

Demographic Development of Russia within the Boundaries of Human Capital Theory: Problems and Solutions

SERGEY VASENEV¹, OLGA MALININA², ALEXANDER N. MAKSIMENKO³,
EKATERINA SAPOZHNIKOVA³

Economics, Service and Entrepreneurship,
Institute of Service and Entrepreneurship (branch) of DSTU in Shakhty,
Shakhty, 147, Shevchenko str.
RUSSIA

²Shipbuilding and Marine Engineering,
Don State Technical University,
Rostov-on-Don, Gagarin Square, 1,
RUSSIA

³Faculty of Law,
Don State Technical University,
Rostov-on-Don, Gagarin Square, 1,
RUSSIA

Abstract: - The article outlines the role of the demographic situation in ensuring the development of the socio-economic system of the country. In the process of empirical research, the dynamics of the list of indicators characterizing the demographic situation in Russia is considered. The calculation of the absolute indicator of the population is presented, which allows to reveal of the numerical losses of human capital. The fact that the reduction of the country's population was due to the population of rural areas was established. It is also noted that there was a constant increase in the number of population over working age, as well as a decrease in the working-age population. The decrease in the existing volumes of human capital has led to certain economic losses expressed in the form of lost GDP, which the socio-economic system has incurred. In the context of the above trends, the preservation of the existing human capital, which can be assessed on the basis of the dynamics of indicators: life expectancy and the number of marriages and divorces, becomes a priority. The processes of human capital reproduction represent one of the important directions of demographic development in Russia. The authors determined that these processes have a negatively directed tendency to change. This problem is considered from the position of the functioning of the family institution and the dynamics of the divorce process. An analytical study of statistical data allowed us to conclude that the intensity of marriages in Russia during ten years was higher than the intensity of divorces. The calculated value of the coefficient of preservation of family relations indicates an increase in the probability of reproduction of human capital. The authors calculated the numerical value of reserve human capital in the form of the volume of potential labor force, which can provide an additional volume of GDP.

Key-Words: - Demography, socio-economic system, population size, human capital, able-bodied population, labor force.

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1 Introduction

Demography as part of the modern scientific picture of the world reveals answers to the most important questions. Among them: are the real state of affairs in the economy, the quality of the regulatory and legal system, the specifics of the worldview of the population, and many others. In particular, the

demographic structure determines the objective basis for the “normality” of GDP growth rates, [1]. Studies have shown that the processes that determine changes in population size, family composition, and life expectancy also affect activity in the labor market. As a result, economic growth is either slowed down or stimulated.

In this direction, the life expectancy of the population has a contradictory impact. Thus, it is possible to characterize the fact of reduction in the size of the market of commodity producers operating in conditions of monopolistic competition due to the increase in life expectancy and aging of the population, [2]. This fact, established on the empirical data of the Japanese economy, can probably be translated as a general pattern of the impact of demographic development. Its microeconomic justification seems to be a universal strategy of reducing the birth rate due to the need to create a "reserve fund" that ensures consumption in old age.

The focus of Russian demographic policy on increasing the life expectancy of the population may have negative consequences in the future. Therefore, an important direction of demographic policy is to reduce risks by encouraging fertility. It should be noted that the scientific work of the team of authors proves that the age structure of the labor force is a key factor in the growth of GDP per capita, [3]. The demographic shift will enable economic growth in Russia. However, this is difficult to achieve. The problems of Russia's socio-economic system are similar to those in Europe. There is a demographic decline, which may adversely affect the growth dynamics of a number of European countries, [4].

The peculiarities of demographic development also influence the possibility of population participation in economic relations and determine the rate of return of such participation. Consequently, the peculiarities of demographic development affect the state and potential of human capital utilization. Individual practical examples of this process can be positioned by differences in wage "penalties" for overeducated categories of the population with different demographic characteristics, [5]. The more divergent their values are, the more demographic characteristics play a role in income inequality, [6]. Therefore, we can agree with the position that young people, as a category of population with specific demographic characteristics, are more exposed to risks that prevent the full utilization of human capital, [7].

The degree of human capital utilization, largely determined by the conditions and qualitative features of employment, depends on demographic data, [8]. They explain the essence of contemporary processes of regionalization. Localizations with high concentration of labor force and low fertility are formed. Population from areas with a low level of human capital output but a high birth rate tends to move to these places, [9].

Demography, as part of the modern scientific picture of the world, provides answers to the most important questions. Among them: are the real state of the economy, the quality of the regulatory and legal system, the peculiarities of the population's outlook, and many others.

The dynamics of the indicators characterizing the demographic state is, among other things, an empirical marker that reveals the supply level of the socio-economic system with human capital. Human capital is a key force driving technological progress and social and economic prosperity, [10]. Therefore, any fluctuations in the demographic state are reflected in the supplies of the production and economic system with the key resources. Thus, the size of the population reflects the objective limits of the available volumes of human capital utilization in any socio-economic system. Russia characterized by extremely heterogeneous development: there is inequality related to geographical location, availability of natural resources, inequality of territories in terms of production factors, etc. [11]. Simultaneously, human capital progressively replaces physical capital as the principal driver of economic growth, [12].

Population aging and an associated slowdown in economic growth is a major concern in many countries, [13]. Authors used the demographic dividend model to study the demographic development of a country. His analysis is used in a simulation with realistic demography to show how human capital investment has varied in relation to the changing demography, [14].

In 1992, for the first time in many years, an excess of mortality over the birth rate was registered. The demographic crisis in Russia, is represented by the infamous intersection of the birth rate and death rate curves, which has been called the "Russian Cross". "Russian cross" is the name of the demographic trend in Russia, caused by the population in the last phase of the demographic transition, characterized by a gradually increasing mortality rate, [15].

2 Problem Formulation

The reduction of the existing volumes of human capital has led to certain economic losses expressed in the form of the GDP shortfall of the socio-economic system. In the context of these trends, the preservation of the existing human capital, which can be assessed by the dynamics of indicators: life expectancy, number of marriages and divorces, becomes a priority. The processes of human capital reproduction represent one of the important

directions of Russia's demographic development. Demographic processes have a negatively directed tendency to change. This problem is considered from the position of the functioning of the family institution and the dynamics of the divorce process.

3 Materials and Methods

The analytical study in the article was conducted by the authors with the help of methods of mathematical analysis of statistical data provided by the Federal State Statistics Service of the Russian Federation.

The authors of the article obtained panel data characterizing the peculiarities of Russia's demographic development in the context of eight blocks:

- 1) main demographic indicators of Russia;
- 2) Dynamics of the demographic load coefficient in Russia;
- 3) Statistical data for determining the value of the average size of GDP produced by one unit of human capital;
- 4) life expectancy of the Russian population;
- 5) The dynamics of divorce processes as an indicator of family characteristics of support for the reproduction of human capital in Russia;
- 6) Characterization of human capital in Russia through the indicators of the labor force;
- 7) potential labor force as a reserve for increasing the volume of human capital in the socio-economic system of Russia;
- 8) characterization of the use of human capital in Russia by groups of occupations.

The mentioned factual data were studied on the basis of the estimation of chain growth rates. Four indicators were calculated: the demographic load coefficient, the average size of GDP produced by one unit of human capital, and GDP losses, determined taking into account deflator indices, of the socio-economic system from human capital attrition.

The analytical study in the article was carried out by the authors using the methods of mathematical analysis. The calculations of the following indicators are presented:

- demographic load coefficient;
- the average size of GDP produced by one unit of a human capital asset;
- GDP losses;
- average coefficient of family relations preservation.

Let us calculate the value of the demographic load coefficient using the formula.

$$k_d = \frac{P_y + P_o}{P_{a-b}} \quad (1)$$

where k_d – demographic load factor;

P_y – the number of population under working age, persons;

P_o – the number of population over working age, persons.;

P_{a-b} – number of working-age population, persons.

Average GDP produced by one unit of human capital in Russia over the period 2000-2021.

$$GDP_{1 HC unit} = \frac{GDP def}{AP} \quad (2)$$

$GDP_{1 HC unit}$ - average size of GDP produced by one unit of human capital asset;

$\overline{GDP def}$ - the average size of GDP for the period under study, determined taking into account the values of GDP deflator indices;

\overline{AP} - average population for the period under study.

The following formula is used to calculate GDP losses 3.

$$\Delta GDP = GDP_{1 HC unit} \cdot \Delta POP \quad (3)$$

ΔGDP – GDP losses, determined taking into account deflator indices, of the socio-economic system from human capital retirement;

$GDP_{1 HC unit}$ – GDP per 1 unit of human capital;

ΔPOP - population dynamics.

Let's calculate the average coefficient of preservation of family relations.

$$k_{CCO} = \frac{K_m}{K_d} \quad (4)$$

k_{CCO} – marital maintenance rate;

K_m – number of marriages per 1,000 population;

K_d – number of divorces per 1,000 population.

This paper is aimed at the analytical identification of empirical data characterizing the peculiarities of demographic development of the socio-economic system of Russia. The article attempts to study demographic problems through the conceptual framework of human capital theory.

4 Results

Analysis of the population of Russia

Russia spends little on enhancing the quality of human capital and life (education, health care, infrastructure, and environment), [16].

Table 1. Main demographic indicators of Russia

Indicator	Indicator value					Growth rate	
	2000	2010	2019	2020	2021	for the period	annual average
Population, including:	146304,0	142865,0	146749,0	146171,0	145557,0	99,5 %	99,9 %
- urban	107072,0	105421,0	109563,0	109252,0	108896,0	101,7 %	100,4 %
- rural	39232,0	37444,0	37186,0	36919,0	36661,0	93,4 %	98,3 %
- under working age	28387,0	23209,0	27442,0	27387,0	27318,0	96,2 %	99,0 %
- able-bodied	88040,0	87847,0	82678,0	81881,0	83227,0	94,5 %	98,6 %
- over the working age	29877,0	31809,0	36629,0	36903,0	35013,0	117,2 %	104,0 %

In this regard, it should be noted that in Russia in the last twenty years, there has been a negative trend of population decline. In 2000, the population of the Russian Federation amounted to 146304.0 thousand people, and by 2021 its value decreased to 145557.0 thousand people. This means that in general for the period 2000-2021, the value of this indicator decreased by 0.5%. However, this process is best characterized not by the relative, but by the absolute indicator of change. Let us define it:

$$\Delta P = 145557,0 - 146304,0 = -747,0 \text{ thous. people}$$

Thus, over the period under study, the population decreased by 747.0 thousand people, which is a significant loss for Russia's human capital. Its scale is partially masked by the relative indicators of the average annual growth rate. Judging by the latter, Russia's population decreased by an average of only 0.1% annually (Table 1).

Table 1 also shows that the reduction in population in Russia was due to the decline in human capital in rural areas. This can be evidenced by focusing on the dynamics of the urban and rural population.

In the first case, during the study period 2000-2021, there was an annual increase in the urban population by an average of 0.4%. This provided an increase in the number from 107072.0 to 108896.0 thousand people or by 1824.0 thousand people. Statistical data confirm that the official number of urban population in Russia for the analyzed period has increased by 1.7%.

The opposite picture was observed when studying the trend of change in the number of rural population. In 2000-2021 there was a decrease in the value of this indicator by 6.6%. In other words, every year during the period under study the number of rural population in Russia decreased by an average of 1.7% per year. As a result, its value decreased from 39232.0 to 36661.0 thousand people, i.e. by 2662.0 thousand people.

Consequently, we can conclude that judging by the changes in the main demographic indicators, the volume of human capital in Russia during 2000-2021 decreased in rural areas exclusively. Globally, urban residents now outnumber people living in rural areas, [17]. Urban areas play a significant role in territory-oriented policies as the key drivers of development processes of countries and regions, [18]. Cities have even increased the stock of this asset in their socio-economic system. The logical explanation is the implementation of the urbanization process, which in Russia is taking place against the background of a general decline in population.

Analysis of the age balance of the population

At the same time, it should be noted that the age balance of human capital is not changing for the better. Other authors argue that increased employment rate of elderly or female workers reduces the aggregate human capital growth while increasing the available labor, [19]. Thus, the analysis of the data presented in Table 1 has allowed us to notice that the number of the population over working age has been steadily increasing in 2000-2021. In 2000, the number of this category was estimated at 29877.0 thousand people, and in 2021 its value increased by 5136.0 thousand people to 35013.0 thousand. - up to 35013.0 thousand people. This means that annually during the analyzed period the number of the Russian population aged "above working age" increased by 4.0%. As a whole, by the results of the period under study, it increased by 17.2%.

The working age population decreased from 88040.0 to 83227.0 thousand people, i.e. by 4813.0 thousand people. The analysis of the annual statistical data for the period under review showed that the number of this category of Russian citizens decreased on average by 1.4%. Over the period there was a decrease of 5.5%.

The dynamics of the age profile for 2010-2020 indicate its gradual "maturation", since the reduction in the number of this group was mainly due to the ordering of the ranks of economically inactive young people aged 15-24, which, in turn, was the result of a decrease in the total number of young people in this age, [20].

The socio-economic system of Russia during the period under study (2000-2021) showed signs of a decline in the potential for replenishing the working-age population. This can be evidenced by the dynamics of the number of the population below working age. On average for this period, its value annually decreased by 1.0%, which resulted in a total reduction of 3.8%. Thus, the number of Russia's population below working age decreased from 28387.0 to 27318.0 thousand people, i.e. by 1069.0 thousand people.

Demographic load analysis

These trends observed in the period 2000-2021 have led to an increase in the demographic burden on the able-bodied population.

The results of calculations of the demographic load coefficient are summarized in Table 2.

During the period under study in Russia, the burden on the working-age population increases steadily. Thus, if in 2000 there were on average 0.662 persons of working age for every person of non-working age, by 2021 this ratio will have increased to 0.749 persons. On average over the period, the demographic burden increases by 3.1%, leading to a total increase of 13.2% by the end of the period.

The overall demographic situation in Russia should be recognized as contradictory and

unfavorable. During the period 2000-2021, the burden on the working population increased, while the existing volume of human capital decreased. This should have led to certain economic losses, which can be calculated using the approach of estimating the size of the GDP shortfall.

The statistical data required for further calculations are summarized in Table 3.

Based on the information presented in Table 3, we will perform calculations according to formula (2). $GDP_{1\text{ HC unit}} = \frac{12,61}{145,53} = 0,087 \text{ RUB mln. per unit}$

The calculations show that on average for the period under consideration, 2000-2021, one unit of human capital in Russia produced 0.087 million rubles. GDP. Earlier in this article, the total loss of human capital in Russia was determined, which amounted to 747.0 thousand people. Therefore, using formula (3), we can determine the amount of losses incurred by the Russian socio-economic system due to the loss of human capital from the sphere of social production.

$$\Delta GDP = 0,087 \cdot 747,0 = 64,989 \text{ billion rubles.}$$

Based on these calculations, we can assume that the approximate amount of losses incurred by the socio-economic system from the reduction of available volumes of human capital in Russia in 2000-2021 can be estimated at 64.989 billion rubles.

Analysis of population life expectancy

This fact is significant. Consequently, the preservation of the existing human capital becomes a priority. The state of the latter process can be judged by the dynamics of life expectancy at birth (Table 4).

Table 2. Dynamics of the demographic load coefficient in Russia

Indicator	Indicator value					Growth rate	
	2000	2010	2019	2020	2021	for the period	annual average
Demographic load factor	0,662	0,626	0,775	0,785	0,749	113,2 %	103,1%

Source: Compiled by the authors

Table 3. Statistical data for determining the value of average GDP produced by one unit of human capital

Indicator	Unit	Indicator value					Period average
		2000	2010	2019	2020	2021	
GDP	trillion rubles	7,31	46,31	109,61	107,66	135,29	81,24
GDP deflator indices	-	1,00	3,96	7,47	7,54	8,97	5,79
GDP including deflator indices	trillion rubles	7,31	11,69	14,67	14,28	15,08	12,61
Population size	million people	146,3	142,9	146,7	146,2	145,6	145,53

Table 4. Life expectancy of the Russian population, years

Indicator	Indicator value					Growth rate	
	2000	2010	2019	2020	2021	for the period	annual average
The entire population, including:	65,34	68,94	73,34	71,54	70,06	107,2 %	101,8 %
- men	59,03	63,09	68,24	66,49	65,51	111,0 %	102,6 %
- women	72,26	74,88	78,17	76,43	74,51	103,1 %	100,8 %

Table 5. Dynamics of Divorce Processes as an Indicator of Family Characteristics of Supporting Human Capital Reproduction in Russia

Indicator	Unit	Indicator value					Growth rate	
		2000	2010	2019	2020	2021	for the period	annual average
Marriages	Thousand units	897,3	1215,1	950,2	770,9	923,5	102,9 %	100,7 %
Divorces	Thousand units	627,7	639,3	620,7	564,7	644,2	102,6 %	100,7 %
Marriages	units per 1000 people	6,2	8,5	6,5	5,3	6,3	101,6 %	100,4 %
Divorces	units per 1000 people	4,3	4,5	4,2	3,9	4,4	102,3 %	100,6 %

Table 4 shows that the situation with the preservation of human capital in the Russian socio-economic system is positive. The life expectancy of the population as a whole has increased by 7.2%. If in 2000 its value was 65.34 years, by 2021 it will have increased by 4.72 years. This means that the average annual increase in the life expectancy of the Russian population between 2000 and 2021 was 1.8%. At the end of the analysed period its value increased by 7.2%.

The above-mentioned positive trend was formed to a greater extent due to the increase in the life expectancy of men. A distinctive feature of Russia is that men live much shorter lives than women: their life expectancy is on average 10 years shorter, [21]. In 2000, its value averaged 59.03 years, and by 2021 it increased by 6.48 years. The annual increase in life expectancy of the population increased by 2.6% on average and in general, for the period 2000-2021, the value of the latter indicator for men increased by 11.0%.

The dynamics of life expectancy in women were smoother. In general, its value increased by 3.1% during the study period. In 2000, it was 72.26 years, and in 2021 - 75.51 years. Thus, in 2000-2021 life expectancy of women in Russia increased by 2.25 years. This means that its value increased by 0.8% per year on average over this period.

It is worth noting that the Russian socio-economic system, at its current stage of development, still has the potential to increase life expectancy. This statement is due to the relatively

low value of this indicator for men. If the life expectancy for women in Russia in 2021 is 74.51 years, it will be only 65.51 years for men, i.e. 9.0 years lower. This leaves a certain reserve for increasing the total duration of the period of preservation of human capital as an asset of the socio-economic system of Russia.

Analyzing the trend of divorces and marriages

At the same time, the processes of human capital reproduction remain the most important among the directions of Russia's demographic development. The study notes that these processes have a negative tendency to change. However, we can look at this problem from the other side - from the perspective of the functioning of the family institution and the dynamics of the divorce process. Divorce has an indirect or direct impact on children, families, the economy, and society as a whole, [22].

It should be noted that the number of marriages in Russia fluctuates constantly. In general, a positive dynamic was observed during the period analyzed. For 2000-2021 the number of marriages increased on average by 0.7% per year. In 2000, 897.3 thousand units were registered, and in 2021 - already 923.5 thousand units of marriage. As a result, during this period the number of marriages concluded in Russia increased by 2.9% (Table 5).

Negative changes associated with the number of divorces are compensated by the positive dynamics of the number of concluded marriages in Russia. In general, during the period under study, 2000-2021,

the total number of divorces in Russia increased from 627.7 to 644.2 thousand units, i.e. by 16.5 thousand units or 2.6%. Annually, the number of divorces in Russia increases on average by 0.6%.

However, the situation looks relatively favorable, as still the number of marriages exceeds the number of divorces. In 2021, there will be 6.3 units of marriage and only 4.4 units of divorce per 1,000 people in Russia. - divorce. Next, let us calculate the average coefficient of preservation of family relations (formula 4).

$$k_{CCO\ 2000} = \frac{6,2}{4,3} = 1,4$$

$$k_{CCO\ 2010} = \frac{8,5}{4,5} = 1,9$$

$$k_{CCO\ 2019} = \frac{6,5}{4,2} = 1,5$$

$$k_{CCO\ 2020} = \frac{5,3}{3,9} = 1,4$$

$$k_{CCO\ 2021} = \frac{6,3}{4,4} = 1,4$$

Then, the mean value of the family preservation rate for the period 2000-2021 is:

$$k_{CCO} = \frac{1,4 + 1,9 + 1,5 + 1,4 + 1,4}{5} = 1,5$$

As a result, the intensity of marriages in Russia during the period analyzed was 1.5 times higher than the intensity of divorces. The value of the coefficient of preservation of family relations indicates an increase in the probability of both the reproduction of human capital and ensuring its development. The family is the key institution of socialization, revealing and strengthening the human potential of all the members of a prosperous family. All this is the main condition for ensuring growth in the quality of human capital. As a result, economic growth is ensured along with increasing competitiveness of the socio-economic system.

In general, the demographic state of the Russian socioeconomic system should be assessed as contradictory. A serious problem is the trend of population decrease. In the period 2000-2021, this problem affected only rural settlements, so it did not critically affect the development of the socio-economic system. If it continues, the severity of the problem may increase significantly. Population decline can be influenced by the factors of scientific and technological progress, which in turn will increase agricultural productivity.

On the other hand, there is a tendency in Russia to increase the duration of human capital. At the same time, the situation with divorce processes is improving substantially. All this allows us to expect

the development of human capital and an increase of its qualitative component. The latter should be accompanied by a more efficient use of it.

Analysis of unemployment and employment

The size of the population and other parameters previously introduced into the analysis reveal the relationship between demographic development and the state of the processes of formation and maintenance of human capital in the socio-economic system of Russia. However, what is important for the latter is not the mere existence of human capital, but the possibilities of its effective use. The primary indicator for this is the overall dynamics of the labor force, which is additionally described by the parameters of employment and unemployment.

The labor force is a cross-section of demographic indicators that fully meets the requirements of the definition of "human capital". Thus, despite the constant decrease in the population, the socio-economic system of Russia does not experience serious limitations in its development. Due to the fact that the number of the labor force remains sufficiently stable, the change in the human capital of the population takes place gradually. Economic growth reduces poverty in the long-run, while unemployment inflates poverty in the long-run, [23].

So for the period 2019-2021, the volume of labor available in the socio-economic system of Russia decreased only by 0.1%. In 2019, its level amounted to 75398.0 thousand people, and in 2021 it decreased by 48.0 thousand people. At the same time, the assessment of the average annual rates of change showed no fluctuations. Based on the dynamics of the labor force indicator, we can affirmatively state that the socioeconomic system of Russia has not recently experienced a deficit in human capital (Table 6).

The above conclusion is supported by statistical data characterizing the dynamics of the number of unemployed. Retrospective analysis of the statistical data for the period 2019-2021 shows that the value of the number of unemployed has been constantly increasing by an average of 2.4% per year. As a result, the total number of unemployed has increased from 3,465.0 to 3,631.0 thousand people, which is estimated at 166.0 thousand people. In relative terms, this means that the total number of unemployed increased by 4.8% during the period under review.

It should be noted that this trend has mainly affected the female part of the Russian population. It is this category that has found it most difficult to use its human capital.

Table 6. Characteristics of Russia's human capital through labor force indicators, ths. people

Indicator	2019	2020	2021	Growth rate	
				within the period	annual average
1) Labor force:	75398	74923	75350	99,9 %	100,0 %
- men	38758	38445	38729	99,9 %	100,0 %
- women	36640	36478	36621	99,9 %	100,0 %
incl.:					
1.1) employed:	71933	70601	71719	99,7 %	99,9 %
- men	36912	36208	36891	99,9 %	100,0 %
- women	35021	34393	34829	99,5 %	99,7 %
1.2) unemployed:	3465	4321	3631	104,8 %	102,4 %
- men	1846,0	2237	1838	99,6 %	99,8 %
- women	1619,0	2085,0	1792,0	110,7 %	105,2 %

Thus, in 2019-2021, the number of unemployed women increased from 1619.0 to 1792.0 thousand people, i.e. by 173.0 thousand people. This means that, in relative terms, the increase in the number of unemployed women in Russia in 2019-2021 was equal to 10.7%. In other words, the scale of unemployment for this category of the Russian population will grow by an average of 5.2% per year.

On the contrary, the scale of unemployment among the male part of the Russian population has decreased. If in 2019 the number of unemployed men amounted to 1,846.0 thousand people, in 2021 there were only 1,838.0 thousand people. On average for the period, unemployment among men decreased by 0.2% per year. In general, its value decreased by 0.4% in 2019-2021.

It was possible to establish some gender differences in the ability to use human capital. In Russia in 2019-2021 it was easier for men to apply their capital to participate in socio-economic relations. This was the main reason for the overall decrease in employment.

In general, the number of employed in the Russian economy decreased by 0.3% during the period under study in 2019-2021. In 2019, its value was equal to 71933.0 thousand people, and by 2021 it decreased to 71719.0 thousand people. Thus, the number of the employed population decreased by 214.0 thousand people, which corresponds to the average annual rate of reduction of the indicator of 0.1%.

The rate of youth unemployment is influenced by the rate and structure of employment, the level of economic development of the region and the demographic structure of the region, [24].

Analysis of potential labor force as reserves for increasing the volume of human capital

It is already clear that the trend in the overall decline in the number of employed people in Russia has mainly concerned the decline in the employment rate of women. For this indicator, a decrease of 0.5% was observed for 2019-2021. In 2019, the number of employment of the female population was 35021.0, and in 2021 - 34829.0 thousand people. There was a decrease in the value of the indicator by 192.0 thousand people, and this corresponded to an annual decrease in employment by an average of 0.3% for the period.

It is worth noting that in the analysed period there was also a decrease in the number of people who are not part of the labor force. So in 2019, they numbered 45665.0 thousand people, and in 2021 - 45462.0 people, therefore the number of the last category of the population of Russia for the analyzed period decreased by 203.0 thousand people. This makes 0.4% and means an average annual decrease of 0.2% per year.

For the category of female population, a more intensive reduction in the number of persons who are not part of the labor force was traced. Overall, there is a decrease of 0.4% for 2019-2021. In 2019 it amounted to 29548.0 and in 2021 29383.0 thousand people. During the analyzed period, the number of women not in the labor force decreased by 165.0 thousand people.

For their part, the number of males who are not part of the Russian labor force will also decrease. The total value of decrease for 2019-2021 was 0.2%. In 2019 its value was 16117.0 and in 2021 - 16079.0 thousand people, i.e. the numerical value was determined at the level of 38.0 thousand people (Table 7).

Table 7. Potential labor force as reserves for increasing the volume of human capital in Russia's socio-economic system

Indicator	2019	2020	2021	Growth rate	
				within the period	annual average
1) Persons not in the labor force:	45665	45916	45462	99,6 %	99,8 %
- men	16117	16337	16079	99,8 %	99,9 %
- women	29548	29578	29383	99,4 %	99,7 %
1.2) potential labor force:	1573	1659	1234	78,4 %	88,6 %
- men	756	811	567	75,0 %	86,6 %
- women	816	848	667	81,7 %	90,4 %
2) Number of unemployed people registered with employment agencies:	691	2773	777	112,4 %	106,0 %
- men	317	1185	339	106,9 %	103,4 %
- women	375	1588	438	116,8 %	108,1 %

It should be noted, however, that the number of females not in the labor force is almost a multiple of that of males. On average for 2019-2021, this ratio is as follows:

$$\frac{29548,0 + 29578,0 + 29383,0}{16117,0 + 16337,0 + 16079,0} = 1,8$$

Thus, the number of women not in the labor force is 1.8 times higher than the same indicator for men. However, when analyzing the indicator "potential labor force" this disproportion is smoothed out. Table 7 shows the following:

$$\frac{816,0 + 848,0 + 667,0}{756,0 + 811,0 + 567,0} = 1,1$$

From this, we can conclude that the significant excess of the number of women not in the labor force over the number of men is mainly due to the higher life expectancy of the former. And to a lesser extent characterizes gender differences in the structure of the human capital reserve.

The latter is almost evenly divided between male and female parts of the Russian population. However, in the first category, its volume is decreasing more rapidly. In 2019, the size of the potential male labor force was estimated at 756.0 thousand people, and in 2021 it was already 567.0 thousand people. Thus, there was a decrease in its value by 189.0 thousand people, which is 25.0%. In turn, the number of potential female labor force for the same period decreased by 149.0 thousand people or 18.3%: from 816.0 thousand people in 2019 to 667.0 thousand people in 2021.

In general, the reserve of human capital available to the socio-economic system of Russia for the analyzed period decreased by 81.5% or by 339.0 thousand people. If in 2019 its value amounted to 1,573.0 thousand people, in 2021 it already numbered 1,234.0 thousand people. The

average annual rate of decrease in the value of this indicator for 2019-2021 is estimated at 11.4%.

Analysis of Human capital by occupation group

According to the results of the period under study, the volume of potential labor force equal to 1234.0 thousand people remained in the reserve of the socio-economic system of Russia. Knowing it, we can calculate the value of possible GDP growth by formula (3).

$$\Delta GDP = 0,087 \cdot 1234,0 = 107,358 \text{ bln. rub.}$$

The inclusion of reserve human capital in socio-economic relations is capable of providing an additional volume of GDP in an amount exceeding one hundred billion rubles. Here it is important that these are highly productive jobs that provide the market with products with high added value.

In this regard, the nature of the dynamics of human capital utilization by occupational groups is of certain interest. Information on this is presented in Table 8.

The data in Table 8 show that the number of managerial jobs in Russia's socio-economic system decreased by 3.8%: from 4.1 to 3.9 million people. To a greater extent, this trend affected men, among whom the number of managers decreased by 4.5%. In contrast, the number of managerial jobs held by women decreased by 2.8%. This indicates that a certain gender equality has been achieved and characterizes Russia's socio-economic system as a modern and equal one.

Another positive development is the overall increase in the number of highly qualified specialists in 2020-2021. While in 2020 there were only 18.6 million such jobs in the Russian economy, in 2021 there will be 18.8 million such jobs. Consequently, there was an increase of 1.0%.

Table 8. Characteristics of Russia's human capital utilization by occupation groups, mln. People

Indicator	2020			2021			Growth rate		
	Total	Men	Women	Total	Men	Women	Total, %	Men, %	Women, %
1	2	3	4	5	6	7	8	9	10
Managers	4,1	2,2	1,9	3,9	2,1	1,8	96,2	95,5	97,2
Specialists at the highest level of qualification	18,6	6,9	11,7	18,8	7,1	11,7	101,0	102,9	99,8
Specialists of intermediate level qualification	9,7	4,0	5,7	9,9	4,1	5,8	102,0	102,8	101,4
Specialists engaged in the preparation and execution of documents, accounting, and maintenance	1,9	0,3	1,6	1,9	0,3	1,6	100,0	100,0	100,0
Service and commercial employees, protection of citizens and property	10,7	3,3	7,5	11,2	3,3	7,8	104,0	102,3	104,7
Skilled workers in agriculture, forestry, fish farming and fisheries	1,8	0,9	0,8	1,7	0,9	0,8	97,3	100,0	100,0
Skilled workers in industry, construction, transportation, and related occupations	9,2	7,6	1,6	9,5	7,8	1,7	103,4	103,2	104,7
Production plants and machines operators, assemblers and drivers	9,2	8,1	1,1	9,2	8,2	1,1	100,0	100,0	100,0
Unskilled workers	5,3	2,8	2,5	5,6	3,0	2,5	104,1	106,0	101,9

At the same time, the number of women occupying these jobs significantly exceeds the number of men. In 2020, the following ratio of 11.7 to 6.9 million jobs is highlighted, and in 2021, 11.7 to 7.1 million jobs.

It also shows that during this period, the number of jobs occupied by men increased by 2.9%, while for the female part of the population, this value remained almost stable (at the scaling level in millions).

During 2020-2021, the number of jobs occupied by middle-skilled specialists increased. In 2020, there were about 9.7 million jobs in Russia's socioeconomic system in total, and by 2021 that number was 9.9 million jobs. There was an increase, which can be estimated at 2.0%. It affected both women and men. In the former case, the increase was 1.4% and in the latter one, it was 2.8%.

In addition, there was an increase in the number of unskilled jobs. And this increase was more intensive. In the Russian economy as a whole in 2020 there were 5.3 million such jobs, and in 2021 there were already 5.6 million jobs. There was an increase, which amounted to 4.1%. It should also be noted that low-skilled jobs are more or less equally distributed between women and men. However, for the latter, the growth in the number of jobs is

outpacing: the increase amounted to 6.0% in 2020-2021. For women, this value is 1.9%.

It should be noted that during the analyzed period there was a stable value of the number of jobs occupied by employees, i.e. specialists engaged in the preparation and execution of documentation, accounting, and maintenance of economic processes. Thus, in 2020-2021, the total number of such jobs in the socio-economic system of Russia amounted to 1.9 million. At the same time, only 0.3 million jobs were occupied by men and 1.6 million jobs were occupied by women.

In the sectoral breakdown, there was an increase in the number of jobs in industry, construction, transportation, trade, and service. The number of workers in service and trade, protection of citizens and property increased by 4.0% over 2020-2021. In 2020, there will be 10.7 million such jobs in Russia's socio-economic system, and in 2021 - 11.2 million jobs. At the same time, women are employed here to a greater extent. In 2020 they occupied 7.5 and in 2021 - 7.8 million such jobs.

The opposite gender structure is inherent in skilled jobs in industry, construction, and transportation. Here, among the 9.2 million jobs that existed in 2020, 7.6 million jobs were occupied by men, while in 2021 this ratio did not change

significantly and amounted to 9.5 and 7.8 million jobs. Over 2020-2021, there was an increase in the number of jobs of this type in the Russian economy as a whole by 3.4%.

The number of jobs of operators of production plants and machines remained at a stable level. During 2020-2021, about 9.2 million such jobs were allocated in the socio-economic system of Russia. This circumstance can speak about a certain type of stagnation of industrial development when the actual number of standard sizes of equipment and technological lines remains at the same level - there is no expanded reproduction.

At the same time, agriculture was the only economic activity that experienced a decline in the number of jobs. Over the 2020-2021 period, the number of skilled workers in agriculture, forestry, and fish farming fell from 1.8 million to 1.7 million jobs. Overall, the total decline over the analyzed period was 2.7%. This is quite consistent with the previously identified trend of reduction of human capital in rural areas. Consequently, this fact is caused not only by the nationwide trends of population reduction but also by economic reasons.

5 Discussion of Results

The conducted research has shown that during 2000-2021 Russia experienced a decline in population. On average for the period it amounted to 0.1% per year. It is worth noting that the urban population grew by an average of 0.4% annually, while the rural population decreased by 1.7%. Population reduction created prerequisites for the loss of human capital mainly within the boundaries of rural settlements. This is a certain peculiarity of Russia's demographic development that exists within the framework of the human capital theory.

At the same time, during 2000-2021, the number of Russia's population aged "above working age" increased. This occurred against the background of a decline in the number of two other age categories of the population: "below working age" and "at working age". As a result, the dynamics of these processes caused a deterioration in the quality of the demographic load. From 2000-2021, the value of the demographic load coefficient for the population of working age increased annually by an average of 3.1%.

In general, population decline and increasing demographic burden are evidence of the deterioration of human capital. This situation results in economic losses. In this paper, we have made calculations that show that the approximate amount of losses from the current state of human capital can

be estimated at 64.989 billion rubles. This is significant. Consequently, the tasks of preserving human capital are of priority importance.

The tasks of preserving human capital have been successfully accomplished. They have served as a basis for increasing the life expectancy of the Russian population. However, an increase in the life expectancy of the population may lead to a reduction in market volumes, lowering the birth rate.

Divorce processes are involved in the process of human capital accumulation. In the modern social system, the institution of family is a key institution in terms of the formation and development of individual human capital. In this regard, during the period under study, the same growth rates of marriages and divorces were observed. On average for 2000-2021 they were estimated at 0.7% per year.

It should be noted that the intensity of divorce increases per thousand people outpaced the intensity of marriage. The divorce rate increased on average by 0.6% per year, and the rate of marriage increased by 0.4%. This indicates an emerging problem that can lead to both qualitative and quantitative losses of human capital. Therefore, this problem should be considered serious, which increases the relevance of the measures needed to resolve it.

The study of the efficiency of the demographic resource utilization by the socio-economic system of Russia showed that during 2019-2021 there was stagnation in the indicator of the labor force. Consequently, the human capital actually remained at a constant level.

At the same time, there was an increase in the unemployment rate. This fact indicates a decrease in the efficiency of human capital utilization in the socio-economic system of Russia. On average for 2019-2021, the unemployment rate increased by 2.4%. At the same time, this negative trend affected exclusively the female part of the Russian population. Among men, the unemployment rate decreased on average by 0.2% per year. The general increase in the unemployment rate was accompanied by a decrease in the volume of potential labor force. On the whole, in 2019-2021, its volume decreased by 11.4% on average. This trend indicates an actual reduction in the human capital reserves of the socio-economic system of Russia.

The reserves of the socio-economic system are more intensively depleted among the male part of the population. The average annual rate of decrease in the labor force for 2019-2021 was 13.4%. Among the female part of the population, the reserves decreased by 9.6% on average. There was a

decrease in the number of persons not in the labor force.

6 Conclusion

The study of Russia's demographic development through the prism of human capital theory has allowed us to identify a number of problems. This empirical evidence is the main result of this paper. It can be used in the practice of managerial decision-making by the government at various levels of formal power. This is the essence of the possibility for practical application of the results of this work, reflecting the fact of the analytical study.

The research has shown that there has been an annual increase in the urban population and a decrease in the rural population. At the same time, there has been a steady decline in the number of people of working age and a decrease in the number of economically inactive young people. The amount of losses incurred by the Russian socio-economic system due to the loss of human capital from the sphere of social production has been determined. The life expectancy of the country's population as a whole has increased. At the same time, the number of marriages exceeds the number of divorces, which indicates positive dynamics.

The study notes the problem of an increasing number of the unemployed. It should be noted that this trend has affected the predominantly female part of the Russian population. It is this category that has found it most difficult to use its human capital. Stabilization of the demographic situation can be achieved at the expense of reserve human capital. The inclusion of reserve human capital in socio-economic relations can provide an additional volume of GDP. The number of managerial jobs in the socio-economic system of Russia has decreased. The nature of the dynamics of human capital utilization by groups of occupations is considered. There is a general increase in the number of specialists of the highest and middle level of qualification. In the sectoral context, there was an increase in the number of jobs in industry, construction, transportation, trade, and service. A decrease in the number of jobs was observed in agriculture.

The conducted research enabled us to identify a certain dependency between demographic development and the state of human capital. This dependence is significant.

This study is based on traditional analytical procedures of mathematical analysis. The main advantages of this method are the attempt to apply a systematic approach to the collection of factual data

and the simplicity of the applied tools. The paper analyzes the demographic development of Russia in the context of eight blocks of information descriptions in a consistent and interrelated manner. At the same time, an attempt was made to reflect the twenty-year retrospective of the socio-economic system of Russia, but it was not achieved everywhere. All this allowed us to draw fairly objective conclusions, which are based mainly on the statistical description of the dynamics of demographic development and are devoid of the subjectivity of assessments to a certain extent.

The material and content of this paper describe the current demographic situation in Russia endogenously, without taking into account the complex exogenous factors that have become acutely apparent in recent years. Therefore, the results of the study, which established a number of key problems of demographic development through the prism of human capital theory, are a sufficiently accurate basis for understanding the directions of elaboration of initiatives and recommendations for the correction of demographic policy.

The completed work has allowed us to identify common key problems of demographic development in Russia and also helps to identify promising areas for further research. It is important to take into account the regional peculiarities of the socio-economic system of Russia. Addressing demographic challenges will be facilitated by work aimed at examining the impact of key aspects of demographic development on indicators that reflect the state of human capital. Further work will make it possible to build a number of models that will describe the impact of demographic development on certain parameters that reflect the efficiency of human capital application in the socio-economic system of Russia.

The most significant limitations of the study should also be noted. First, it was based on an insufficiently complete database. Its incompleteness is expressed by the set of selected indicators by the method of their systematization. Supplementing this database with data, probably, allowed us to identify other important problems of demographic development and better understand its features. In addition, urbanization issues have not found due attention in the work. Urbanization significantly affects spatial changes in the demographic structure. This fact is revealed in the example of urbanization in China, [25].

A known limitation of the study should be considered the absence of taking into account the influence of the age pyramid of the population on the level of entrepreneurial activity. They determine

to a significant extent the possibilities of human capital utilization, [26]. This paper does not consider the problem of poverty. Poverty is an element of demographic development and a barrier that affects the potential of the population to utilize its human capital, [27].

All the limitations can be considered as directions for further research into the issues of demographic development and the efficiency of human capital utilization in the socio-economic system of Russia. In general, the completed work has made it possible to establish the nature of key problems that hinder development. However, it cannot claim completeness and unambiguous objectivity. This study is an attempt to perform an unbiased analytical study of the specifics of modern demographic development in Russia using a systematic approach to endogenous factors.

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