married, the analysis included all full years until the time of the survey; for married women, the years lived after this event were not included in the analysis (so-called right censoring was carried out). Since only fully lived years were included in the analysis, women who got married at the same age in full years as they were at the time of the survey were excluded from the analysis (for previous experience in applying the proportional risk model for analyzing the demographic behavior of the population of the North Caucasus, see (Mitrofanova 2019)).

All models included the following parameters characterizing the generational and social characteristics of women:

- the woman's year of birth (at five-year intervals: 1979-1983, 1984-1988, 1989-1993, 1994-1998, 1999-2003);
- place of birth (city/village);
- having higher or incomplete higher education;
- having a job at the time of the survey.

The first two were control parameters. The parameters related to education and work were considered above as being among the indicators of gender asymmetries in a woman's family. However, while other indicators of gender asymmetries, as well as indicators of generational asymmetries, were included selectively in different combinations in the models, the parameters of work and education were included (simultaneously or one at a time) in all models. This decision is due to the fact that a woman’s education and employment are known as factors that universally affect fertility, and a correlation is expected for them with other parameters acting as independent in the models (for example, a lower level of education is expected for rural women). Thus, the non-inclusion of the parameters of education and labor activity in the model could lead to biases.

It should be noted that due to the peculiarities of the proportional risk models, all independent parameters included in them must either have the same value for all time intervals lived by a woman (in our case, person-years) included in the analysis, or be specified separately for each such interval. At the same time, employment and education are acquired during the course of one’s life and, strictly speaking, it is incorrect to consider the meanings of these parameters as constant over the entire interval from 15 years to the time of the survey or the first marriage. However, taking into account that more than 90% of respondents who continued their education after leaving school began it before the age of 19, it can be said that the presence of higher education is a parameter that uniformly characterizes almost the entire reproductive period of a

[7] For the application of such models to the analysis of demographic events, see (Burdyak 2007).

woman, except for the initial part. It is also important to take into account that educational plans for the near future are very likely to affect the matrimonial behavior of women at the earliest reproductive age, thus reducing the likelihood of marriage at this age. As for employment outside the household, it was not possible to establish its presence or absence at different ages in full years during the survey: a pilot survey showed that it was difficult for respondents to restore their "work biography" in one-year increments. Thus, it seemed the only possibility was to characterize a woman's employment as being either present or absent at the time of the survey.

Table 11. Models of proportional risks for women in the first marriage (according to the survey)

Parameters / Year of birth	(1)	(2)	(3)	(4)	(5)	(6
1979-1983	1	1	1	1	1	1
1984-1988	0.796*	0.814	0.849	0.863	0.814	0.823
1989-1993	0.545***	0.551***	0.565***	0.568***	0.560***	0.558***
1994-1998	0.262***	0.248***	0.263***	0.245***	0.250***	0.231***
1999-2003	0.087*	0.094**	0.074**	0.079**	0.061***	0.064***
Urban place of birth	0.850	0.867	0.864	0.878	0.900	0.916
Has higher or incomplete higher education			0.621***	0.634***	0.666***	0.685***
Working at the time of the survey					0.639***	0.633***
Karachai		0.731***		0.748***		0.729***
N	699	699	689	675	672	659
-2Log credibility	3743.962	3668.598	3703.164	3628.954	3571.276	3497.664
Chi-square models	55.971***	64.358***	68.575***	75.957***	78.001***	84.540***

*Note: * p <0.1, ** p <0.05, *** p <0.001.*

When testing Hypothesis 1 in the proportional risk model, along with the parameters listed above, the following parameters characterizing the "traditionalism" of the family structure were included in different combinations (for the rationale for using these parameters, see Section 2):

- acknowledging the importance of teaching children about the traditions of their people;
- the need to obtain the approval of older relatives for marriage;
- the need to obtain the approval of older relatives to move to another region;
- the need to obtain the approval of older relatives when changing their place of residence within the same location;
- living together with older relatives (their own or their husband's)[8].

All the parameters of this list for the risks of first marriage were insignificant, thereby refuting Hypothesis 1 (the corresponding models are not shown here for reasons of space and can be sent by the author upon request).

[8] Of the indicators of the traditional family structure discussed in Section 2, those that are only identifiable for married women were not included in the model.

Hypothesis 2, on the contrary, has been confirmed in proportional risk models. The corresponding models are shown in Table 11. It should be noted that there are differences in the sample size between the specific models given below, due to the fact that some respondents refused to answer most of the questions asked during the survey. For each model, the sample size was equal to the number of respondents for whom, based on their answers, it is possible to determine all the parameters included in this model. The sample size is indicated separately for each model. Differences in these sizes are not an obstacle for comparing the significance of the same parameter in different models.

From the models in Table 11, it is easy to see, firstly, that the risks of a first marriage significantly decrease from older cohorts to younger ones. They are also significantly lower for women studying in higher educational institutions and for women who had jobs at the time of the survey. The parameter of the place of birth (rural or urban) turned out to be insignificant (as did the parameters introduced in the model instead of it, indicating the completion of school in an urban or rural settlement and urban/rural residence; the corresponding models are not shown for reasons of space). Finally, the risks of a first marriage for women of Karachai nationality were significantly lower than for respondents of other nationalities.

Table 12. Logistic model for marriage at 22 years of age or earlier (according to the survey; only for respondents who were 22 years old at the time of the survey)

	Standard error	Wald	Exp(B)
1979-83		9.056	
1984-88	0.278	1.430	0.717
1989-93	0.301	8.484	0.417***
1994-98	0.370	2.572	0.553*
Living in the city at time of survey (1 – yes. 0 – no)	0.266	0.409	0.844
Has higher or incomplete higher education (1 – yes. 0 – no)	0.232	14.825	0.409***
Karachai (1 – yes. 0 – no)	0.223	2.657	0.695*
Constant	0.285	.110	1.099

*Note: N = 497, R^2Nigelkirke = 0.112; * p <0.1, ** p <0.05, *** p <0.001.*

The significance of the ethnicity parameter found in the proportional risk models was also confirmed in logistic regressions, in which the modelled event was entering first marriage by the age of 22, 23 and 24 (for respondents who reached the corresponding age at the time of the survey). These models confirmed the "aging" of the marriage model in the region as a whole (significantly lower chances of marriage at these ages among younger cohorts), and revealed a negative significance of studying at a higher educational institution for entering a first marriage by these ages. As for the ethnicity parameter, women of Karachai nationality had a lower chance of getting married at these ages than women of other nationalities, at a 90% significance level. Table 12 shows the logistic model for the fact of marriage by the age of 22 (in the models built for age 23 and 24, the significance levels of the parameters and the "signs" of the coefficients were the same).

7. DISCUSSION OF ANALYSIS RESULTS

A significant reduction in the risks of marriage from older to younger generations generally fits into the all-Russian tendency towards an increase in the age at first marriage in the post-Soviet

decades (Zakharov 2018: 131-149). However, given that a number of generations covered by the survey were far from completing their reproductive period at the time of the survey, it is impossible to determine to what extent this result indicates an increase in the age of the first marriage, and to what extent an increase in the share of those never marrying.

The negative significance of a woman's educational level and employment for marriage is consistent with well-known global trends. In the light of the starting assumptions of our analysis, this significance could also be considered as a confirmation of the influence of characteristics of family traditionalism on marriage. However, such an interpretation raises questions because for other parameters of traditionality no significant connection with nuptiality was found. At the same time, a woman's level of education and her job (unlike, for example, her right to make certain life decisions independently) may be a consequence of not only the family's way of life, but also of factors "external" to the family, such as the labor market, the availability of educational services, etc. As for the lack of significance of the rural/urban residence parameter, this rather unexpected result requires further reflection.

We turn now to the significance of the ethnicity parameter. Confirmation of Hypothesis 2 in the course of our analysis, along with interethnic differences established by descriptive methods in Section 5 (Table 10), lead us to the following conclusion: the Karachai ethnos, to a greater extent than other peoples, retains signs of a traditional family structure, yet at the same time it is characterized by a later age of first marriage[9]. From the point of view of expectations based on studies of other countries and regions, which are summarized in Section 3, such a result is paradoxical. However, the tendency toward later marriage among women of Karachai nationality indicated by the results of our modeling also is indirectly confirmed by the data of the 2010 All-Russian Population Census.

As was already mentioned, this census did not collect data on the age of marriage, but did collect data on the age of a woman at the birth of her first child. Figures P1-P7 of the Appendix compare the cumulative probability of "surviving" childless to different ages for women of the Karachai and the two other largest non-Slavic ethnic groups of the KCR (Circassians and Abazins) for birth cohorts according to VPN-2010. It is easy to see that in all cohorts, starting from the cohort of 1950-54, Karachai women were characterized by a later "start" of motherhood (for cohorts who lived to be 40 years old at the time of VPN 2010, we can also note a slight excess among the Karachai of women who remained childless) That is, we can talk about the interethnic difference in the age-specific fertility model observed from generation to generation for at least several decades. The data of VPN-2010, of course, do not allow us to answer the question of what the regularly later "start" of motherhood among Karachais is connected with: with an older age of women getting married or with the postponement of first births in marriage. Nevertheless, the tendency revealed by the survey toward later marriage among women of Karachai nationality, in the context of an extremely low level of illegitimate birth rates, allows us to predict an older average age at the birth of their first child, and this prediction is confirmed by census data. It is also important to note that the differences identified by VPN-2010 were already found for women

[9] Since the reproductive period in the cohorts included in the study is not completed, it is, strictly speaking, impossible to determine whether this result is due to women of Karachai nationality postponing their first marriage or to the greater proportion of childlessness among them.

born in the 1950s, i.e., those born and undergoing primary socialization even before the mass rural-to-urban migration of non-Slavic peoples of the KCR (see section 4). So, the VPN-2010 data reflect a difference in the age characteristics of demographic behavior dating back to the period when the main non-Slavic peoples of the KCR lived mainly in rural settlements. Thus, the age differences in question are most likely to indicate a difference in age-related behaviors in traditional models of demographic behavior of ethnic groups. And if so, then the later nuptiality among Karachais can be explained precisely by the greater preservation of their traditional family structure, which we discovered from the survey.

Consequently, contrary to the expectations formed by existing marriage studies outside of Western Europe and North America, signs of a traditional family pattern do not necessarily correlate with a woman's earlier age at marriage. Using the example of the KCR, we have seen precisely an opposite picture, i.e. an ethnic group characterized by a more traditional family structure compared to other ethnic groups in the region and showing a later age pattern of marriage. Such a result does not contradict the concept of the traditional family structure as a family organization in which each next generation is required to reproduce certain "patterns" of ancestral behavior. However, this result does compel us to admit that these patterns may vary, and that they may prescribe a relatively late onset of demographic events. If in a given society the norms of the traditional family structure play a significant role, it is appropriate to assume only the existence of age-related patterns of matrimonial behavior, but not specific characteristics of the age of marriage. And if in different ethnic groups the relationship between the features of the traditional family structure and the age of the first marriage may be multidirectional, it should not be surprising that in the sample combining all the ethnic groups of the region we have studied, these features do not show a significant unidirectional relationship with the age at which a woman got married.

We add that the combination of features of a traditional family structure with a fairly late age of marriage for women in the North Caucasus is, apparently, observed not only in Karachay-Cherkessia. A survey of women 16-44 years old in the Republic of Ingushetia, conducted by us in 2019, showed that in this region the average age of a woman at her first marriage for those who had reached the age of 40 at the time of the survey was over 24 years old (the survey was conducted by telephone interview and included 800 respondents). Ingushetia differs from the KCR by a significantly higher "preservation" of many features of family traditionalism (in particular, as the survey showed, the percentage of marriages on the initiative of the older relatives of the bride and groom is much higher than in the KCR, the woman is more dependent on older members family when making various important life decisions, etc.). At the same time, a preliminary analysis of the survey results showed that among sociocultural parameters, parameters characterizing a woman's personal religiosity are significantly related to a younger age of marriage, but not parameters that are indicators of a traditional family structure.

The conclusion of our analysis has some implications for studies of demographic processes in developing countries. The large-scale increase in many of these countries of the average age of the "start" of motherhood, which began in the last third of the last century (Bongaarts 1999), is considered to be one of the components of demographic modernization, a departure from the traditional attitudes of marital and reproductive behavior. However, in the light of the results obtained, it must be borne in mind that the absolute value of the average age of a woman at some demographic event, even if it is high compared to other developing countries, cannot be

automatically considered as evidence of family modernization: this value can also comply with local age-specific standards.

However, the question remains as to what determines the "direction" of the relationship between family traditionalism and the age at marriage. Was this "tradition of late marriage" among the Karachai people determined by some social processes that unfolded during the Stalin deportation of 1943-1957, or does it go back to more ancient customs? The answers to such questions, of course, require a separate study.

8. CONCLUSIONS

The article examined the relationship between the characteristics of the family structure and the age of a woman upon her first marriage in one of the regions of the North Caucasus - Karachay-Cherkessia. The study was based on the results of a survey of women of reproductive age that we conducted in the KCR in 2018. The survey showed that in this region some features of a traditional family structure regarding gender and generational asymmetries are quite widespread. Moreover, the influence of family "traditionalism" on the age characteristics of marriage was not at all unexpected based on studies conducted in other countries and regions. The most unexpected result, however, is that an ethnic group characterized by a higher degree of preservation of the norms of a traditional family way of life exhibits a statistically significant tendency to later marriage of women. It follows that the relationship between family norms and age characteristics of demographic events may be more diverse than is assumed on the basis of previous studies of this issue. The data of the North Caucasus, which is distinguished by a noticeable variability of the models of marital and reproductive behavior, as well as of the characteristics of the family structure, can provide many more opportunities for studying the relationships between them. As regards the KCR, the next step, it would seem, should be the study of the significance of family norms for age parameters of fertility.

ACKNOWLEDGEMENT

The survey in Ingushetia, the results of which are discussed in Section 7, was carried out as part of the 2019 RANEPA research and development program "Analysis of the possibilities of using online research on the demographic characteristics of traditional communities". The author gives thanks to S.V. Zakharov, V.A. Kozlov, E.S. Mitrofanova and A.I. Raksha for regular discussions on the results of research on marriage and fertility in the North Caucasus.

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APPENDIX

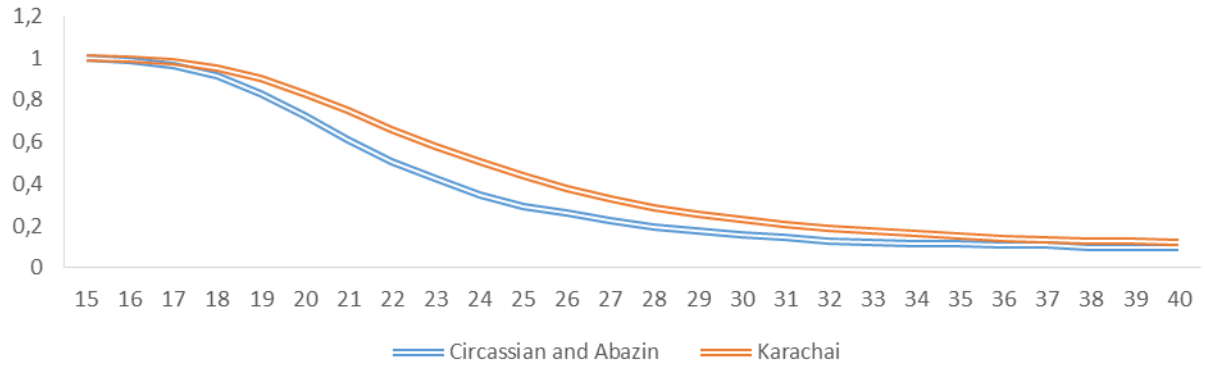

Figure A1. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1950-54

Source: Data of VPN-2010.

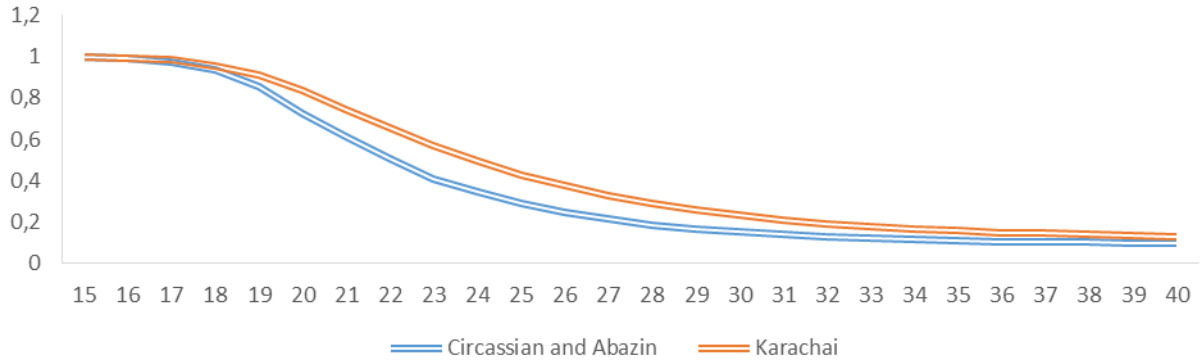

Figure A2. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1955-59

Source: Data of VPN-2010.

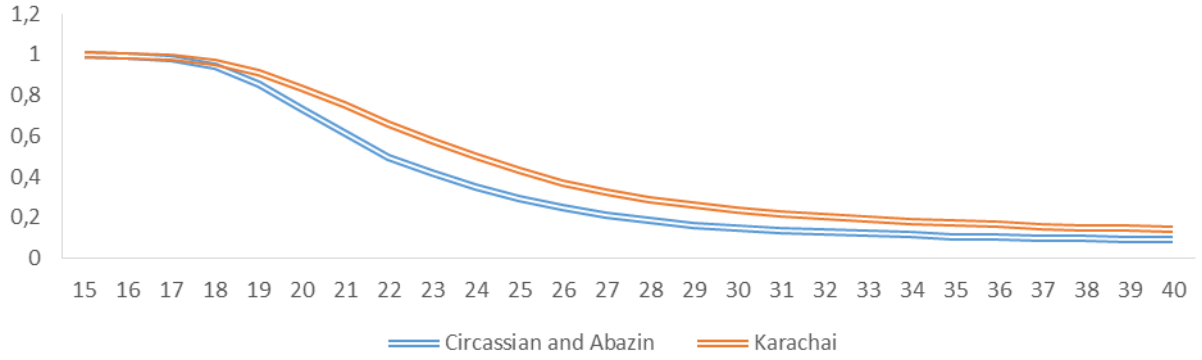

Figure A3. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1960-64

Source: Data of VPN-2010.

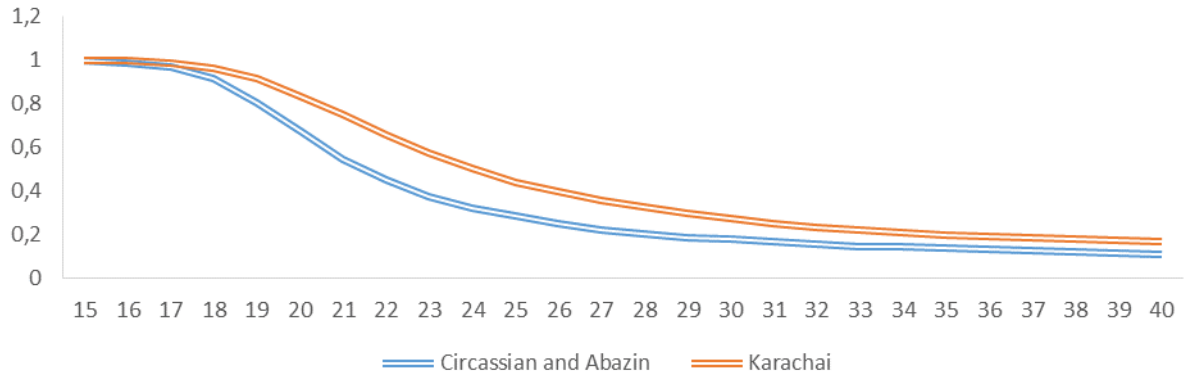

Figure A4. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1965-69

Source: Data of VPN-2010.

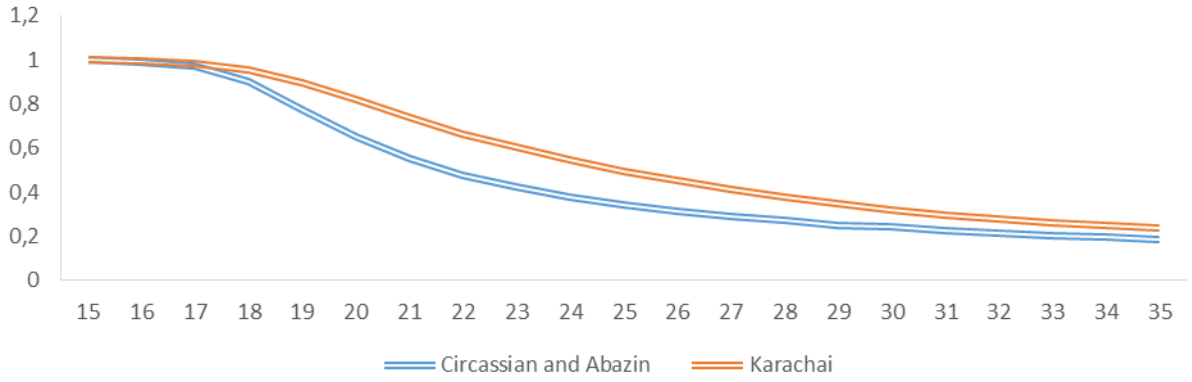

Figure A5. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1970-74

Source: Data of VPN-2010.

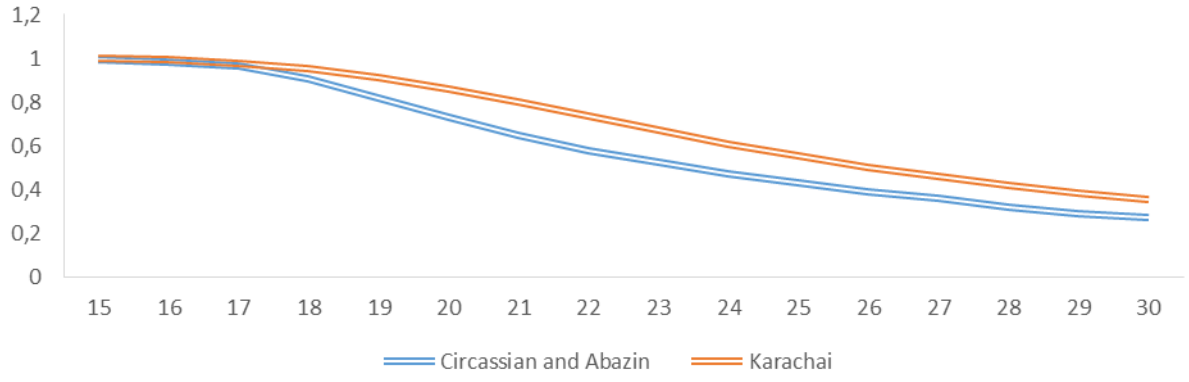

Figure A6. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1975-79

Source: Data of VPN-2010.

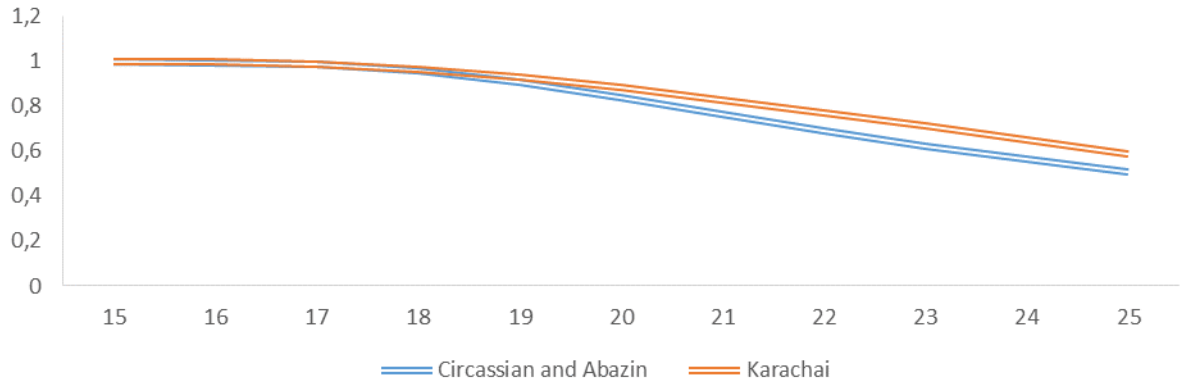

Figure A7. Cumulative probability of remaining childless, Karachai, Circassian and Abazin women born in 1980-84

Source: Data of VPN-2010.

ROAD TRAFFIC MORTALITY IN RUSSIA: DEFINITIONS, TRENDS AND PERSPECTIVES

ANASTASIYA PYANKOVA, TIMUR FATTAKHOV

In 2016, the crude death rate from road traffic accidents in Russia decreased, according to police data, to a level not observed since 1971, after which it continued to decline. The positive trends apparently served as the basis for the optimistic goals laid down in the Road Safety Strategy for 2018-2024.

Based on police data, vital statistics on mortality and international databases on mortality and road safety, the authors try to answer these questions: Are the goals set achievable within the specified timeframe, and how consistent are they with European trends in road traffic mortality, as well as with Russia's present differentiation of road traffic mortality by space, age and category of road users?

The study showed that the deadlines for achieving targets in the Road Safety Strategy are very tight. Today, only large and medium-sized cities have the potential to implement a new Road Safety Strategy in which the crude death rate should not exceed 1.5-2 deaths per 100 thousand people by 2024, whereas in small cities and rural settlements - 2.5-3 deaths per 100 thousand people. For many years, the main risk groups have been drivers and passengers aged 15-44 and pedestrians over 60 years old, who do not appear in the Road Safety Strategy as priority categories.

In addition, the article shows that in order to eliminate the existing discrepancies between the numbers of deaths published by the two official reporting systems (the police and Rosstat), the very first step might be for Rosstat to stop calculating the number of road traffic deaths based on the current version of the abridged classification of causes of death and transition to one of the two international approaches for aggregating three-digit codes of causes of death used by the WHO.

***Key words**: road traffic accidents, road safety, road traffic mortality, police data, vital statistics.*

INTRODUCTION

In contrast to European countries, where since the 1970s there has been a consistent decrease in mortality from road traffic accidents (RTAs), in Russia the long-term dynamics of road traffic mortality are wave-like. Russia has maintained a positive trend in the decline in road traffic mortality that has developed since 2004.

In 2016, the crude death rate (CDR) from road traffic accidents according to the police data and the standardized mortality rate (SDR), based on vital statistics, which had previously fluctuated, reached historic lows (13.9 and 12.6 deaths per 100 thousand people, respectively) after which they continued to decline.

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THE STUDY WAS IMPLEMENTED UNDER THE GRANT FROM RUSSIAN FOUNDATION FOR BASIC RESEARCH NO. 19-013-00060 «ROAD-TRAFFIC MORTALITY IN RUSSIA AND ITS REGIONS: ANALYSIS BASED ON LINKED POLICE ROAD-CRASH RECORDS WITH MORTALITY STATISTICS».

THE ORIGINAL ARTICLE IN RUSSIAN WAS PUBLISHED IN DEMOGRAPHIC REVIEW 2019. 6(3): 58-84.
DOI: 10.17323/DEMREVIEW.V613.9855

Apparently, the recent trends have formed the basis for the optimistic targets adopted in the Road Safety Strategy (RSS)[1]: reducing the crude death rate to 4 deaths per 100 thousand people by 2024 and striving for a zero mortality rate by 2030.

Based on the data on road traffic deaths from the two reporting systems in Russia (the police and the Federal State Statistics Service), as well as international databases on mortality and road safety, the authors try to answer the following questions: are the targets achievable within the timeframe proposed in RSS and, if so, for which regions and types of road users; how are the targets in RSS in line with international road traffic mortality trends.

However, before answering these questions, it is necessary to consider the different approaches to the definition of a road traffic death in the two reporting systems, its variations within them and the compliance of these definitions with international ones, as well as to explain the discrepancy in the number of deaths in road traffic accidents between those reporting systems in Russia.

THE DEFINITION OF A ROAD TRAFFIC DEATH IN DIFFERENT REPORTING SYSTEMS

According to the Road Safety Strategy, the indicator evaluating its effectiveness is the crude death rate due to road traffic accidents calculated on police data[2]. In Russia, as in many countries of the world, there are two main reporting systems for those who died in road traffic accidents: the police and the Federal State Statistics Service. Whereas the definition of a person killed in a road traffic accident applied by the police has not changed significantly since the ratification of the Vienna Convention on Road Traffic of 1968, the corresponding definition in vital statistics depends on the current version of the abridged classification of causes of death.

The International Classifications of Diseases (ICD) were never directly applied in the USSR. The versions of the abridged classifications of causes of death existing in the USSR were adapted to the ICD, but significantly differed from it. From 1965 to 1988, there were 4 versions of abridged classifications of causes of death in the USSR. A feature of three of them (those of 1965, 1970 and 1981) was the division of external causes of death into occupational and non-occupational accidents, including all categories of transport accidents (Table A1 of the Appendix). Occupational accidents along with some other causes of death were listed separately in a secret statistical table (Table 5b), while the remaining causes were tabulated in Table 5. The situation changed after the revision of the classification of 1988, which was in use until 1998, where this division was abolished and the statistical tables №5 and №5b were replaced by a single statistical reporting form C-51, "Distribution of the deaths by gender, age group, and cause of death" (Mesle et al. 1996). In the last version of the Soviet abridged classification of 1988, transport accidents were divided into three categories: 1) motor vehicle traffic accident; 2) motor vehicle traffic accident involving collision with a pedestrian; 3) other transport accidents. Meanwhile, in an ICD-

[1] Decree of the Government of the Russian Federation of January 8, 2018 No. 1-r “Road Safety Strategy in the Russian Federation for 2018-2024”.
[2] Hereinafter, by the police we mean the traffic police of the Ministry of Internal Affairs of the Russian Federation.

9 basic tabulation list transport accidents (E470) were divided into five groups: 1) motor vehicle traffic accidents; 2) other road vehicle accidents; 3) railway accidents; 4) water transport accidents; 5) air and space transport accidents.

After the dissolution of the USSR, from the beginning of the 1990s aggregate mortality statistics by causes of death started to be transmitted to the World Health Organization (WHO). The European detailed mortality database (DMDB) provides data on the number of deaths in motor vehicle traffic accidents from 1980 to 1998 in Russia. The number of deaths within 1) motor vehicle traffic accident and 2) motor vehicle traffic accident involving collision with pedestrians was considered by WHO as killed in «motor vehicle traffic accidents» for the period 1980-1998. From 1988 to 1998 the number of deaths in Russia in motor vehicle accidents extracted from DMDB and the number of deaths due to road traffic accidents according to the Russian police, do not differ significantly (the blue and dark blue lines in Figure 1, respectively). Therefore, the definitions of death due to road traffic accidents applied by Russian police and WHO within DMDB could be considered synonymous.

The situation changed with the introduction of ICD-10, where the differentiation of the transport causes of death associated with land-based non-rail modes of transport became more detailed. In ICD-9, motor vehicle traffic accidents included all accidents involving motor vehicles. In ICD-10, a distinction between the categories of road users was made: a pedestrian, a cyclist, a motorcyclist and a person in a vehicle. Unlike ICD-9, the types of vehicle are differentiated in detail. Instead of the general notion "motor vehicle", the following types of land transport were used: pedal cycle; two- or three-wheeled motor vehicle; car, pick-up truck or van; heavy transport vehicle or bus and other types of transport modes. The most detailed fourth digit specifies simultaneously both the category of the road user located on/in the vehicle (driver, passenger or unspecified as a driver or a passenger person), and the place of the accident (traffic, non-traffic or unspecified as a traffic or non-traffic accident). WHO determined a set of the following three-digit ICD-10 codes which would correspond to the deceased in a "motor vehicle traffic accident" from ICD-9, to maintain the comparability of the time series: V02-V04; V09; V12-V14; V20-V79; V82-V87; V89[3]. In addition, WHO in "Global Health Assessments" uses another set of 3-digit codes to distinguish the number of people killed in "road injuries": V01-V04; V06; V09-V80; V87; V89; V99. A set of 4-digit codes is also specified to distinguish the number of people killed in "road injuries" (World Health Organization 2018b: 69).

ICD-10 came into force in 1999 in Russia, and correspondingly, a new Russian abridged classification (RC) was introduced. Since then, it has been revised three times (table A2 in the Appendix).

In the first RC of 1999 following the ICD-10 the criteria for grouping transport codes changed. The following three items were introduced in RC-1999: 1) a pedestrian injured in a transport accident; 2) car occupant injured in a transport accident; 3) other and unspecified transport accidents. Similarly to the SC-1988, in the RC-1999 «transport accidents» comprised 3 items, but they were not identical to the previous ones. Therefore, there is no easy way to

[3] https://gateway.euro.who.int/en/indicators/hfa_167-1740-sdr-motor-vehicle-traffic-accidents-all-ages-per-100-000/visualizations/#id=19098&tab=notes (accessed 13 September 2019).

continue a time series using the definition «motor vehicle traffic accidents». Presumably, this interruption in the time series affected the possibility of publishing data on the number of deaths in RTA in the "Demographic Yearbook of Russia". Hence only the total number of deaths in all transport accidents was published in 1999 - 2005.

In the second RC-2006, each of the previous items was subdivided into fatalities in traffic and non-traffic accidents, depending on the 4th digit of the ICD-10 code. Rosstat determined the total number of deaths coded by items 239, 240 and 241 from RC-2006 as the number of deaths due to road traffic accidents and started to publish this figure in the "Demographic Yearbook of Russia". The number of deaths in road accidents (the red line in Figure 1), defined in this way, was significantly lower compared to the police data (in 2006, 22.1 thousand people against 32.7 thousand, respectively).

An attempt to get a coherent cause-specific time series under the same RC was made in the Human Cause-of-Deaths Database (HCoD)[4], using a reconstruction method. HCoD provides data on Russia for the period from 1956 to 2014 in line with the Russian abridged classification in use in 2006-2010.

In 2011, a new expanded abridged classification was introduced (the RC-2011). As before, new detailed categories are mostly the result of division of the broader items from the RC-2006. However, it doesn't concern «transport accidents», as a new classification criterion was introduced within V-codes (Danilova 2015). Firstly, an aggregation was made according to the 3th character of the ICD-10 code defining the category of road user (pedestrian; pedal cyclist, motorcyclist and occupant of a three-wheeled motor vehicle; occupant of a motor vehicle (car, pick-up, heavy transport vehicle, bus)). Then, the same was done for the 4th digit of the ICD-10 code defining the place of the accident (traffic, non-traffic, unspecified whether traffic or non-traffic accident). As a result, all transport accidents comprised 13 items instead of the previous 6 (Table A2 in the Appendix). The sum of 3 items (256, 257, 257 from Table A2 in the Appendix) are defined by Rosstat as the number of deaths in road traffic accidents and published in the "Demographic Yearbook of Russia" (Federal Service ... 2017). Therefore, there is a different combination of ICD-10 codes[5] under the same name. This approach indicates a non-inclusion of both all non-traffic accidents and pedestrians who died in an unspecified whether traffic or non-traffic accident. It corresponds neither to any group of codes used by WHO for defining the number of fatalities in road traffic accidents, nor to the previous definition in RC-2006. Possibly, for this reason the DMDB publishes the number of deaths in all transport accidents in Russia only starting from 1999.

The situation worsens due to peculiarities of coding a death due to road traffic accidents in the medical death certificate by forensic experts. There is a problem of determining the place of accident for forensic experts if the deceased was a pedestrian. Thus a significant number of such cases are coded as unspecified whether traffic or non-traffic accident (179 of 264 pedestrian deaths in Moscow in 2016) (Pyankova et al. 2019). Further, they are aggregated by Rosstat in RC-2011 items" a pedestrian injured as a result of an unspecified transport accident (except for a railway)" and are not considered as death due to road traffic accidents. A combination of these two facts

[4] https://www.causesofdeath.org/cgi-bin/country.php?country=RUS (accessed 13 September 2019).
[5] V01-V04(1); V09(2-3); V10-V18, V20-V28(3-9); V19, V29-V39(4-9); V40-V79(4-9); V83-V86(2).

leads to an underestimation the number of death in RTA in Russia in statistical table C-51 and correspondingly in the "Demographic Yearbook of Russia" (Federal Service ... 2017; the red line in Figure 1).

Given the above, carrying out research on the long-term road traffic mortality in Russia based on the RC is highly problematic, as it would lead to wrong conclusions concerning even the up-to-date level of road traffic mortality, besides its evolution and composition. HCoD provides coherent time series only until 2014 under the out of use RC-2006 and does not allow the defining of road traffic mortality following one of the international approaches. Thus, we conduct our research on individual non-personalized data on the deceased aggregated along with the international approaches for identifying the number of deaths in road traffic accidents.

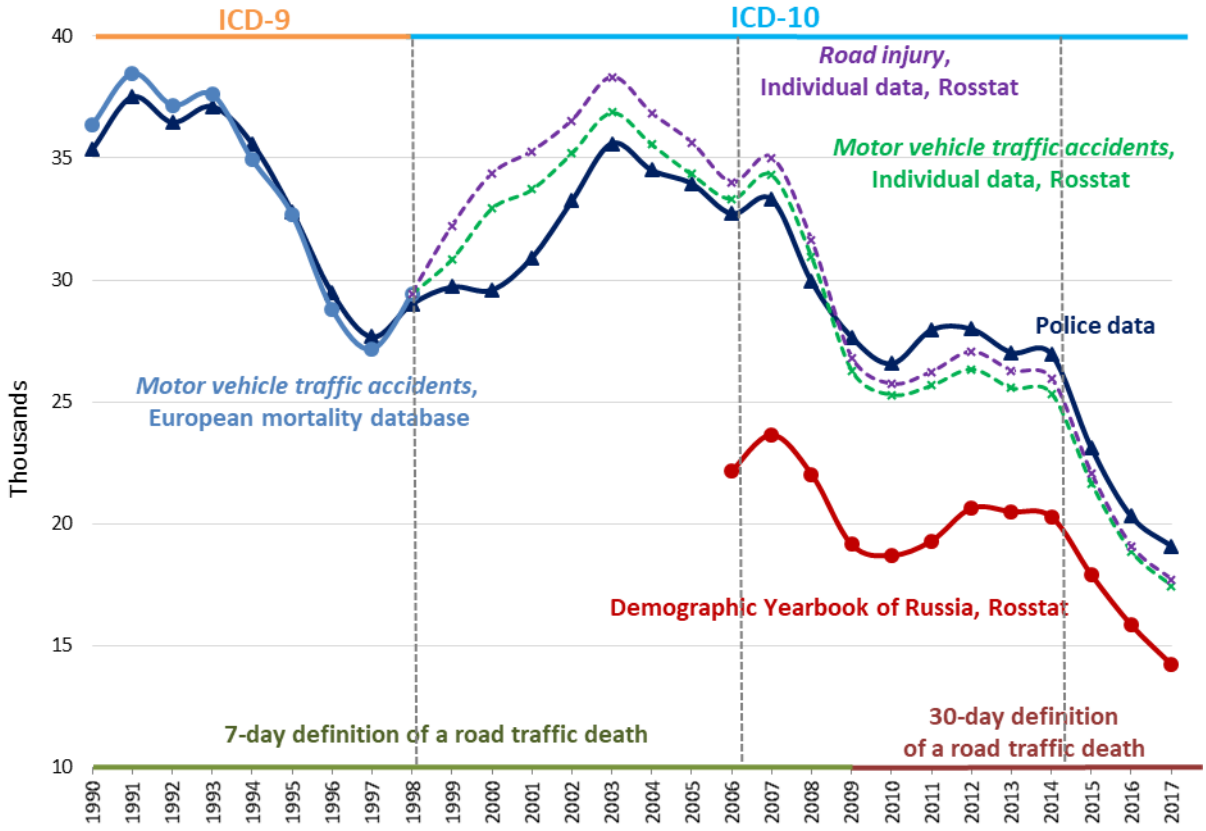

Figure 1. The number of deaths in road traffic accidents in Russia according to different data sources

Source: police data, Demographic Yearbook of Russia (Federal Service ... 2017), individual data from Rosstat, DMDB.

Beginning in 1999 the number of deaths in "motor vehicle traffic accident" and "road injuries" based on individual data from vital statistics (green and purple lines in Figure 1) differs from police data (dark blue line in Figure 1). The maximum number of discrepancies are observed during the transition from ICD-9 to ICD-10. From 1999 to 2008, the number of deaths in "motor vehicle traffic accident" and "road injuries" was higher than the figures provided by the police. Since 2009 it has been the reverse, probably due to the transition of Russia and the police registration system from a 7-day to a 30-day definition of the deceased in road traffic accidents. Unlike the above-mentioned discrepancy explained by a change in ICD revisions, simultaneous

changes in responsibility for coding causes of death in the medical death certificates, a data capture system, a huge discrepancy exists between police data and data published in the "Demographic Yearbook of Russia" because of Rosstat's approach to defining the number of deaths in RTA (Danilova el al. 2016).

Table 1 presents a variety of estimates of the number of deaths in road traffic accidents in Russia in 2016 in line with two main data sources on fatalities in RTA and depending on the approach for aggregating detailed ICD-10 codes within vital statistics.

Table 1. The number of deaths in road traffic accidents in Russia in 2016, people

No.	State reporting systems	The number of deaths depending on	
		year of registration of death	year of death
1	Police reporting systems, Ministry of Interior Affairs		
1.1	The number of fatalities in road traffic accidents	20308	Not applicable
1.2	The number of fatalities in road traffic accidents adjusted for accidents occurring off public roads	19725	Not applicable
2	Vital Statistics, Rosstat:		
2.1	The number of deaths in road injuries, individual data:		
2.1.1	Three-digit ICD-10 codes	19100	19186
2.1.2	Four-digit ICD-10 codes [6]	17431	17437
2.2	The number of deaths in motor vehicle traffic accidents, individual data	18969	18948
2.3	The number of deaths in motor road accidents (parts of V01-V89), Demographic Yearbook of Russia	15800	15805

Source: police data, Demographic Yearbook of Russia (Federal Service ... 2017), individual data from Rosstat.

According to the representatives of the scientific center for road safety of the Ministry of Internal Affairs of the Russian Federation, the official number of deaths reported by the police includes some cases not in line with the definition from the Glossary for Transport Statistics (Economic Commission for Europe ... 2009: 93). Such events include cases that occurred off-road (a clearing, forest, field, the ice of a frozen pond; a car park separated from the carriageway; a multi-storey parking; an underground or underground constructions, etc.) or in closed areas outside of common use (quarry, airfield, pier, industrial, technological, service, warehouse or other administrative territory, including one used for driving on a dam). In 2016, according to the police, 583 similar accidents occurred (Bakanov 2019). Without considering these cases, the number of fatalities in road traffic accidents according to the police would be 19.7 thousand persons killed in 2016 (Table 1). A selection of three-digit ICD-10 codes (V01-V04; V06; V09-V80; V87; V89; V99) within the "road injury" definition in vital statistics provides the nearest assessment (19.1 thousand deaths in 2016) to the adjusted police data (19.7 thousand persons killed in 2016).

Using detailed mortality data, no fundamental contradictions on the number of deaths in RTA between the police and vital statistics have been observed. Thus it is justified to use both depending on the research objectives.

[6] V01-04.1-9;V06.1-9;V09.2-3;V10-14.3-9;V15-19.4-9;V20-28.3-9;V29-79.4-9;V80.3-5;V81.1;V82.1,8,9; V83-86.0-3;V87.0 9;V89.2,3,9;V99;Y85.0.

CONSISTENCY OF ROAD SAFETY STRATEGY WITH THE RUSSIAN AND EUROPEAN ROAD TRAFFIC MORTALITY TRENDS

It is assumed that the crude death rate will decrease by 3.5 times during the implementation of the Road Safety Strategy and will not exceed 4 deaths per 100 thousand people by 2024. In 2017, a similar and lower level of road traffic mortality was observed in 13 countries: Great Britain, Germany, Denmark, Israel, Ireland, Spain, the Netherlands, Norway, Finland, Sweden, Switzerland, Estonia, Japan (IRTAD 2018). In the 1970s, in these countries the mortality rate ranged from 13 to 19 deaths per 100 thousand people, as in Russia in recent years. Only after 30 years did the mortality rate decrease to 4-5 dead per 100 thousand people in these countries.

In the early 2000s, a completely new task was formulated under the auspices of the UN and WHO. The challenge was not another nosological one of infectious diseases, but one of the external causes of death - road traffic accidents and their consequences. The Global Sustainable Development Goals (SDGs) postulated a necessity to halve the number of global deaths and injuries from road traffic accidents by 2020[7]. In Europe in 2011 began the second wave of the global plan "Decade of Action for Road Safety 2011-2020"[8] suggesting a reduction of the number of deaths from road traffic accidents in the European Union (EU) in accordance with the SDGs. The principles from the Swedish road safety conception "Vision Zero" are the basis for this plan. The conception was developed in 1997, when the number of deaths in road traffic accidents in Sweden was 541 people or 6 deaths per 100 thousand people. Within it, road traffic mortality is considered as completely preventable causes of death and injuries. With such a low level of road traffic mortality, the slogan "zero road traffic mortality" seemed justified and achievable. At the first stage of the concept, the aim was to reduce the number of deaths by 50% by 2007 relative to 1996. By the end of its implementation, the number of road traffic deaths had decreased by only 13%. In 2017, the road traffic death rate decreased to 2.7 deaths per 100 thousand people after 20 years of “Vision Zero” implementation.

In Russia, under the Federal Target Programs (FTP)[9] for 2006-2012 and 2013-2020 the planned decrease in the absolute number of deaths in road traffic accidents generally corresponded to similar plans in other countries (IRTAD 2018). The FTP for 2006-2012 assumed "a decrease in the number of people killed in road traffic accidents by 1.5 times by 2012 compared to 2004"[10] or by 33% compared to the baseline. In the next FTP for the 2013-2020 it was planned to "reduce deaths from road traffic accidents by 8 thousand people by 2020 compared to 2012,"[11] or by 29% from the baseline.

A comparison of the targeted and actual number of deaths in road traffic accidents in the EU-28 countries shows that the actual reduction of road traffic deaths almost never reached the

[7] https://sustainabledevelopment.un.org/sdg3 (accessed 13 September 2019).
[8] https://www.unece.org/fileadmin/DAM/trans/roadsafe/docs/A-RES-64-255r.pdf (accessed 13 September 2019).
[9] In Russia, in the first Federal Target Program (FTP) for the period 1996-1998, reducing the number of deaths in road accidents was not the main goal, but was one of the tasks within the overall goal of improving road safety. It was also not specified by how much the number of deaths in road accidents should decrease.
[10] Decree of the Government of the Russian Federation of February 20, 2006 No. 100 “On the federal target program ‘Improving road safety in 2006 – 2012’”.
[11] Decree of the Government of the Russian Federation of October 3, 2013 No. 864 "On the federal target program ‘Improving road safety in 2013 – 2020’".

targets (Figure 2). In Russia, the decrease in the number of road traffic deaths was at a faster pace than planned, and the target indicators of the second FTP were achieved earlier than the deadline.

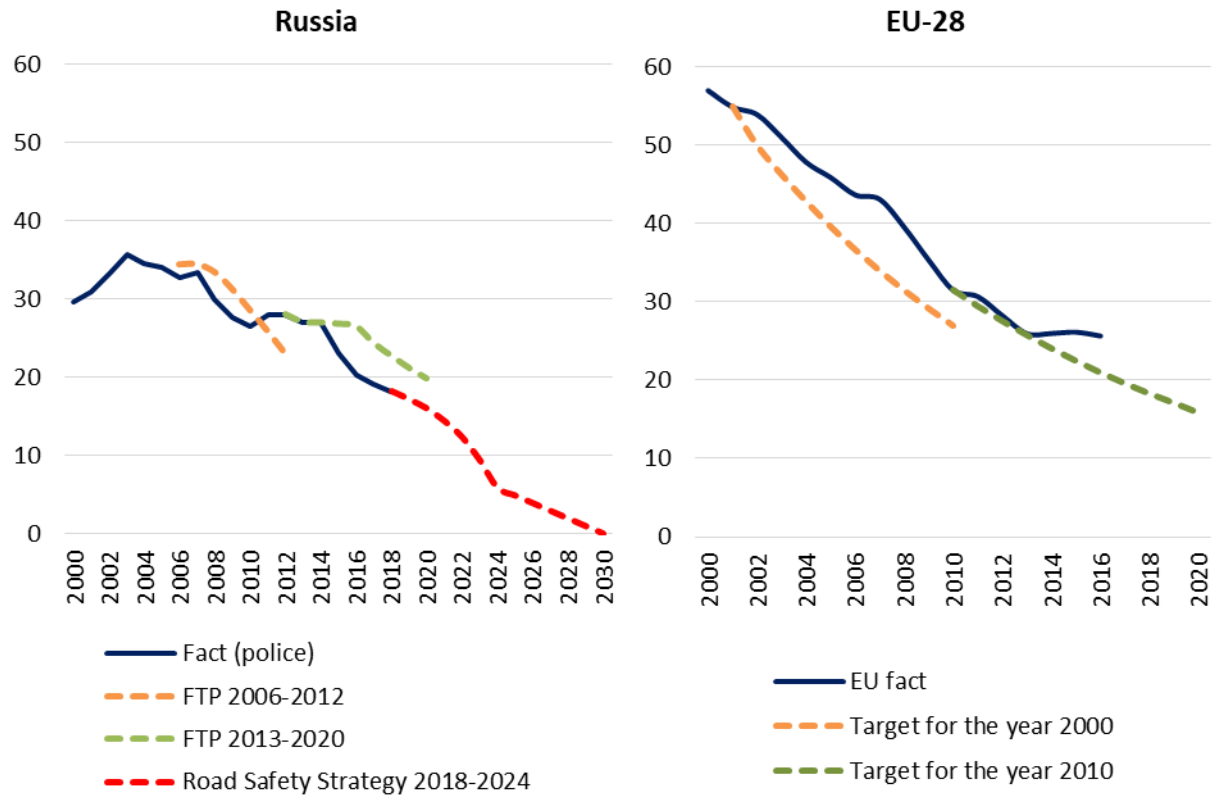

Figure 2. The targeted and actual number of deaths in road traffic accidents in Russia and the EU-28, thousand deaths

Source: Compiled from (European Commission 2017), police and federal target data.

The Road Safety Strategy for 2018-2024 was the first document to formulate the goal in term of mortality rates, not in absolute numbers (a reduction in the number of deaths per 100 thousand people). If we recalculate the mortality rate into the absolute number of deaths, using Rossat's medium population projection by 2030, it turns out that the absolute number of deaths in road traffic accidents should decrease by 68% over 7 years. The reduction should be more than 2 times more intense compared with previous programs. These figures are less consistent with the international targets for road traffic mortality reduction, which have never exceeded 50% over 10 years (IRTAD 2018). Moreover, in the EU-28, relying on the Vision Zero concept, the complete prevention of road traffic deaths is set as a goal only by 2050 (UN Road Safety ... 2010).

The international context shows that no one has managed to achieve such low mortality rates from road accidents (4 deaths per 100 thousand) in such a short time (7 years) as proposed by the Russian Road Safety Strategy. The required time period for reducing CDR from 13 to 4 deaths per 100 thousand people has varied from 33 years in Norway to 11 years in Spain (Table 2). The lower the level of road traffic mortality, the more time is required for its further reduction; the previous road safety measures in the new conditions no longer lead to such an intense decline. New drastic measures are needed to ensure further intensive reduction, involving more

sophisticated infrastructural and urban planning decisions and, most importantly, changing people's behavior.

In conclusion, the goal of the Road Safety Strategy is consistent with the international agenda and national objectives, but the same cannot be said of the dates for its achievement.

Table 2. Required time for a reduction of road traffic CDR from 13 to 4 deaths per 100 thousand people in countries where it was lower than 4 deaths per 100 thousand people in 2017

No.	Country	Year when CDR was 13 deaths per 100 thousand people	Year when CDR was 4 deaths per 100 thousand people	Number of years required to reduce CDR from 13 to 4 deaths per 100 thousand people	CDR in 2017. per 100 thousand people
1	Norway	1975	2008	33	2.0
2	Sweden	1977	2009	32	2.5
3	Switzerland	1989	2011	22	2.7
4	UK	1974	2009	35	2.8
5	Denmark	1989	2011	22	3.0
6	The Netherlands	1981	2009	28	3.1
7	Israel	1979	2012	33	3.3
8	Estonia	2003	2017	14	3.6
9	Japan	1975	2014	39	3.7
10	Germany	1987	2016	29	3.8
11	Spain	2002	2013	11	3.9
12	Ireland	1997	2012	15	3.9 (2016)
13	Finland	1990	2017	27	3.9
14	Russia	2017	2024 (plan)	7 (plan)	13.0

Source: calculated according to (IRTAD 2018) and the Russian police.

THE STRUCTURE AND DYNAMICS OF ROAD TRAFFIC MORTALITY IN RUSSIA

Prior to the early 1980s, road traffic mortality grew steadily. In the period from 1981 to 1983, the fight against traffic violations was intensified and fines were increased. This, possibly in combination with the anti-alcohol campaign in the second half of the 1980s, led to a reduction in road traffic mortality. After the abolition of the campaign, road traffic death rates skyrocketed, reaching a historic maximum in 1991. Researchers attribute the mortality increase in this period, specifically pedestrian mortality, to the growth of the level of motorization and the weakening of police control (Luneev 2005).

According to police data, CDR from RTA for 2014-2017 significantly decreased (from 19 to 13 deaths per 100 thousand people). Such an intense decrease is not unique. In some countries it was even faster: in Japan over 2 years, in the Netherlands over 3 years, in Australia and Portugal over 4 years (IRTAD 2018). In addition, CDR equal to 19 deaths per 100 thousand people had been observed in Russia in 1976, 1983, 1997 and 2009. If we take any of these dates as a reference point, then the period of mortality decline from 19 to 13 deaths per 100 thousand people becomes much longer.

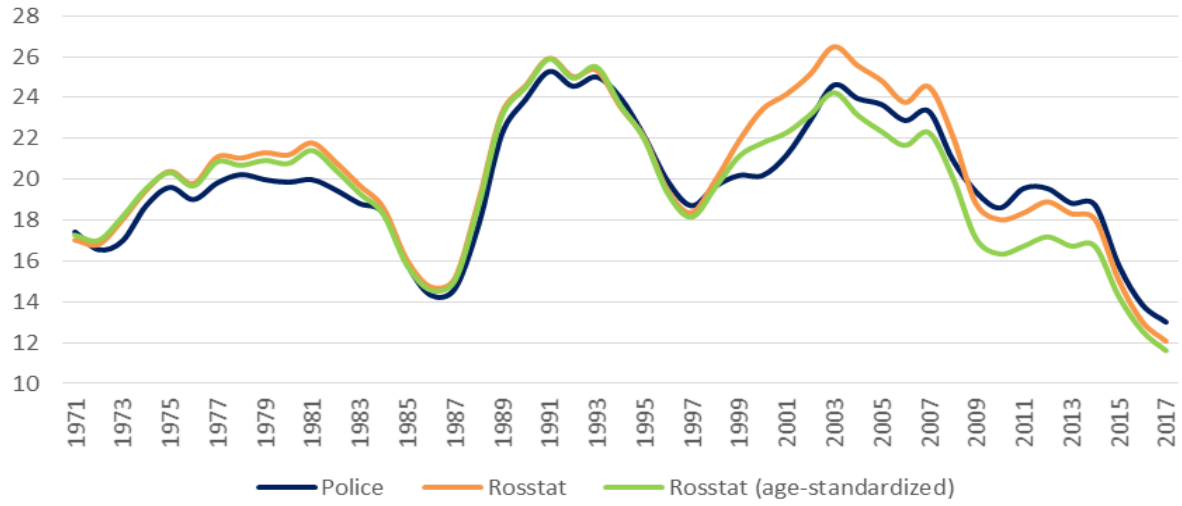

Figure 3. Death rates due to road traffic accidents in Russia according to the police (crude death rate) and Rosstat (crude and age-standardized death rates), per 100 thousand people

Note: Aggregation of causes of death by a group of codes related to "motor vehicle traffic accidents".

Source: Until 1998 data are from RusFMD (Russian Economic School 2019), since 1999 - unpublished data from Rosstat.

One of the targets of RSS is an "increasing protection of the most vulnerable road users, especially children and pedestrians, against road traffic accidents and their consequences ". Indeed, there has been a steady decrease in the ASDR of pedestrians, but it had actually started back in the early 1990s, even before the beginning of the first federal target program (Figure 4). During this period, the ASDR of drivers and passengers was lower corresponding figures for pedestrians by about 2 times. In 1998 it began to increase, exceeding the pedestrian mortality rate in 2000 and reaching a maximum level in 2007. The first stage of mortality reduction of drivers and passengers occurred in 2007 - 2011. It coincided with the introduction and intensification of alcohol control policy in Russia, as well as with the adoption of some legislative acts defining a new procedure for interaction between the police and drivers suspected of drinking and driving (Burtsev et al. 2019). As was shown, adoption of the new alcohol control policy influenced the reduction of transport-related mortality in men positively (Pridemore et al. 2013). The second stage of road traffic mortality reduction of drivers and passengers started in 2014 and is still ongoing. During this period, drinking and driving legislation was toughened, specifically if it resulted in a corresponding fatality[12].

[12] Article 264.1 of the Criminal Code.

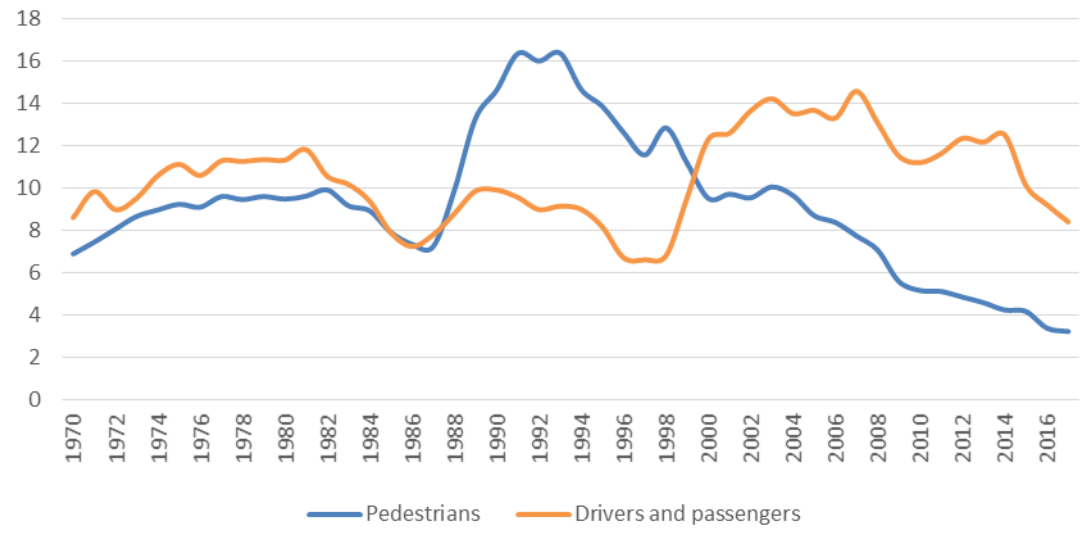

Figure 4. Age-standardized death rates due to road traffic accidents by road users types, per 100 thousand people

Note: see note to figure 3.

Source: Until 1998 - data from RusFMD (Russian Economic School 2019), since 1999 - unpublished data from Rosstat.

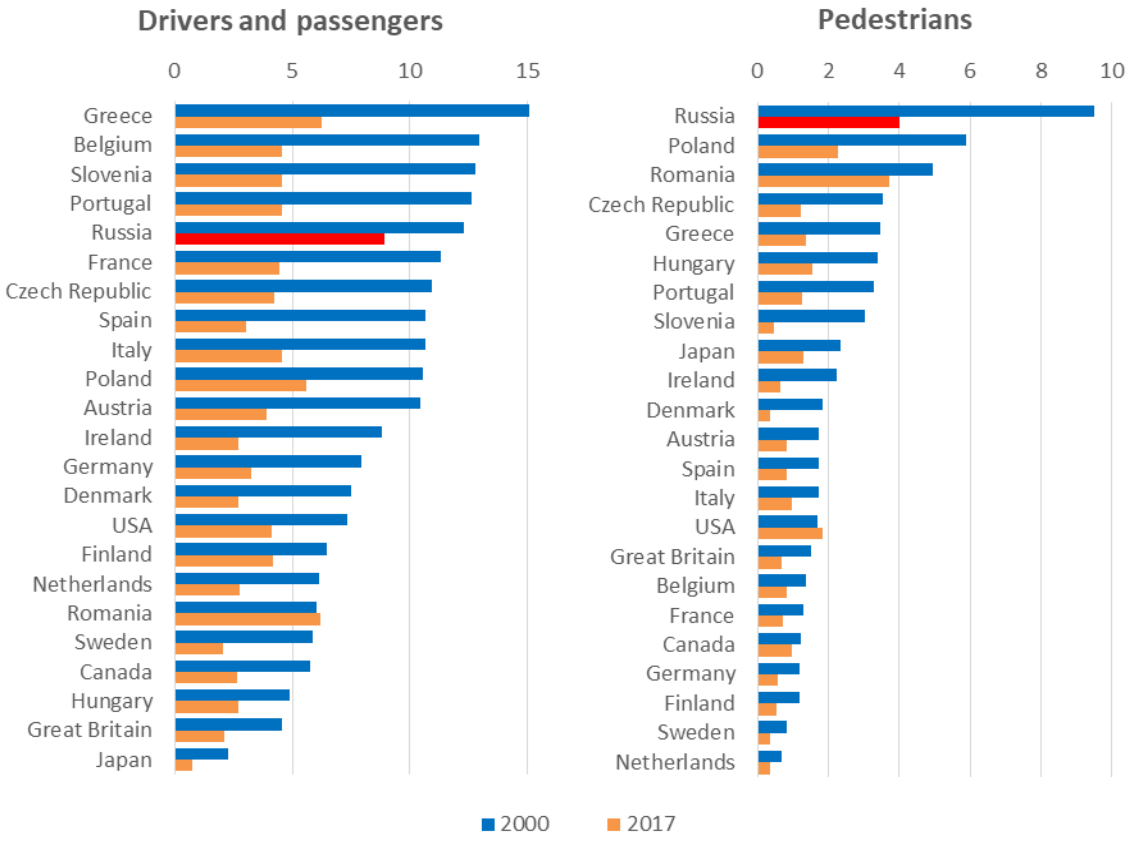

Figure 5. CDR by road user types in some countries in 2000 and 2017, per 100 thousand people

Source: (IRTAD 2018), police data.

Despite the positive trends and tremendous progress in reducing pedestrian mortality, Russia's lag behind other countries remains significant. The CDR of drivers and passengers in 2017 (8.9 deaths per 100 thousand people) was the highest among the countries shown in Figure 5. In neighboring countries (Poland, Greece, Romania), CDR varies from 5.6 to 6.2 deaths per 100 thousand people. Concerning pedestrian mortality, Russia's lag behind these countries is less, but the gap with the vanguard countries (Sweden, the Netherlands) is tenfold.

Pedestrian age-specific mortality rates increase with age, peaking at the oldest ages. The most rapid increase is from age 0 to 39 years and after 75 years, while in the age group of 40-74 years they are almost stable (Figure 6). For drivers and passengers, the age profile of mortality is fundamentally different: a sharp increase, starting from age 15, with a peak between the ages of 25 and 29 years old and then a gradual decrease with increasing age. Since different categories of road users in different age groups are exposed to different risks of death, the emphasis in formulating road safety policies should take these features into account.

Starting in the 1990s a steady decrease in the standardized pedestrian mortality rate occurred in different age groups with different intensities (Figure 7, left panel). The steepest decline was observed in the youngest age group (0-14 years old), where a 10-fold reduction occurred - from 20 to 2 deaths per 100 thousand people of this age in 1991 - 2017. With increasing age, the pace of the reduction of pedestrian mortality slowed down. Thus, in the age groups 15-29, 30-44, 45-59 and 60+, characterized by higher mortality rates, the age-specific mortality rate for the period 1991-2017 decreased by 7.5, 5.0, 4.0 and 3.6 times, respectively.

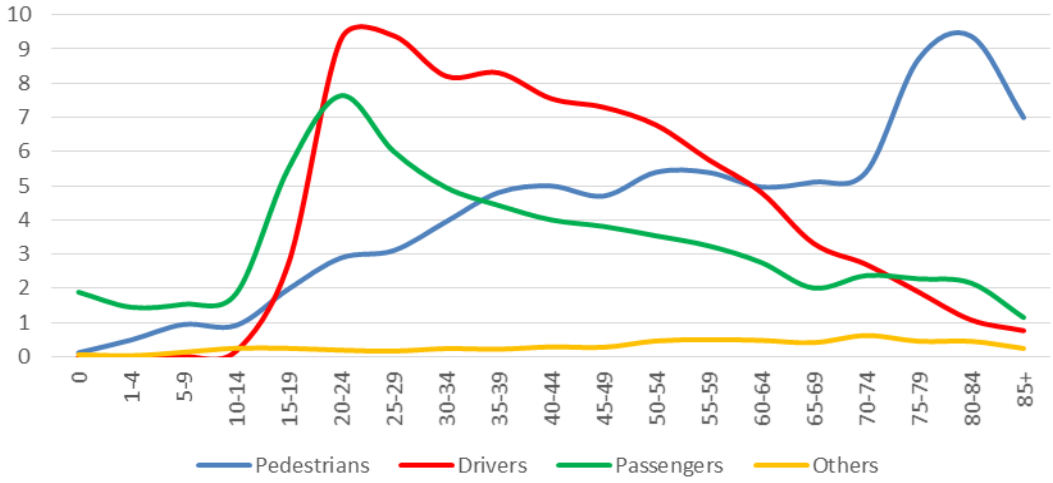

Figure 6. Age-specific death rates by road user types in Russia, 2017, per 100 thousand people

Source: police data.

The age-specific mortality rates of drivers and passengers decreased less intensively within all age groups (Figure 7, right panel). There is no such a shift compared with pedestrians. An uninterrupted mortality reduction for drivers and passengers among all age groups has been observed since 2007. The greatest decrease occurred among children (0-14 years old) and young drivers and passengers aged 15-44 years, for whom age-specific mortality rates decreased by 2 times in 2007-2017.

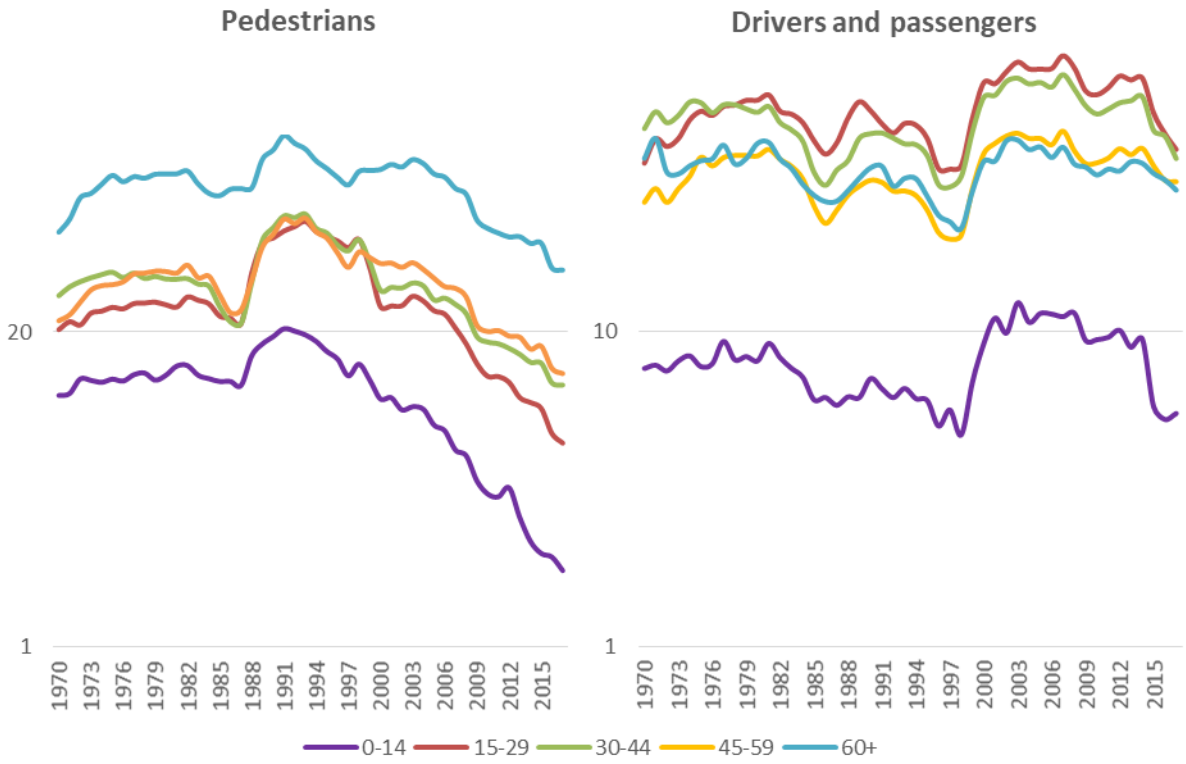

Figure 7. Dynamics of age-specific death rates by main road user types in Russia, per 100 thousand people (log scale)

Note: Aggregation of causes of death according to a group of codes related to "motor vehicle traffic accidents".

Source: Until 1998 - data from RusFMD (Russian Economic School 2019), since 1999 - unpublished data from Rosstat.

Regarding child mortality in road traffic accidents, it is important to note that its decrease from 1993 to 2013 was primarily due to a decrease in pedestrian child mortality (Figure 7, left panel). Mortality of child passengers, however, did not decrease (Figure 7, right panel), despite harsher punishment for violating the rules for transporting children in a car[13]. Currently, the mortality of child passengers is 2.5 times higher than the mortality of child pedestrians. This is due to adult behavior, since child passengers under 14 years are passive road users. In addition, the proportion of people using child restraints for transporting a child in their own car is still low in Russia compared to other European countries - only about 50% (WHO 2018a).

THE SPATIAL DIMENSION OF ROAD TRAFFIC MORTALITY IN RUSSIA

Unfortunately, there is no spatial differentiation of targets in the Road Safety Strategy. However, there are regions in Russia now where the targeted level of road traffic mortality has already been achieved (according to police data, in Moscow and St. Petersburg). Simultaneously, there are regions where reducing road traffic mortality to the target value seems to be a difficult task, given

[13] The Code of the Russian Federation on administrative offenses of December 301, 2001 No. 195-FZ (as amended on June 17, 2019).

its current high level: the Republics of Kalmykia, Tyva, Adygea, Magadanskaya and Leningradskaya oblast and Zabaikalsky kray (more than 20 deaths in RTA per 100 thousand people).

The reduction in the pace of road traffic mortality in these regions did not depend on its level in 2003, when the tempo of CDR reduction accelerated. If we divide all the regions of Russia into three groups according to the road traffic mortality level in 2003 (more than 25, from 15 to 25, fewer than 15 deaths in RTA per 100 thousand people), it turns out that the reduction of road traffic mortality in groups in 2003-2018 was the following: by 43, 45 and 46 p.p., respectively. Moreover, within regions with positive road traffic mortality dynamics there were ones where the CDR was very high in 2003 (more than 30 deaths per 100 thousand people in the Moscow region, Tverskaya and Vladimirskaya oblasti), and vice versa (below 13 deaths per 100 thousand people in Moscow city, St. Petersburg).

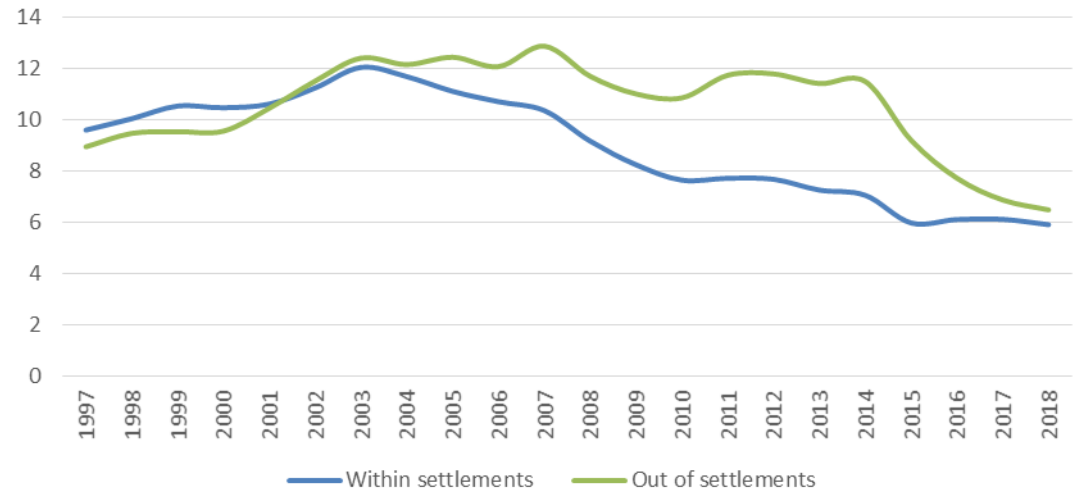

Figure 8. Dynamics of the crude death rate due to road traffic accidents, depending on the place of accident, per 100 thousand population

Source: Police data.

In addition to the place of the accident, also important is whether a person died *within* or *outside of* a settlement. During the period of rapid motorization the number of deaths in RTA within settlements was greater than outside them. Starting in 2002 this ratio went in the opposite direction. Since 2000, the proportion of deaths in settlements to the total number of deaths in RTA has been steadily declining, reaching a minimum of 38% in 2014, stabilizing afterwards and remaining virtually unchanged during 2015-2018.

The lowering of the CDR in road traffic accidents during 2003 - 2014 occurred mainly in populated areas, while it did not change until 2014 outside of settlements (Figure 8). Since then the reduction of road traffic mortality in populated areas has slowed, while outside of them it has accelerated.

There is also a differentiation of road traffic mortality within the urban-rural dichotomy. In 2015 road traffic mortality in urban settlements was higher than in rural ones; by 2017 the situation had reversed. During this period, road traffic mortality in urban areas decreased, while in

rural areas it grew (table 3). The decrease of road traffic mortality took place in cities with a population of more than 250 thousand people, but most rapidly in cities with a population of over one million. The dynamics of the indicator in cities with a population of less than 250 thousand people more similar to those in rural areas.

Table 3. The number of deaths and the crude death rate due to road traffic accidents in cities with different populations and rural settlements in Russia

	In cities					In rural municipalities and rural areas in urban municipalities
	Total	with a population of				
		Over 1 million people	250-999 thousand people	100-249 thousand people	Fewer than 100 thousand people	
			Number of deaths, people			
2015	6892	2001	2018	932	1941	1 860
2016	6526	1516	1799	1011	2200	2 438
2017	6458	1444	1816	1028	2170	2 533
			The number of deaths per 100 thousand people			
2015	6.3	6.0	7.1	6.4	5.8	5.0
2016	6.0	4.6	6.3	7.0	6.6	6.5
2017	5.9	4.4	6.4	7.1	6.5	6.8

Source: Calculated according to police and Rosstat data.

Thus, the larger the city, the lower the road traffic mortality rate. This is true both for most European countries and for Russia as a whole (table 4).

Table 4. The crude death rate from road traffic accidents in cities with different populations in some European countries, groups of countries and in Russia, per 100 thousand population

	Cities with a population of:			
	Over 1 million people	250 - 999 thousand people	100 - 249 thousand people	Fewer than 100 thousand people
UK (2017)	1.8	1.8	1.9	2.5
Germany (2016)	1.6	1.9	2.4	3.0
Spain (2016)	1.9	2.0	2.1	2.2
Italy (2017)	3.9	3.9	5.1	5.1
France (2015)	1.9	2.5	2.9	3.5
Sweden (2018), Norway (2013), Finland (2017)	0.9	1.4	1.9	2.2
Bulgaria (2017), Czech Republic (2016), Estonia (2017), Latvia (2017), Lithuania (2017), Hungary (2017), Poland (2014), Slovenia (2017), Slovakia (2017)	3.2	3.4	4.8	5.5
Belgium (2016), The Netherlands (2013), Ireland (2011). Switzerland (2016)	1.4	2.6	2.6	1.9
Russia (2017)	4.4	6.4	7.1	6.5

Source: Calculated according to (Eurostat 2019), Russia - according to the police.

On the one hand, in the Russian million-plus cities the targets for reducing mortality by 2024 were already achieved in 2017, using police data. Therefore, cities with a smaller population should become policy priorities in the field of road safety. On the other hand, the crude death rate from road traffic accidents in Russian million-plus cities is unacceptably high compared with similar cities in Great Britain, Germany, Spain, France, and the countries of Northern Europe. It is comparable only with million-plus cities in Italy and Eastern Europe. In many European million-

plus cities (Berlin, Paris, London, Stockholm, etc.) with a comparable motorization level (an average of 329 cars per 1000 population), the road traffic mortality rate is 1.9 deaths per 100 thousand people, whereas in Russia it is 2.3 times higher.

The significant spatial road traffic mortality differentiation in Russia is, possibly, partly attributable to the settlement pattern, the urbanization rate and the level of road network connectivity of the region. For million-plus cities, the goals of reducing road traffic mortality could be more ambitious, since the potential for reduction in them has not been exhausted. Based on international experience and ongoing Russian trends, road traffic mortality in large and medium-sized cities of Russia should be 1.5-2 deaths per 100 thousand people, and in small cities and rural settlements - 2.5-3 deaths per 100 thousand people. Only with such mortality rates in cities and rural settlements and with the mortality rate outside populated areas maintained at the same level is it possible to achieve CDR of 4 deaths per 100 thousand people.

LIMITATIONS

The study was not without limitations. In this work, we considered the consistency of road traffic mortality only with the targets set in the first Road Safety Strategy, leaving outside our scope legislative changes in other areas, such as the administrative and criminal codes, adopted national alcohol control policy, drinking and driving policy, changes in the healthcare system, etc. Focusing on RSS seemed justified, as this document sets out a fundamental vision on road traffic mortality and outlines targets for its reduction.

Using police data for international comparisons, the crude death rates are not age-standardized due to the limitation of the IRTAD database, which does not provide users a distribution of the number of deaths by gender and age.

There is no sex-specific analysis of road traffic mortality, as it was outside the scope of our objectives. But such a differentiation exists in Russia, and it is quite significant.

The category of "cyclists" was not separated due to the difficulty of distinguishing it in vital statistics and police data for the entire time period under study. Given the small number of cyclists who have died in Russia (392 deaths in 2016), we believe that this only slightly affected the mortality trends of unprotected road users, a category which usually includes cyclists.

The dynamics of the number of deaths and the crude death rate in road traffic accidents in cities and rural settlements are presented for a short period of time (only 3 years), which is explained by the depth of the open source police archive.

All assessments of the number of deaths based on vital statistics are given without taking into account the possible impact of the so-called "garbage" codes of causes of death[14]. Of these, codes that could influence the statistics of deaths from accidents include codes of the ICD-10

[14] The concept of “garbage” codes of causes of death was introduced in 1990 by Nagavi and Lopez in the Global Burden of Disease project. A “junk” cause of death code is a code that cannot or should not be used as the original cause of death (Murray CJL, Lopez A.D. 1996). Then the concept of “junk” codes was expanded by them, and their classification was given (Naghavi, Makela, Foreman et al. 2010).

heading such as "injuries with uncertain intentions" (Y10-Y34). WHO has adopted the concept of “garbage codes” and includes Y10-Y34 in its short list of “garbage” codes (World Health Organization 2014: 4). Forensic experts using "garbage" codes to code deaths still occurs in Russia (Pyankova et al. 2019). If we adjust the number of deaths in road traffic accidents based on vital statistics for these codes, road traffic mortality will increase, thus reducing the discrepancy between police data and vital statistics on the number of deaths in road traffic accidents.

CONCLUSION

A consideration of road traffic mortality as a completely preventable cause of death is reasonable. However, the timelines set in the Russian Road Safety Strategy for 2018-2024 are very tight, in terms of international experience and the existing mortality rate. There have been no precedents of road traffic mortality reduction by 3.5 times in 7 years in other countries.

The Road Safety Strategy prioritizes the reduction of road traffic mortality of children and pedestrians. The mortality rate within both groups has recently decreased most intensively compared to other categories of road users. At the same time, the main risk groups for many years have been drivers and passengers aged 15-44 years old and pedestrians over 60 years old. However, while among pedestrians a decrease in mortality seems to be a steady trend with no visible signs of leveling off, for drivers and passengers it is not so obvious.

The achievement of target indicators in the framework of monitoring the implementation of the Road Safety Strategy must be considered differentially, both by type of region depending on the existing level, and by the scene of the accidents (in or outside of settlements). At present, it is possible to achieve the targets of the Road Safety Strategy for 2018-2024 only in cities with a large and medium population.

For a precise definition of the category of road traffic accident deaths based on vital statistics, the very first step may be to abandon the present approach based on the Russian abridged classification of causes of death and switch to one of the two international options for aggregating three-digit ICD-10 codes used by WHO to determine the number of deaths in road traffic accidents. This will lead to the elimination of the existing significant discrepancies between the published figures in the two official reporting systems, but will not completely eliminate them. Given the fact that forensic experts in Russia attribute a significant number of deaths from road traffic accidents to non-traffic or unspecified as traffic or non-traffic accidents, it makes no sense to use the four-digit code sample also proposed by WHO. This will again lead to an underestimation of the number of deaths in "road traffic accidents". In this case, the easily solved problem of switching to one of the international approaches of aggregating cause of death codes is confronted with the more complex problem of accurately determining the circumstances of the accident by forensic experts in the context of a fully decentralized coding system in Russia and the absence of two-way effective communication with police officers.

At the same time, within the framework of the police reporting system it is advisable to keep a separate record of accidents not corresponding to the concept of road traffic accidents from the Glossary for Transport Statistics, and subsequently not include them in the official number of deaths in road traffic accidents according to police data.

Strengthening interagency cooperation between the police and the state death registration system may result in the possibility of either preliminary coding of the circumstances of the accident in the ICD-10 language by the police when filling out the accident report, or the possibility of correcting the circumstances of the accident when interacting with the forensic medical experts. It is also necessary to establish a system of bilateral information exchange with them, both with the aim of improving the quality of coding of this cause of death in the medical death certificate and reducing the number of deaths due to accidents unspecified as traffic or nontraffic, and to exclude deaths from natural causes in the police reporting system.

However, the scientific community still has certain concerns related to a possible change in the quality of registration of deaths due to road traffic accidents and its consequences for vital statistics in the coming years. For example, it happened with diseases of the circulatory system after the Russian President declared 2015 the year of the fight against cardiovascular diseases (Vishnevsky, Andreev, Timonin 2016).

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APPENDIX

Table A1. The division of transport accidents in the short list of causes of death in ICD-9 and in Soviet Abridged Classifications (SCs) of causes of death during ICD-9

RC-items	Russian name of RC-items	English name of RC-items
	Short list of causes of death ICD-9	
E471	Происшествия с участием автомобильного транспорта	Motor vehicle traffic accidents
E472	Происшествия с другими с дорожными транспортными средствами	Other road vehicle accidents
E470	Железнодорожные происшествия	Railway accidents
E473	Аварии на водном транспорте	Water transport accidents
E474	Авиационные и космические аварии	Air and space transport accidents
	SC in use from 1981 to 1987.	
160	Несчастные случаи, связанные с мототранспортом, исключая случаи на производстве	Motor vehicle traffic accident, excluding occupational
161	Автомототранспортный несчастный случай на общественной дороге в результате наезда на пешехода	Motor vehicle traffic accident involving collision with pedestrian
162	Несчастные случаи, связанные с мототранспортом, случаи на производстве	Motor vehicle traffic accident, occupational
163	Автомототранспортные несчастные случаи, исключая случаи на производстве	Accidents involving other types of transport, excluding occupational
164	Автомототранспортные несчастные случаи, случаи на производстве	Accidents involving other types of transport, occupational
	SC in use from 1988 to 1998	
160	Несчастные случаи, связанные с мототранспортом	Motor vehicle traffic accident
161	Автомототранспортный несчастный случай на общественной дороге в результате наезда на пешехода	Motor vehicle traffic accident involving collision with pedestrian
162	Автомототранспортные несчастные случаи	Other transport accidents

Table A2. The division of transport accidents (V-codes) in Russian Abridged Classifications (RCs) of causes of death during ICD-10

RC-items	Russian name of RC-items	English name of RC-items
	RC in use in the period 1999-2005	
239	Пешеход, пострадавший в результате транспортного несчастного случая	Pedestrian injured in transport accident
240	Лицо, находившееся в легковом автомобиле, пострадавшее в результате транспортного несчастного случая	Car occupant injured in transport accident
241	Другие и неуточненные транспортные несчастные случаи	Other and unspecified transport accidents
	RC in use in the period 2006-2010.	
239	Пешеход, пострадавший в результате транспортного несчастного случая	Pedestrian injured in transport accident
272	Пешеход, пострадавший от внедорожного мототранспортного несчастного случая	Pedestrian injured in collision with motor vehicle, nontraffic accident
240	Лицо, находившееся в легковом автомобиле, пострадавшее в результате транспортного несчастного случая	Car occupant injured in transport accident
241	Другие и неуточненные транспортные несчастные случаи	Occupant of other transport vehicle in transport accident
273	Другое лицо, пострадавшее от внедорожного мототранспортного несчастного случая	Other persons injured in collision with motor vehicle, nontraffic accident
274	Другие транспортные несчастные случаи	Other transport accidents
	RC in use in the period 2011-nowadays.	
256	Пешеход, пострадавший в результате дорожного транспортного случая	Pedestrian injured in road traffic accident (except rail)
259	Пешеход, пострадавший в результате недорожного транспортного случая (кроме железнодорожного)	Pedestrian injured in nontraffic accident (except rail)
263	Пешеход, пострадавший в результате неуточненного транспортного случая (кроме железнодорожного)	Pedestrian injured in unspecified transport accident (except rail)
257	Велосипедист (любой), мотоциклист (любой) и лицо, находящееся в трехколесном транспортном средстве, пострадавшие в результате дорожного транспортного случая	Cyclist (any), motorcyclist (any) and occupant of a three-wheeled vehicle, injured in road traffic accident
260	Велосипедист (любой), мотоциклист (любой) и лицо, находящееся в трехколесном транспортном средстве, пострадавшие в результате недорожного транспортного случая	Cyclist (any), motorcyclist (any) and occupant of a three-wheeled vehicle, injured in nontraffic accidents
258	Лицо, находившееся в автотранспортном средстве, пострадавшее в результате дорожного транспортного случая	Person in vehicle injured in road traffic accident
261	Лицо, находившееся в автотранспортном средстве, пострадавшее в результате недорожного транспортного случая	Person in vehicle injured in nontraffic accident
262	Пешеход, пострадавший при столкновении с поездом или другим железнодорожным транспортным средством	Pedestrian injured in a collision with a train or other railway vehicle
268	Другие и неуточненные транспортные несчастные случаи	Other and unspecified transport accidents
264	Погружение в воду и утопление в результате аварии на водном транспортном средстве	Immersion in water and drowning in an accident on a watercraft
265	Погружение в воду и утопление, связанное с водным транспортом, не связанное с аварией на нем	Immersion in water and drowning related to water transport but not associated with an accident on it
266	Другие и неуточненные несчастные случаи на водном транспорте	Other and unspecified accidents in water transport
267	Несчастные случаи на воздушном транспорте и при космических полетах	Accidents in air transport and space travel

SMOKING AS A FACTOR OF REDUCED LIFE EXPECTANCY IN RUSSIA

POLINA KUZNETSOVA

Smoking is an important factor of preventable mortality in Russia. According to the author's calculations, based on international estimates of the relative risks of mortality for smokers and Russian data on smoking prevalence, self-assessment of health and mortality by causes of death, in 2017 the life expectancy of smokers was 5.2-5.3 years lower than that of non-smokers, while healthy life expectancy was 2.6-3.2 years lower.

Since 2005, smoking-related standardized mortality rates have been steadily declining, generally repeating the changes in mortality from all causes in Russia during this period. However, the aggregated data conceal significant gender differences – the main decrease in smoking-related mortality was observed among men. The smoking epidemic among men started earlier and is now at a more mature stage (decline) than among women (stagnation or even growth for some groups).

From 2004 to 2017, the life expectancy of women smokers increased significantly more (by more than a year and a half) than for non-smokers, although for men such a trend is not observed. The decomposition of differences in life expectancy between smokers and non-smokers shows that the advantage in life expectancy of non-smoking women mainly decreased in the age range from 50 to 69 years, mainly as a result of changes in mortality from cardiovascular diseases. For men, a similar reduction of the advantage in life expectancy of non-smokers compared to smokers occurred at younger ages, from 40 to 64 years. At older ages, non-smokers compensate for their lag in the increase of life expectancy; however, since for women this trend is observed later and on a smaller scale, life expectancy of women smokers in the study period grows faster.

***Key words**: smoking, mortality, causes of death, life expectancy, healthy life expectancy.*

INTRODUCTION

Smoking is an important factor in preventable mortality. Beginning, as a rule, already in adolescence[1], by the age of 30-35 it becomes the cause of significant differences in mortality between smokers and non-smokers.

Due to the higher prevalence of smoking among men (in 2017, according to the HSE RLMS, 43% of men and 14% of women in Russia smoked[2]), smoking is especially noticeable for male mortality, including at working ages.

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THE ORIGINAL ARTICLE IN RUSSIAN WAS PUBLISHED IN DEMOGRAPHIC REVIEW 2019. 6(3): 31-57.
DOI: 10.17323/DEMREVIEW.V6I3.9854

[1] According to the author's calculations for 2017, to the question "Could you please recall when you started smoking? How old were you then?", among current smokers more than 80% of men and more than 65% of women replied that they had started smoking before the age of 20.

[2] The data of specialized surveys on questions of tobacco consumption give, as a rule, higher estimates than sociological surveys of households. In particular, in the presence of other relatives, some of the respondents - more often women and youth (Hwang et al. 2018) - may hide the fact that they smoke (Perlman et al. 2007; Laatikainen, Vartiainen, Puska 1999). According to the GATS (World Health Organization 2016) specialized global survey, 50% of men and 15% of women in Russia smoked in 2016.

Long-term observations of significant groups of smokers and non-smokers as part of prospective mortality surveys conducted in many countries on international (see, for example, (Oza et al. 2011; National Center ... 2014) and Russian data (Plavinsky, Plavinskaya 2012; Konstantinov and et al. 2007), allowed us to identify a number of diseases that can be caused by smoking and to assess how much higher the risks of death from these diseases are at certain ages for smokers compared with non-smokers (see the example of the estimates in table 1). By combining such estimates of relative risks with data on mortality by causes of death and on the proportion of smokers among different age and gender groups, the contribution of smoking to total mortality can be determined. Such calculations have been made before. For example, (Maslennikova, Oganov 2011) used similar methods to estimate tobacco-related mortality in 2009 at 278,000 people, or 14% of all deaths.

Of interest is the effect of smoking on both life expectancy and healthy life expectancy. This study attempts to answer a number of questions. In particular, we were interested in the extent to which changes in life expectancy in 2004-2017 were due to changes in mortality from diseases caused by smoking. Another object of study was the dynamics of life expectancy and healthy life expectancy of smokers and non-smokers, as well as its gender characteristics. The final section of the article provides comparative data on the effect of smoking on life expectancy in Russia and other countries (using as examples the USA and India).

LITERATURE REVIEW

Since 2003, life expectancy in Russia has been growing, making this the longest period of improvement in mortality rates since the mid-1960s (Shkolnikov et al. 2014). But a comparison with the values of half a century ago does not show an improvement in the mortality structure; the age distribution of mortality from large classes of causes has not changed, which allows us to conclude that there are no signs of a second epidemiological transition in Russia (Vishnevsky 2015).

The work (Shkolnikov et al. 2013) notes that the improvement in mortality dynamics in the 2000s was mainly due to the decrease in mortality from cardiovascular diseases and external causes among adults. The authors note a larger effect on the reduction in mortality from circulatory diseases and especially from cerebrovascular diseases, which makes the current situation in Russia partly similar to the changes both in the countries of Central Europe in the 1990-2000s and in Western European countries in the 1970s, what is called the “cardiovascular revolution.” But the question of how sustainable this trend is trend remains open.

The same authors in the study (Shkolnikov et al. 2014) note that excess mortality in Russia can be reduced, including by further reducing tobacco consumption (along with a decrease in alcohol consumption and an increase in the effectiveness of the national healthcare system).

The work (Grigoriev et al. 2014) explores the components and factors of the steady decline in mortality in Russia observed since 2003. Using data on mortality by cause of death, the main elements of recent improvements were determined - a combination of factors due to changes in behavior (reduced alcohol consumption, improved diet) and the implementation of healthcare policies (using drugs to lower blood pressure, expanding access and using high-tech medical and

surgical interventions), as well as an improved economic situation of the population. The authors conclude that, despite a certain similarity between the Russian trend and the initial stages of mortality reduction in a number of European countries (France, Poland and Estonia), one cannot exclude the possibility of a return to stagnation of mortality due to the insufficient willingness of the authorities and society to pay adequate attention to public health care.

In addition, Russia's significant lag in life expectancy behind not only developed countries, but also behind countries with similar levels of economic development persists. Thus, life expectancy in Russia is significantly lower than the level predicted by the Preston curve, which establishes a relationship between life expectancy and GDP per capita. According to the results presented in the work (Andreev, Shkolnikov 2018), in 2010 the difference between model and actual life expectancy for Russia was 8.7 years and was the highest among the 57 countries included in the calculations.

A significant effect of smoking on mortality has been repeatedly proven, including for Russian data. For example, according to the results of a prospective study of mortality among residents of St. Petersburg over the course of 30 years, mortality from all causes among men was for smokers more than double the mortality of never-smokers (Plavinsky, Plavinskaya 2012). A retrospective study of male mortality in Tomsk in 1990-2001 showed that between the ages 15-74, smoking increases the risk of death by 1.5 times, and at working age - more than 2 times (Efimova et al. 2017). Female smoking is no less dangerous. In a prospective study of mortality among residents of Moscow aged 20 and older, the relative risks of mortality from all causes for moderate smokers and ex-smokers were assessed as 1.86 and 1.25, respectively (Konstantinov et al. 2007).

A study carried out on the panel data of a national representative survey of the Russian Monitoring of the Economic Situation and Health of the National Research University - Higher School of Economics (hereinafter RLMS) showed that smoking is comparable in terms of its influence on mortality to excessive consumption of alcohol: relative mortality risks for smokers and respondents with a dangerous type of alcohol consumption were 1.64 and 1.56, respectively (Denisova 2010).

The tobacco epidemic in Russia began in the Soviet era, when it was widespread mainly among men. In the 1990s, it continued to gain momentum: smoking prevalence among men reached its maximum and then stopped for a long time, while the proportion of women smokers almost doubled over this period (Perlman et al. 2007).

By the end of the 2000s, when the negative consequences of mass smoking became apparent not only to experts, but to society as a whole, the tobacco control policy was significantly strengthened: a ban on smoking in public places was introduced, advertising was prohibited, excise taxes on cigarettes and other tobacco products began to increase noticeably[3]. Over the past decade,

[3] Most of the non-excise measures restricting the consumption of tobacco products were introduced by Federal Law No. 15-FZ "On the Protection of Citizens' Health from Exposure to Tobacco Smoke and the Consequences of Tobacco Use" dated February 23, 2013.

noticeable changes have occurred in smoking in Russia: for the first time in the post-Soviet period, the prevalence of smoking has steadily declined.

In a recent work (Quirmbach, Gerry 2016), it was concluded that the dynamics of smoking in Russia as a whole repeat the main stages of the development of the tobacco epidemic previously observed in other countries. In particular, the authors note a change in the behavior of different generations of smokers, as well as a steady decrease in gender differences in the prevalence of smoking.

METHODOLOGY

Data

The calculations used estimates of the relative risks of mortality from a number of diseases caused by smoking on the data of the second round of the American Cancer Prevention Study CPS II (Oza et al. 2011). The relative risk values used are shown in Table 1. The CPS II survey[4] was conducted by the American Cancer Society over a 24-year period and included observations of 1.2 million people in all 50 states, the District of Columbia and Puerto Rico. The purpose of this large-scale prospective survey was to examine the relationship between individual factors and lifestyle characteristics, including nutrition and bad habits, and the risk of developing cancer and other diseases.

The survey questionnaire included questions about the physical and demographic characteristics of respondents, their personal and family history of cancer and other diseases, the use of drugs and vitamins, the reproductive behavior of women, work in harmful industries, eating habits, smoking and drinking, physical education and sports and other aspects of personal behavior. Over 24 years of observation (from 1982 to 2006), 491,188 deaths were recorded as part of the survey, with the cause of death being recorded for 99.3% of them. Estimates of the relative mortality risks obtained using the survey data have a significantly higher level of detail both by gender and age groups and by the list of diseases compared to similar Russian prospective mortality surveys (Plavinsky, Plavinskaya 2012; Konstantinov et al. 2007; Efimova et al. 2017).

To estimate the prevalence of smoking and health status, data from the RLMS of the Higher School of Economics[5] from 1994 to 2017 were used.

The main source of information for estimating mortality from diseases caused by smoking is the Russian NES[6] database on fertility and mortality (mortality rates by cause of death and average annual population for five-year age and gender groups, 1994-2017).

[4] See (Calle et al. 2002), and the American Cancer Society site survey URL: https://www.cancer.org/research/we-conduct-cancer-research/epidemiology/cancer-prevention-study -2.html

[5] Russian monitoring of the economic situation and public health of the HSE (RLMS HSE), conducted by the Higher School of Economics National Research University and Demoscope LLC with the participation of the Population Center of the University of North Carolina at Chapel Hill and the Institute of Sociology of the Federal Research Sociological Center of the Russian Academy of Sciences. (RLMS HSE Survey Sites: URL: http://www.cpc.unc.edu/projects/rlms and URL: http://www.hse.ru/rlms).

[6] URL: http://demogr.nes.ru/index.php/ru/demogr_indicat/data

Estimated smoking prevalence and poor / good health by gender and age

To assess the prevalence of smoking, RLMS data for 1994-2007 were used. Smokers were considered those respondents who gave a positive answer to the question "Do you currently smoke?", and ex-smokers – those who gave a negative answer to the question about smoking at present and a positive answer to the question "Have you ever smoked?"

In the research literature, the problem of accounting for the delayed effect of smoking on health and mortality is addressed in different ways. One possible solution is the Peto-Lopez approach (Peto et al. 1992), which involves the use of the smoking impact ratio (SIR) on public health. The value of the impact ratio of smoking, SIR, is determined by comparing mortality from lung cancer in the study population and in the reference group, usually borrowed from the previously mentioned American Cancer Prevention Survey CPS II. The fact is that lung cancer in the vast majority of cases is caused precisely by active or passive smoking. The impact level of smoking, SIR, is defined as:

$$SIR = [(C_{LC} - N_{LC})/(S^*_{LC} - N^*_{LC})] \times (N^*_{LC}/N_{LC}), \quad (1)$$

where C_{LC} and N_{LC} are the mortality rates for lung cancer for the studied population as a whole and for those who never smoked, respectively, and S^*_{LC} and N^*_{LC} are the mortality rates for lung cancer for smokers and non-smokers in the control group. The N^*_{LC}/N_{LC} correction factor is necessary in cases where, in addition to smoking, there are other factors that significantly affect mortality from lung cancer, for example, the use of coal for heating and cooking, a high level of incarceration, etc.

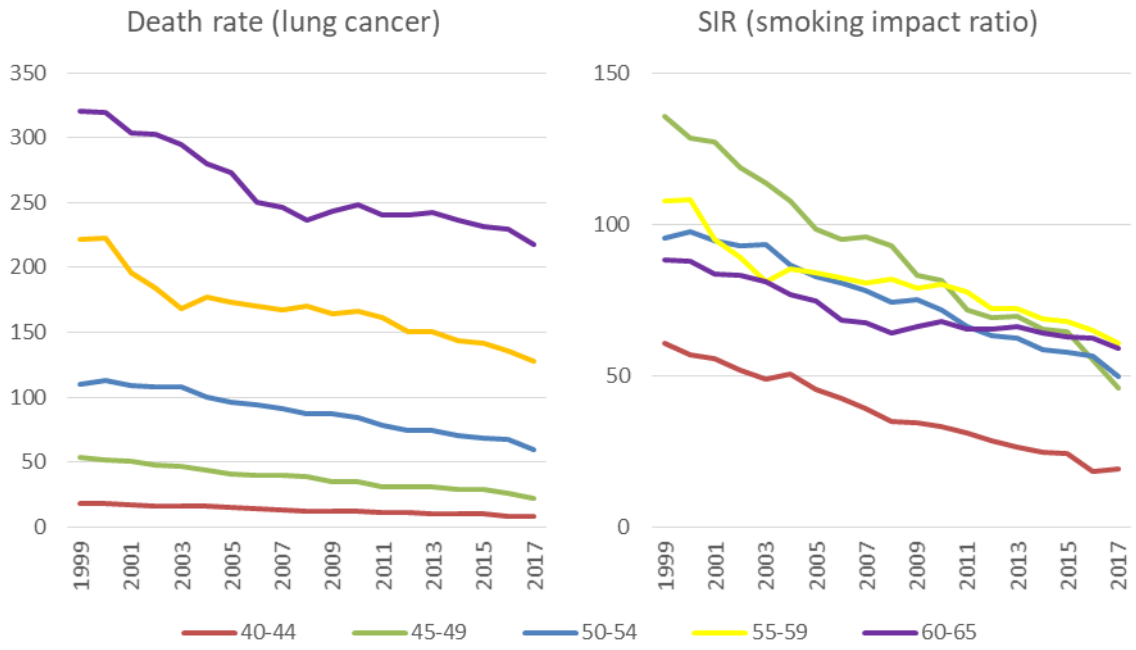

Figure 1. Dynamics of male mortality from lung cancer and the smoking impact ratio (SIR) determined on their basis, 1999-2017

Source: Author's calculations based on data from the Russian database on fertility and mortality.

In the course of our study, an attempt was made to apply the SIR method to Russian data starting from the 2000s. However, due to the very high mortality rate from lung cancer in the first half of the 2000s, the accumulated negative effect of smoking for some groups, in particular for men 45-49 years old, turns out to be higher than 100% (Figure 1).

Table 1. Relative mortality risks from a number of diseases for current smokers and former smokers compared to never smokers

	Men		Women	
	Current Smokers	Former smokers	Current Smokers	Former smokers
Neoplasms				
trachea, bronchi, lungs (C33, C34)	21.3	8.3	12.5	4.8
lips, oral cavity and pharynx (C00-C14), esophagus (C15) and larynx (C32)	8.1	4.4	6.0	3.0
stomach (C16)	2.16	1.55	1.49	1.36
liver (C22)	2.33	1.81	1.5	1.69
pancreas (C25)	2.2	1.2	2.2	1.6
cervix (C53)	0	0	1.5	1.4
bladder (C67)	3.0	2.0	2.4	2.0
leukemia (C91-C95)	1.89	1.3	1.23	1.3
rectum (C18-C21)	1.32	1.15	1.41	1.22
kidney and other urinary organs	2.5	1.8	1.5	1.2
Cardiovascular diseases				
Coronary heart disease (I20-I25), 30-44 years	5.51	1.18	2.26	2.22
Coronary heart disease (I20-I25), 45-59 years	3.04	1.64	3.78	1.74
Coronary heart disease (I20-I25), 60-69 years of age	1.88	1.29	2.53	1.34
Coronary heart disease (I20-I25), 70-79 years old	1.44	1.13	1.68	1.40
Coronary heart disease (I20-I25), 80 years old and over	1.05	1.02	1.38	1.40
Cerebrovascular disease (I60-I69), 30-44 years	1	1	1	1
Cerebrovascular disease (I60-I69), 45-59 years	3.12	1	4.61	1.44
Cerebrovascular disease (I60-I69), 60-69 years of age	1.87	1.19	2.81	1.44
Cerebrovascular disease (I60-I69), 70-79 years	1.39	1	1.95	1.36
Cerebrovascular disease (I60-I69), 80 years and older	1.05	1	1	1
Hypertension (I10-I15)	1.96	1	2.12	1.12
Other cardiovascular diseases (I00-I09, I26-I51, I70-I99)	2.15	1.3	2.0	1.34
Respiratory diseases				
Bronchitis, emphysema and other chronic obstructive pulmonary diseases (J20-J22, J40-J44)	10.8	7.8	12.3	8.9
Other respiratory diseases (pneumonia, asthma, flu) (J09-J18, J45-J46)	1.9	1.4	2.2	1.2
Tuberculosis (A15-A19)	1.62	1.58	1.62	1.58
Diabetes (E10-E14)	1.42	1.1	1.14	1

Sources: (Oza et al. 2011: table 1), as well as (Ezzati et al. 2005a: table 1) - neoplasms, (Thun, Apicella, Henley 2000: table 4) - respiratory diseases, (Ezzati et al. 2005b : table 1) - cardiovascular disease.

Due to the impossibility of using the SIR coefficient, the proportion of the population affected by the negative effects of smoking was estimated using data on smoking prevalence (National Center ... 2014; Oza et al. 2011). Many authors (Kong et al. 2016; Liutkute et al. 2017) use data on smoking prevalence with a lag of 8, 10, or 20 years to take into account the delayed effect of smoking on health and mortality. The period of observation of smoking in the RLMS began in 1994, for which reason it was decided to use a lag of 10 years, making it possible to track the dynamics of the indicator from 2004 through 2017.

To estimate the share of the population with poor health, RLMS data for 2004-2017 were used. Respondents were considered to have poor health if they answered the question "How do you assess your health?" with the answer "bad" or "completely bad". A similar method of assessment is used in the methodology for calculating the indicator "Healthy life expectancy (years)"[7].

Mortality from smoking-related diseases

To estimate the mortality from diseases caused by smoking, we calculated the coefficient of additional risk due to smoking, the PAF (population attributable fraction), separately for the types of diseases and age and gender groups:

$$PAF_{ij} = \left(\left(p_j^{(0)} + p_j^{(1)} \times RR_{ij}^{(1)} + p_j^{(2)} \times RR_{ij}^{(2)}\right) - 1\right) / \left(p_j^{(0)} + p_j^{(1)} \times RR_{ij}^{(1)} + p_j^{(2)} \times RR_{ij}^{(2)}\right), \quad (2)$$

where $p_j^{(0)}, p_j^{(1)}, p_j^{(2)}$ is the prevalence of smoking in the age and gender group j among never-smokers, ex-smokers and smokers, respectively, and $RR_{ij}^{(1)}$ and $RR_{ij}^{(2)}$ are the relative death risks for ex-smokers and smokers from disease i in the age and gender group j compared to never-smokers. The prevalence of smoking depending on the status of the smoker for various age and gender groups was calculated on the basis of RLMS data with a lag of 10 years. The relative risks of death were taken from studies using the CPS II survey data ((Oza et al. 2011: table 1) and others) and are presented in table 1.

The number of additional deaths AM (here, mortality attributed to smoking) for a given disease is calculated as $AM = OM \times PAF$, where OM is the total number of deaths from a given cause of death, taken from official mortality data.

Age-specific mortality rates for smokers, ex-smokers and non-smokers

Knowing the relative risks of death (RR), smoking prevalence (p), and mortality rates by cause of death for five-year age groups (m^{total}), we can calculate the mortality rates from disease i for age group j for smokers ($m_{ij}^{(2)}$), ex-smokers ($m_{ij}^{(1)}$) and never-smokers ($m_{ij}^{(0)}$):

$$\begin{aligned} m_{ij}^{(2)} &= m_{ij}^{total} * \frac{RR_{ij}^{(2)}}{p_j^{(0)} + p_j^{(1)} * RR_{ij}^{(1)} + p_j^{(2)} * RR_{ij}^{(2)}}; \\ m_{ij}^{(1)} &= m_{ij}^{total} * \frac{RR_{ij}^{(1)}}{p_j^{(0)} + p_j^{(1)} * RR_{ij}^{(1)} + p_j^{(2)} * RR_{ij}^{(2)}}; \\ m_{ij}^{(0)} &= m_{ij}^{total} * \frac{1}{p_j^{(0)} + p_j^{(1)} * RR_{ij}^{(1)} + p_j^{(2)} * RR_{ij}^{(2)}}. \end{aligned} \quad (3)$$

[7] Rosstat order of February 25, 2019 No. 95 "On approval of the methodology for calculating the indicator 'Healthy life expectancy (years).'" URL: http://www.consultant.ru/document/cons_doc_LAW_319186/076a4f37654d826be73fe6c5347bee3830e053

Then, using the standard technique for constructing mortality tables[8], we can calculate the life expectancy for smokers, ex-smokers and never-smokers. Similarly, dividing the totality of people in each age group into two groups, those with poor health and the rest, the values of the healthy life expectancy for these three groups of the population are calculated.

The contribution of changes in mortality by age groups and causes of death to the dynamics of life expectancy (decomposition method)

When analyzing the contribution to the increase in life expectancy of changes in mortality of certain age groups and mortality from various causes, the decomposition method was used (Andreev, Shkolnikov, Begun 2002); see also recent examples of the application of the method in (Timonin et al. 2017; Papanova, Shkolnikov, Timonin 2019). The calculations used a numerical decomposition program from a technical report (Andreev, Shkolnikov 2012: Example 1: decomposition of differences in life expectancy at birth by age and causes of death for two populations). Two examples were considered: 1) the contribution to the differences between life expectancy in 2004 and 2017 of diseases caused by smoking; 2) the contribution of the main classes of diseases to the differences in the life expectancy of smokers and non-smokers in 2004 and 2017.

RESULTS

The dynamics of mortality due to smoking

Since 2004, Russia has witnessed a long period of decline in mortality and an increase in life expectancy, against which, according to the calculations, the mortality from diseases caused by smoking was reduced. According to the results, in 2017 smoking was the direct cause of 211.5 thousand deaths among men and 23.4 thousand deaths among women (table 2). The absolute values of mortality due to smoking have been steadily decreasing since 2005, generally repeating the changes that occurred during this period in all-cause mortality. However, data across the entire population mask significant gender differences: the main decrease in tobacco mortality occurred among men.

One possible explanation of what is happening is offered by the theory of the tobacco epidemic (Lopez, Collishaw, Piha 1994). The tobacco epidemic among men began earlier and is now at a more mature stage compared to the female one. For women, smoking in many respects continues to be one of the manifestations of emancipation or, on the contrary, an attribute of more successful male behavior, as well as a possible struggle with stress, overweight, etc. Use of lagged data on smoking prevalence (to take into account the delayed effect of smoking on health, when calculations looked at data with a 10-year shift) only enhances this effect. And if for men smoking in 1994-2007 stabilized (albeit at very high values), the proportion of women smokers during this period increased markedly. As a result, even the favorable dynamics of mortality from

[8] See (Preston, Heuveline, Guillot 2001: 49); when calculating a_0 for a given m0, the Andreev-Kingcade formula from the technical protocol Methods Protocol for the Human Mortality Database (Version 6) was used, URL: https://www.mortality.org/Public/Docs/MethodsProtocol.pdf

cardiovascular diseases in the second half of the 2000s and 2010s did not allow a reduction in the relative rates of tobacco mortality for women (Figure 2); see also (Kalabikhina, Kuznetsova 2019).

Table 2. Prevalence of smoking, number of deaths and standardized mortality rates[9] from diseases caused by smoking. Russia, 2004-2017

Year	Smoking prevalence, % (with a 10-year lag)		Deaths from diseases caused by smoking, persons		Standardized death rate, per 100,000	
	men	women	men	women	me	women
2004	57.6	9.2	296 830	24 401	492.0	24.4
2005	59.6	9.1	301 059	24 730	494.3	25.4
2006	59.7	9.8	276 705	21 666	453.4	22.2
2007	59.3	10.2	263 561	22 984	430.8	22.9
2008	58.8	10.5	263 153	25 001	429.8	24.8
2009	58.9	11.1	253 258	23 138	413.7	23.6
2010	58.9	11.7	249 926	21 598	404.2	22.8
2011	59.9	14.3	239 145	26 044	379.9	25.7
2012	60.9	14.2	232 907	20 618	366.3	21.5
2013	60.6	15.0	229 747	23 376	355.6	23.1
2014	60.1	15.6	226 198	21 403	345.7	21.8
2015	59.9	15.2	225 554	19 182	333.7	19.9
2016	60.4	15.7	224 550	22 817	325.8	22.6
2017	59.9	15.9	211 538	23 368	303.5	22.5

Source: Author's calculations.

Note: Data on smoking prevalence is taken with a 10-year lag in order to take into account the effect of the delayed effects on health.

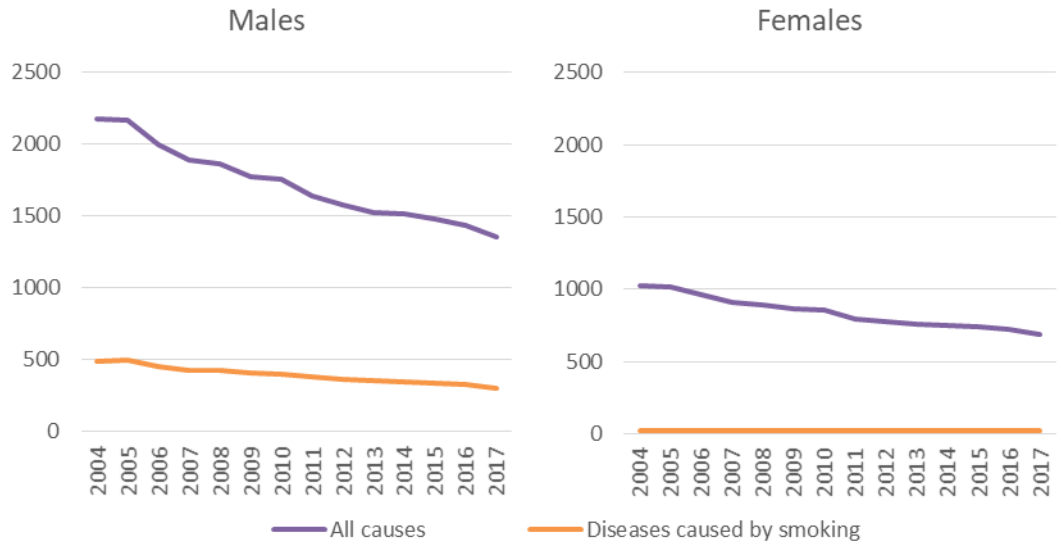

Figure 2. Standardized mortality rates for all causes and for diseases caused by smoking, 2004-2017, per 100,000

Source: Author's calculations.

[9] The WHO European standard is used. See: Rosstat (1996). Methods of standardization of indicators of natural population movement. Methodological provisions on statistics (issue 1, 2, 3, 4, 5). URL: http://www.gks.ru/bgd/free/B99_10/IssWWW.exe/Stg/d000/i000050r.htm

Dynamics of life expectancy indicators of smokers and non-smokers

By calculating the mortality tables separately for smokers, ex-smokers and never-smokers (see Appendix), we can compare the values of life expectancy for these three groups, which together give the entire adult population. The largest differences in life expectancy, as expected, are observed for smokers and never-smokers, amounting to 5.3 years for men in 2017 and 5.2 years for women. The fact of quitting smoking significantly (by 2.6 years for men and 3.2 years for women) prolongs the life of quitters (table 3).

Table 3. Life Expectancy at birth depending on smoking status, 2004-2017, years

Year	Men				Women			
	Never smoked	Used to smoke	Smoke	Difference (never smoked / smoke), years	Never smoked	Used to smoke	Smoke	Difference (never smoked / smoke), years
2004	62.6	60.1	57.2	5.4	72.7	69.3	65.9	6.7
2005	62.6	60.2	57.3	5.4	72.8	69.3	66.1	6.7
2006	64.1	61.7	58.8	5.4	73.6	70.2	67.1	6.5
2007	65.2	62.7	59.8	5.4	74.4	71.0	68.0	6.3
2008	65.6	63.1	60.2	5.4	74.7	71.3	68.3	6.3
2009	66.6	64.0	61.1	5.5	75.2	71.7	69.0	6.2
2010	66.8	64.3	61.4	5.4	75.3	71.9	69.4	5.9
2011	67.8	65.2	62.3	5.5	76.1	73.0	69.9	6.2
2012	68.3	65.8	62.9	5.4	76.4	73.2	70.5	5.8
2013	68.9	66.3	63.5	5.5	76.8	73.7	70.9	6.0
2014	68.9	66.4	63.6	5.4	77.0	74.4	71.3	5.7
2015	69.5	66.9	64.2	5.3	77.2	74.4	72.3	4.9
2016	70.1	67.6	64.9	5.3	77.6	74.3	72.2	5.3
2017	71.1	68.5	65.9	5.3	78.2	75.0	73.0	5.2

Source: Author's calculations.

The dynamics of healthy life expectancy indicators for smokers and non-smokers are presented in table 4. We used the methodology used in Russian official statistics, according to which people are considered healthy who rate their health as average, good or very good. A healthy life expectancy for both smokers and non-smokers is markedly lower than similar indicators of life expectancy, and differences for non-smokers are especially noticeable, since their additional life years compared to smokers are in old age, when self-evaluation of health decreases sharply.

As a result, the gap in life expectancy caused by smoking is reduced: if for life expectancy in 2017 it was more than 5 years, then for healthy life expectancy it is only 2.5-3 years. The healthy life expectancy of smokers depending on smoking status in 2017 was, for men, 59.8 years for smokers and 62.8 years for non-smokers, and for women - 63 years for smokers and 65.4 years for non-smokers. Of particular note is the significant gap between life expectancy and healthy life expectancy of the population: even for non-smoking women, the group with the lowest mortality risks, the healthy life expectancy is barely more than 65 years. This is due, at least in part, to the characteristics of the indicator used for the proportion of healthy people based on respondents' self-evaluation.

Table 4. Information on healthy life expectancy depending on smoking status, 2004-2017, years

Year	Men			Women		
	Never smoked	Smoke	Difference	Never smoked	Smoke	Difference
2004	55.1	52.0	3.1	57.7	54.7	3.0
2005	55.6	52.2	3.4	59.1	56.2	2.9
2006	56.3	53.2	3.2	59.5	56.7	2.8
2007	57.6	54.3	3.3	59.9	57.3	2.6
2008	58.3	54.8	3.4	59.5	57.0	2.5
2009	58.8	55.5	3.3	60.8	58.2	2.6
2010	58.1	54.9	3.1	61.5	58.7	2.7
2011	59.6	56.4	3.2	62.4	59.6	2.8
2012	60.6	57.1	3.5	63.3	60.7	2.6
2013	61.0	57.6	3.4	62.7	60.1	2.6
2014	61.3	57.9	3.4	63.9	61.2	2.7
2015	61.8	58.5	3.3	64.8	62.5	2.4
2016	62.4	59.1	3.4	64.7	62.2	2.5
2017	62.8	59.8	3.0	65.4	63.0	2.4

Source: Author's calculations.

Estimates of mortality from diseases caused by smoking have a number of limitations. Thus, the calculations did not take into account passive smoking, as well as the effect that smoking of pregnant women has on the health of their unborn children. Another important limitation is the use of relative mortality risk values for smokers compared to non-smokers obtained for another population (US population 1982–2006). The accuracy of the estimates directly depends on the quality of the RLMS data used to calculate the proportion of the healthy population and smoking prevalence.

THE CONTRIBUTION OF SMOKING TO CHANGES IN LIFE EXPECTANCY IN 2004-2017

The increase in life expectancy of men in 2017 compared to 2004 was mainly due to a decrease in mortality in older working age from 40 to 60 years, and a significant part of this improvement was associated with a decrease in mortality from diseases caused by smoking (Figure 3).

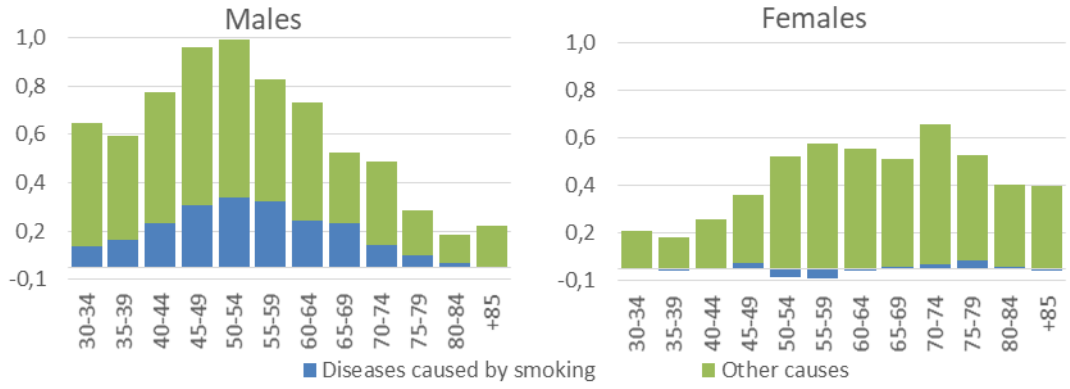

Figure 3. Contribution of mortality from diseases caused by smoking to changes in life expectancy of men and women, 2004-2017, years

Source: Author's calculations.

Decomposition of the increase in the life expectancy of women, on the contrary, shows that the change in mortality from diseases caused by smoking practically did not affect the improvement of the situation, and for some age groups (50-54 and 55-59 years) it even contributed to a certain decrease in life expectancy.

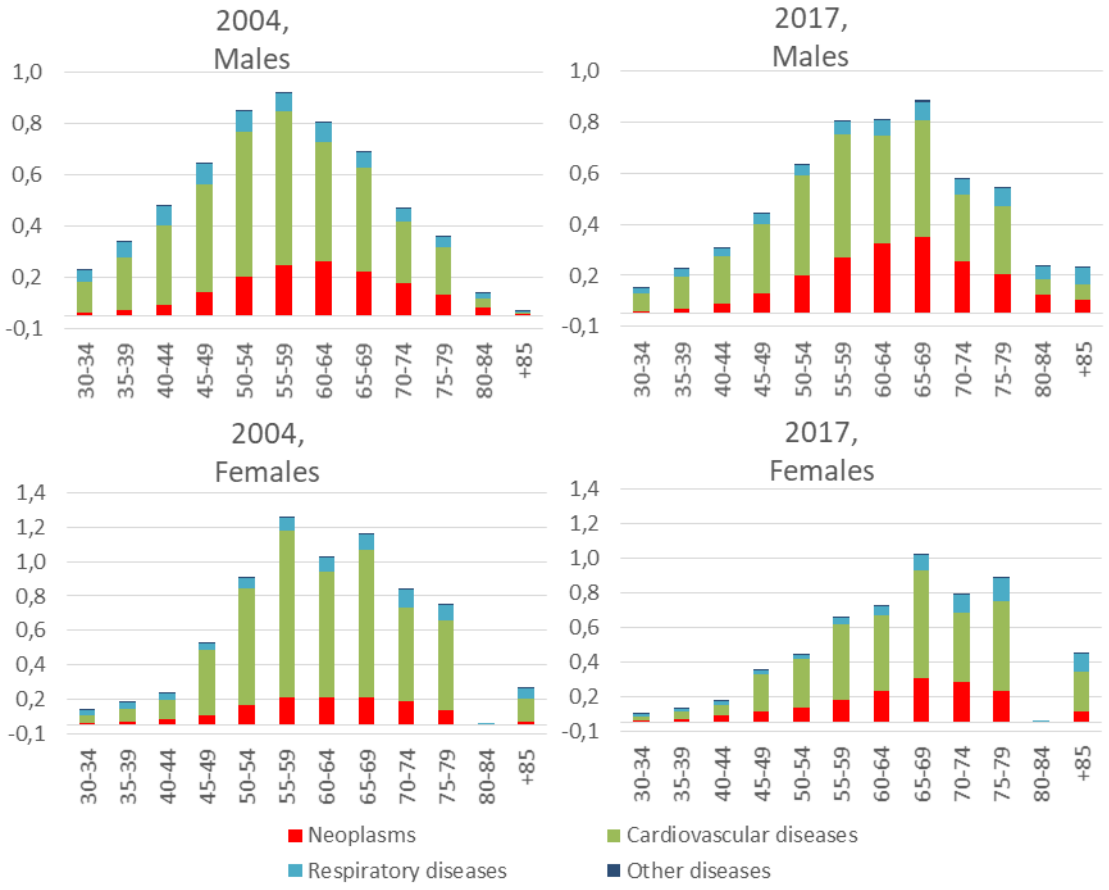

Figure 4. Contribution of mortality from various causes to differences in life expectancy of smokers and non-smokers, 2004 and 2017

Source: Author's calculations.

We emphasize that the life expectancy of women smokers from 2004 to 2017 increased more than for non-smokers: the growth for smokers and non-smokers was 7.1 and 5.5 years, respectively (table 3). Similar dynamics were observed for healthy life expectancy: the advantage of non-smokers over smokers decreased by 0.5 years (table 4). Why did this happen? One possible explanation arises when studying the contribution of changes in mortality by age groups and causes of death to the dynamics of life expectancy (Figure 4) using the decomposition method. As can be seen from the data presented, for smokers (both men and women) in 2017, compared with 2004, the advantage of non-smokers over smokers was reduced at younger ages. In particular, the advantage of non-smoking women is especially noticeable in the age range from 50 to 69 years, which is mainly due to a change in mortality from cardiovascular diseases. For men, a similar reduction in the advantage of non-smokers over smokers occurs in younger ages (from 40 to 64 years). At older ages, non-smokers compensate for their lag in the increase in life expectancy, however, since for women this effect manifests itself later, its influence is insufficient and the overall increase in life expectancy of women smokers in the study period is higher.

INTERNATIONAL COMPARISONS

In order to compare the life expectancy of smokers and non-smokers in Russia with other countries, we used data from (Jha, Peto 2014: 62), which summarizes information on four countries where nationally representative studies of the dependence of mortality on the smoking status of the deceased were conducted. Thus, according to the results of such studies, in the UK for 35-year-old men the probability of surviving to 80 is 60% for those who have never smoked, and 26% for smokers, and the differences in life expectancy for these categories are 10 years. In Japan, the probability of survival is 68 and 41%, respectively, for non-smokers and smokers, and the difference in life expectancy is 9 years.

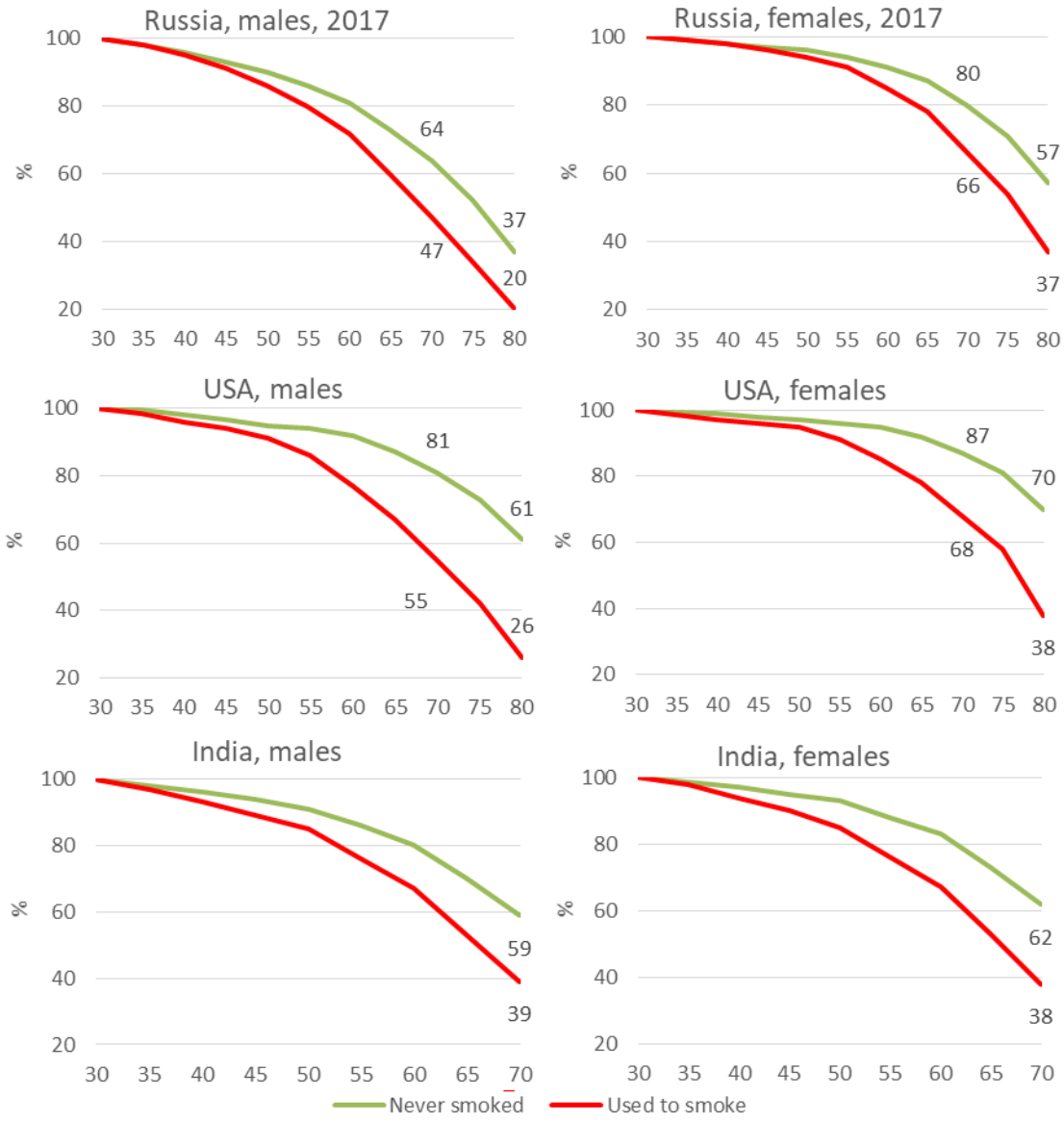

Figure 5. Probability of surviving to a certain age for people over 30 in Russia, the USA and India

Source: Russia - author's calculations; USA - (Jha et al. 2013), India - (Jha et al. 2008).

Figure 5 presents comparisons of the situation in Russia with two other countries mentioned in the article (Jha, Peto 2014): the USA (Jha et al. 2013) and India (Jha et al. 2008).

The United States was chosen as a large economically developed country, India as a country with a value of life expectancy closer to Russia's. It should be noted that for both countries we are talking about estimates of mortality caused by smoking at the beginning of the 2000s. For India, estimates were made of the probabilities of surviving to age 70, which is more relevant when comparing with Russian data. For men, they came to 59 and 39%, respectively, for non-smokers and smokers (similar values for Russia were 64 and 47%, respectively). A feature of India is the almost complete absence of gender differences in the effect of smoking on life expectancy: the proportion of women surviving to 70 years of age is 62 and 38% for non-smokers and smokers, respectively.

Comparison of the proportion of those living up to 80 years old with similar American indicators shows a significant lag in Russia in the expected life expectancy of non-smokers. If in the USA 61% of thirty-year-old men and 70% of women live to the age of 80, in Russia only 37 and 57%, respectively, do so. Similar values for smokers are much closer: in the USA - 26% of men and 38% of women, in Russia - 20% of men and 37% of women. This suggests that, in addition to smoking, in Russia there are other factors that significantly reduce life expectancy, including excessive consumption of alcohol and the low quality of public healthcare (How to overcome ... 2016).

CONCLUSION

Smoking is an important factor in preventable mortality. Long-term studies conducted both in Russia and abroad show that smokers face significantly higher mortality risks from many diseases of the cardiovascular system, respiratory system and neoplasms. This paper provides a quantitative assessment of the effect of smoking on the mortality rate of the Russian population in 2004-2017, using indicators such as standardized mortality rates, life expectancy and healthy life expectancy for smokers and non-smokers. For the estimates, we used international data on the relative risks of mortality from various diseases and Russian data on the prevalence of smoking, ill health and mortality by cause of death.

Mortality from diseases caused by smoking, according to estimates, in 2017 exceeded 220 thousand people, having significantly decreased compared to the beginning of the 2000s, following the decrease in overall mortality from cardiovascular diseases observed during this period. Among women, mortality from smoking has not declined, due to the less mature tobacco epidemic among women: having started later than among men, it has not yet reached peak smoking prevalence rates and the mortality caused by it, and smoking remains attractive to many teenage girls and young women.

According to calculations, smoking significantly reduces life expectancy. In 2017, the differences in life expectancy of smokers compared to never-smokers were 5.3 years for men and 5.2 years for women. The fact of quitting smoking noticeably (by 2.6 years for men and 3.2 years for women) prolongs the life of quitters.

Compared to 2004, the life expectancy of smokers and non-smokers increased significantly, and for smokers, the increase in life expectancy was greater, resulting in a decrease in the advantage of non-smokers in life expectancy in 2004-2017 of more than 1.5 years (in healthy

life expectancy - 0.5 years). The decomposition of differences in life expectancy between smokers and non-smokers shows that the advantage of women non-smokers mainly decreased in the age range from 50 to 69 years, the result primarily of a change in mortality from cardiovascular diseases. In men, a similar reduction in the benefits of non-smokers compared to smokers occurs in younger ages (from 40 to 64 years). At older ages, however, non-smokers compensate for their lag in growth of life expectancy, since for women this effect appears later, its influence is insufficient and the overall increase in the life expectancy of women smokers in the study period is higher.

Compared with developed countries (USA, UK, Japan), the life expectancy of smokers and non-smokers in Russia shows more noticeable gender differences. Another important feature of Russia is a significant lag in the life expectancy of non-smokers. If in the USA 61% of thirty-year-old men and 70% of women live to the age of 80, in Russia only 37 and 57%, respectively, do so. Similar values for smokers are much closer, which additionally confirms the existence in Russia, in addition to smoking, of other factors that significantly reduce life expectancy, including lifestyle-related factors (alcohol abuse, unbalanced diet, untimely medical treatment, etc.).

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APPENDIX

A1. Health Self-Assessment Data, RLMS, 2004-2017

Table A1.1. Distribution of answers to the question "Tell me, please, how do you rate your health?", Men aged 15 years and older

Year	Very good	Good	Average, not good but not bad	Bad	Very bad	Number of observations
2004	2.5	37.2	49.9	8.9	1.5	3179
2005	2.7	38.8	48.2	8.6	1.7	3013
2006	2.7	36.6	50.3	8.8	1.6	3841
2007	3.2	37.9	48.7	8.5	1.7	3707
2008	3.4	38.8	47.0	9.6	1.2	3504
2009	3.7	35.9	49.9	9.3	1.2	3387
2010	2.7	40.1	48.4	7.8	1.0	5922
2011	3.0	39.6	47.0	9.0	1.3	5974
2012	3.0	41.4	46.7	7.5	1.3	5899
2013	2.8	41.4	46.6	8.1	1.1	5555
2014	3.2	42.3	45.5	8.0	1.0	4522
2015	3.4	43.2	44.5	7.6	1.3	4414
2016	3.3	44.5	43.5	7.8	0.9	4355
2017	3.5	45.0	43.0	7.4	1.2	4368

Table A1.2. Distribution of answers to the question "Tell me, please, how do you rate your health?", Women aged 15 years and older

Year	Very good	Good	Average, not good but not bad	Bad	Very bad	Number of observations
2004	1.1	24.5	55.6	15.8	3.0	4359
2005	1.7	26.2	54.2	15.1	2.7	4120
2006	1.5	23.2	57.0	15.8	2.5	5324
2007	2.1	25.4	54.7	15.0	2.8	5146
2008	2.0	25.4	54.3	15.4	2.9	4971
2009	2.1	25.6	55.1	15.0	2.1	4844
2010	1.6	28.2	54.7	13.6	2.0	8180
2011	1.8	29.3	52.4	14.4	2.1	8184
2012	1.3	29.8	54.1	12.8	1.9	8290
2013	1.2	30.3	53.1	13.5	2.0	7743
2014	1.6	31.9	52.4	12.5	1.6	6212
2015	1.2	32.0	52.6	12.5	1.6	6130
2016	1.7	32.9	51.9	12.2	1.4	6093
2017	1.6	35.1	50.0	11.7	1.7	6019

A2. Mortality Tables by Smoking Status

Table A2.1. Mortality table of the population of Russia (never smoked)

Age x (total number of completed years)	Death rate at age x years, m (x)	Life expectancy at age x years, e (x)	Healthy life expectancy at age x years, eh (x)	Death rate at age x years, m (x)	Life expectancy at age x years, e (x)	Healthy life expectancy at age x years, eh (x)
	Men			Women		
0	0.005911	71.1	62.8	0.004826	78.2	65.4
1-4	0.000371	70.5	62.2	0.000293	77.6	64.7
5-9	0.000226	66.7	58.4	0.000173	73.7	60.9
10-14	0.000311	61.7	53.5	0.000192	68.7	55.9
15-19	0.000867	56.8	48.7	0.000382	63.8	51.0
20-24	0.001547	52.1	43.9	0.000499	58.9	46.3
25-29	0.002394	47.4	39.4	0.000801	54.1	41.5
30-34	0.003579	43.0	34.9	0.001288	49.3	36.8
35-39	0.005331	38.7	30.7	0.001996	44.6	32.3
40-44	0.006262	34.7	26.7	0.002477	40.0	27.8
45-49	0.006899	30.7	22.8	0.003082	35.5	23.4
50-54	0.008935	26.7	18.8	0.003949	31.0	19.3
55-59	0.011818	22.8	15.1	0.006008	26.5	15.2
60-64	0.019486	19.0	11.5	0.009542	22.3	11.6
65-69	0.027453	15.7	8.6	0.015424	18.2	8.3
70-74	0.039438	12.7	6.3	0.024185	14.5	5.8
75-79	0.066309	9.9	4.1	0.045274	11.0	3.8
80-84	0.099167	7.9	2.6	0.077993	8.2	2.7
85+	0.15626	6.4	1.6	0.166846	6.0	2.1

Source: Author's calculations.

Table A2.2. Mortality table of the population of Russia (previously smoked)

Age x (total number of completed years)	Death rate at age x years, m (x)	Life expectancy at age x years, e (x)	Healthy life expectancy at age x years, eh (x)	Death rate at age x years, m (x)	Life expectancy at age x years, e (x)	Healthy life expectancy at age x years, eh (x)
	Men			Women		
0	0.005911	71.1	62.8	0.004826	78.2	65.4
1-4	0.000371	70.5	62.2	0.000293	77.6	64.7
5-9	0.000226	66.7	58.4	0.000173	73.7	60.9
10-14	0.000311	61.7	53.5	0.000192	68.7	55.9
15-19	0.000867	56.8	48.7	0.000382	63.8	51.0
20-24	0.001547	52.1	43.9	0.000499	58.9	46.3
25-29	0.002394	47.4	39.4	0.000801	54.1	41.5
30-34	0.003579	43.0	34.9	0.001288	49.3	36.8
35-39	0.005331	38.7	30.7	0.001996	44.6	32.3
40-44	0.006262	34.7	26.7	0.002477	40.0	27.8
45-49	0.006899	30.7	22.8	0.003082	35.5	23.4
50-54	0.008935	26.7	18.8	0.003949	31.0	19.3
55-59	0.011818	22.8	15.1	0.006008	26.5	15.2
60-64	0.019486	19.0	11.5	0.009542	22.3	11.6
65-69	0.027453	15.7	8.6	0.015424	18.2	8.3
70-74	0.039438	12.7	6.3	0.024185	14.5	5.8
75-79	0.066309	9.9	4.1	0.045274	11.0	3.8
80-84	0.099167	7.9	2.6	0.077993	8.2	2.7
85+	0.15626	6.4	1.6	0.166846	6.0	2.1

Source: Author's calculations.

Table A2.3. Mortality table of the population of Russia (smoke)

Age x (total number of completed years)	Death rate at age x years, m (x)	Life expectancy at age x years, e (x)	Healthy life expectancy at age x years, eh (x)	Death rate at age x years, m (x)	Life expectancy at age x years, e (x)	Healthy life expectancy at age x years, eh (x)
	Men			Women		
0	0.005911	68.5	61.4	0.004826	75.0	64.0
1-4	0.000371	67.9	60.8	0.000293	74.4	63.3
5-9	0.000226	64.0	57.0	0.000173	70.5	59.5
10-14	0.000311	59.1	52.1	0.000192	65.5	54.5
15-19	0.000867	54.2	47.3	0.000382	60.6	49.7
20-24	0.001547	49.4	42.5	0.000499	55.7	44.9
25-29	0.002394	44.8	37.9	0.000801	50.8	40.1
30-34	0.003749	40.3	33.5	0.001412	46.0	35.4
35-39	0.005653	36.0	29.2	0.002227	41.3	30.9
40-44	0.006801	32.0	25.2	0.002921	36.8	26.4
45-49	0.008137	28.0	21.3	0.003844	32.3	22.1
50-54	0.01136	24.1	17.4	0.00512	27.9	18.0
55-59	0.016065	20.3	13.9	0.008254	23.5	14.0
60-64	0.026408	16.8	10.4	0.01342	19.4	10.5
65-69	0.038495	13.8	7.8	0.023385	15.6	7.4
70-74	0.050101	11.2	5.8	0.036856	12.2	5.0
75-79	0.082651	8.8	3.7	0.067404	9.2	3.2
80-84	0.115421	7.0	2.4	0.102949	6.9	2.2
85+	0.176617	5.7	1.4	0.204242	4.9	1.7

Source: Author's calculations.