PIE Discussion Paper Series

March 2005

Russia's Population Crises in the 1990s and the Long Run*: How can we dream with Russia?

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Introduction

In Russia of the 1990s, while the collapse of the Soviet Union contributed to moving towards democracy, freedom and helped solving chronic shortages, we can say that these particularly severe ten years (the 1990s) added to the hardship of Russia.

Figure 1[1] clearly shows that, under hyperinflation of the period, the sudden drop in the birth-death ratio[2], as well as the fall in real average monthly pension exceeded the drop in the GDP. Under the worsening high inflation, along the deepening of the production crisis, the population and pension crisis also became clear. Although signs pointed to a recovery of pensions, corresponding to improvements in the GDP from 1999 (annual growth rates in 1999, 2000, and 2001 were 5.4%, 9%, and 5% respectively), the levels in 2000 and 2001 were only half of those in 1991. The birth-death ratio showed slight improvements for three years

after 1994, but reverted back to a diminishing trend after the Financial Crisis of the August 1998. In 2001 the birth-death ratio finally showed a sign of recovery again, but it was just over half (55%) of the 1991 level.

The main purpose of this paper is the statistical analysis of population crises in Russia in the 1990s and the long run. This is a preliminary research to determine the outlook for the intergenerational interest adjustment trend, as well as the population trend in the 21st century in Russia.

This paper examines the Russian population crisis and demographic paths to 2050 in view of international comparisons, based on data by the Russian Statistics Office and the United Nations. First, it is shown that in Russia subsequent population drops for 1993-2050 can be expected. It is clarified that the population crisis in the 1990s made the beginning of long term population decline trend earlier and deeper. Then this paper statistically verifies the population crisis in the 1990s, and presents a new estimate of premature deaths or population loss due to the early transition. In addition, employing dependent ratios as a reference, the impacts of the 1990s crisis on demographic and pension burdens in Russia are considered.

1Russia's Population Crisis in the Long Run

Figure 2 shows Russia's population projections made by the United Nations 2000 revision (UN, 2001a,b) (1950-2000: actual values; 2000-2050: estimations; all are mid-year values). As can be seen from the graph, Russia's population gradually increased from 102.70 million in 1950 and reached its peak of

148.79 million in 1992. Then, Russia enter a longstanding depopulation process (1992 population figure is from (UN, 2001a,, p. 553)). The population size in 2000 was estimated to stand at 145.49 million, which constitutes an element of the early depopulation process. Based on the medium variant projections, the Russian gross population is expected to fall to 133.31 million in 2015 (the same as the 1975 level) and reach 104.26 million in 2050, equivalent to the 1950 level. Both the high and low variant projections after 2000 expect subsequent decline trends. The high variant projection expects 113.14 million in 2050, while the low variant projection estimates 96.8 million. What is noticeable in the new 2000 revised projections by the UN is that the 1998 (UN, 1999a) medium variant projections (142.95 million in 2015 and 121.26 million in 2050) were downward adjusted by the size of 10 to 20 million.

The UN's new projections may be shocking news for Russia. In the Table 1 with the medium variant projections, Russia is among in the top 10 countries of those 39 countries whose populations are expected to decline for 2000-2050. Russia's decrease between 2000 and 2050 in the absolute terms is expected to be the largest by losing 41.23 million people. Ukraine, a former Soviet Union country, and Eastern European countries, Poland, Romania, Bulgaria and Hungary are also highly ranked. Japan is expected to follow Ukraine by losing 17.88 million people. Although Japan is facing a future population crisis, it is suggested that long term population crises in Russia and Ukraine are worse. It is also suggested that Bulgaria, which has just as large rate of decline in the percentage term as Ukraine, has a marked problem in the long term population.

Along with the United Nations, the Russian authorities recognize the long term population crisis. Table 2 presents mid-year population figures from 1989 to 2000 and estimates from 2002 to 2015, based on data by the Russian Statistics Office. According to these data, Russia's gross population marked a peak of 148.31 million in 1992 and gradually declined to 145.19 million in 2000. Following subsequent declines, the population is estimated to reach 135.20 million in 2015, exceeding the UN's high variant projection (134.56 million). According to Goskomstat (2002), such estimates are extended to 2050 and they predict the total population of 101.92 million (end-year value). In contrast with the estimate for 2015, the Russian Statistics Office's estimate for 2050 is less than the UN's medium variant projection. Russia's high variant projection expects 122.63 million in 2050 while their low variant projection expects only 77.16 million. This low variant projection provides population much less than the UN estimate by approximately 20 million, while Russia's high variant projection exceed the UN projection by approximately 10 million.

By comparing the UN's data and the Russian Statistics Office's data, as shown in Table 3, we can observe that the United Nations suggest 300,000-400,000 larger population than Russia. The Russian Statistics Office 2015 medium variant projection is higher than the UN's by 1.89 million mainly due to the difference in the female population estimate (1.71 million).

Immigrants and emigrants to and from Russia also have influence on population dynamics. As for Russia, in the first half of the 1990's after the collapse of the former Soviet Union, immigrants to Russia from former Soviet republics far

exceeded the number of emigrants moving out of Russia. The net-population movement in 1993, 1994 and 1995 were 430 thousand, 810 thousand and 500 thousand respectively. This drastic movement of the population contributed to relieving the decrease in population during the same period (this explains why the calculated cohort change rates exceed "1" for 1990 and 1995). In the following years net population movement decreased, it was 160 thousand in 1999, 210 thousand in the year 2000, and in 2001 it was only 70 thousand (preliminary figures) (Sorokina,(2002)). It is generally agreed that much net movement cannot be expected in subsequent years. The medium variant projections of the Russian Statistics Office expect an annual population movement of 100 thousand between 2005 and 2015 (the low variant predicts approximately 40 thousand while the high variant predicts 120 thousand, (Goskomstat (2002, p.146)). The UN's estimates also expect the annual net movement to be only 50 thousand (UN, 2001a, p. 388). Therefore, we will not discuss population movement furthermore in this paper.

As was shown, the population decline in Russia began in the 1990's, and a massive decline is expected in the long run. The population crisis in the 1990's that we will discuss in the next section made the start of the long-term population crisis earlier and deeper.

Data in Table 4 provided by the Russian Statistics Office, show the 1990, 1995, and 2000 mid-year population estimates by age and sex group. In the following, the 1990-2000 mid-year estimates for each year are employed as basic data. There are certain features or flaws in Russian population data statistics. First, except for the national census data, only the beginning-year (January 1st) population figures have been released. Therefore, it have not shown the

persons-years lived or mid-year values which should be the sources for death rate calculations and so on have not been released. Second, the released time series by age and sex group have the following three problematic characteristics: 1) all those people who are 85 or over are put in a single age group, 2) (beginning-year) sex and age group data were not fully prepared for years prior to 1992, 3) since population for 15 years old is not shown separately, 1-15 yrs. age population and 16-59 yrs. age population cannot be read directly. (As for the data in the tables, we can derive the 15 year old male and female population by subtracting the 0-14 yrs. population from the 0-15 yrs. population). Third, post-war population census data were limited to national census data of 1959, 1970, 1979, and 1989 of the former Soviet Union before the 2002 census for Russian population. The first national census of Russia was held in October 2002, and the result has been made public after 2004.

2 Russia's Population Crisis in the 1990s

2.1 Average Life Expectancy

Differing both from industrialized nations and developing nations, Russia's average life expectancy has stagnated since 1959. Already many researchers have pointed out that the massive decrease in the average life expectancy, particularly the decrease in the male average life expectancy, for the 1990s is a direct indication of the Russian population crisis (Bennett et al. (1998), Becker and Bloom(1998), Shkolnikov et al. (1998)). In other words, the enough short average life expectancy became much shorter.

Figure 3[3] indicates the changes in the Russian average male and female life expectancy, as well as the national average life expectancy. 1970-2000 are actual figures and 2002-2015 are the medium variant projections of the Russian Statistics Office.

Male average life expectancy gradually declined from 63.15 yrs. in 1970 to 61.45 yrs. in 1980. The declining trend remained for a little while after 1980, but we can see a sharp temporary rise during the Gorbachev period (64.91 yrs in 1987, 64.8 yrs. in 1988, and 64.21 yrs. in 1989.). However, it was again followed by a declining trend, and during the initial transition period the average life expectancy fell drastically from 62.02 yrs. in 1992 to 58.91 yrs. in 1993, 57.59 yrs in 1994. For two subsequent years it was under 60 yrs. Although we can observe a slight improvement in 1997 to 60.8 yrs., and to 61.3 yrs. in 1998, the situation deteriorated and it fell from 59.9 yrs. in 1999 to 59 yrs. in 2000. The improvement of average life expectancy in the Gorbachev period is thought to be largely due to the policy to reduce alcohol consumption through legal restrictions. (The law was repealed due to the decrease in alcohol tax revenue leading to the increased financial deficit). The decline in 1993 and 1994 can be explained by the hard living conditions caused by hyper-inflation, increasing social instability and growing alcohol consumption (giving a rise in circulatory system diseases, alcoholism, suicide and homicide). Though there is no question that inflation, as well as income and regional differentials accelerated by the August 1998 financial crisis contributed to the repeated decline in 1999 and 2000, further research needs to be done in this area.

According to the medium estimates of the Russian Statistics Office, male life expectancy will make little improvement in the years to come. As we will see later, the estimates are far more pessimistic than that of the UN's. Although the Statistics Office estimates the male average life expectancy to be 59.8 yrs. in 2005, 60.4 yrs. in 2015, followed by a gradual rise, it will still only increase to a maximum of 66.3 yrs in 2050.

Although female average life expectancy of Russia hovered around the level of 73.5 yrs. since 1970, like male average life expectancy, it showed some improvement for a short of time during the Gorbachev period. It was followed by a drastic decrease through 1993-1995, and again during 1999-2000. The range in the change in female average life expectancy is smaller than that in the male average life expectancy. Russian Statistics Office's medium variant projections are rather pessimistic regarding the improvement in female average life expectancy in the future (74.1 yrs. in 2015, and 77.7 yrs in 2050).

The difference between male and female average life expectancy (gender differential) is very large, which highly characterizes the Russian population crisis (Becker and Bloom (1998, p. 1914)). The life expectancy gender differential was on a relatively high level by international comparison, 10.2 yrs. in 1970, 11.6 yrs. in 1980, and 10.5 yrs. in 1990, which was followed by a sudden increase and rose to the highest level in the world, 13 yrs. in 1993, 11.6 yrs. in 1994, and 13.4 yrs. in 1995. Though the differential thereafter slightly decreased, it was rising again, and reached 12.5 yrs. in 1999 and 13.2 yrs. in 2000.

Russian Statistics Office forecasts the medium gender differential to stay at a high level (13.8 yrs. in 2005, 13.7 yrs. in 2015), followed by a gradual decrease

and settle at 11.4 yrs. in 2050 (same as 1978-1984 level).

Table 5 indicates an international comparison of male average life expectancy based on the UN's medium variant projections. It shows that Russia had the largest decrease in average life expectancy between the period 1985-1990 and the period 1990-1995 (a 6% decrease), followed by Ukraine, Kazakhstan, Latvia, Estonia, and Latvia (all with a 5% decrease). Kazakhstan, located in Central Asia has had a male average life expectancy lower than Russia, at 63.6 yrs. in the second half of the 1980s, 60.5 yrs. in the first half of the 1990s, and 58.6 yrs. in the second half of the 1990s. Over the whole of the 1990s, the decrease in male average life expectancy was much greater in Kazakhstan than in Russia (Russia with a 7% decrease, and Kazakhstan with an 8%). The male average life expectancy in former Soviet republics, excluding the Caucasian countries, was rather short, when we look at the East Slavic states (Belarus, Russia, and the Ukraine), the five Central Asian countries, and the three Baltic States.

The UN medium variant projections suggest that the male average life expectancy in Russia as well as in other countries will see some considerable improvement after 2010-2015. The male average life expectancy during 2045-2050 in Kazakhstan and Russia is expected to reach 73 yrs. and 73.1 yrs. Although the Russian life expectancy is the shortest in the table, it is still far longer than the previously quoted Russian Statistics Office estimation.

Table 6 shows the male-female life expectancy differential through UN medium variant projections. Russia's gender differential was 10 yrs. through 1985-1990, 12.3 yrs. through 1990-1995, and 12.3 yrs. through 1995-2000. Whichever period we look at in the chart until 2015, Russia has the largest gender

differential. Other countries such as Belarus (1990-1995: 10.4 yrs., 1995-2000: 11.6 yrs.), the Ukraine (1995-2000: 10.8 yrs.), Kazakhstan (1995-2000: 11.4 yrs.), and the Baltic States (1990-1995: 11.3 ~ 11.6 yrs., 1995-2000: 10.6 ~ 11.7 yrs.) also have a relatively high gender differential.

The gender differential in almost all countries is expected to shrink after 2015, except for Japan, where the gender differential is predicted to reach 8.9 yrs. between 2045 and 2050, the highest differential in the table for that period.

2.2 Birth Rate and Mortality (Death) Rate

Figure 4[4] indicates the change and expected value of crude birth rates, crude mortality rates and natural increase rate (all indicated in per mill (‰) i.e. per one thousand persons) according to the Russian Statistics Office's data (medium variant).

As a result of a decrease in crude birth rate to 10.7‰, and an increase in normal mortality rate to 12.2‰ in 1992, the natural increase marked a minus (▲) 1.5‰ for the first time after 1950 (the birth-mortality ratio broke 1 and decreased to 0.88). In 1993, due to a further decrease in birth rate to 9.4‰, and a sharp rise in the mortality rate up to 14.5‰, the natural increase rate dropped to minus (▲) 5.1‰ (birth-mortality ratio fell to 0.65). The actual number of death in that year was 2.13 million compared to the 1.66 million deaths in 1990; an increase of 0.47 million. Although the birth rate made a slight increase to 9.6‰ in 1994, the mortality rate further increased to 15.7‰, resulting in the natural increase further falling to minus (▲) 6.1‰. The number of dead persons in the same year was 2.3 million. In 1995 the birth rate was 9.3‰, while the mortality rate was 15‰,

therefore marking a minus (▲) 5.7‰ natural increase rate. The number of dead persons in this year was 2.2 million. Although the levels between 1996-1998 improved compared to the 1994 level, the low level of birth rates (8.6-8.9‰) and the high level of mortality rates (13.6-14.2‰) resulted in negative natural increase rates ((▲)4.8-(▲)5.3‰; birth-death ratio was 0.63-0.65). After this period, the situation worsened again for 1999-2000. In 1999, the birth rate was 8.3‰, mortality rate stood at 14.7‰, and thus the natural increase rate was minus (▲) 6.4‰, which is the lowest since 1950 (birth-death ratio at 0.57; and 214,000 dead persons). In 2000, the birth rate was 8.7‰ and mortality rate was 15.4‰, setting a new lowest record of natural increase rate of minus (▲)6.7‰ (birth-death ratio at 0.57; and 226,000 dead persons).

Although the Russian Statistics Office's medium variant predicts the birth rate to improve slightly (10-11‰) during 2005-2015, due to the unchanged high mortality rate (15.4-16.5‰), the natural increase rate will remain below minus (▲) 5‰. Therefore, this indicates that the mortality crisis in Russia is not a temporary phenomenon of the 1990s, but it is expected to continue even after 2000.

Figure 5[5] indicates the change in the infant mortality rate (dead infants÷1000 births) based on the Russian official and United Nations data. It is a well known fact that infant mortality rate statistics in the former Soviet Union had a bias due to the difference in the definition of birth (pregnancy period of over 28 weeks, 1 week or more of survival after birth, taller than 35 cm, and body weight over 1 kg). The bias is said to have decreased after the adoption of international standards in 1995. In the conventional method, infant mortality rate of the Russian statistics should be inflated by 25% before 1992, 15% in 1993, and 10% in 1994

(UN, 2000, p.229). What we can confirm here, is that although the infant mortality rate undoubtedly showed an increase 19.9‰ in 1993, it basically showed a decreasing trend. This implies that the change in infant mortality rate was not a factor in the population crisis of the 1990s. Russian Statistics Office's medium variant predicts the infant mortality rate to decrease to 10.3‰ by 2015 and reach 3.8‰ by 2050. Therefore, infant mortality rate cannot be a cause behind the long term population crisis.

Figure 6[6] indicates changes in total fertility rate (TFR; children per a woman) based on the Russian Statistics Office's data (medium variant). In Russia, TFR was stable and normal at approximately 2 during the period from 1970 to 1990. A dramatic decrease in TFR began in the 1990s, and it dropped to a level of 1.4 after 1994. By 1999 the number fell to 1.17, which is the lowest ever. The TFR was 1.21 in 2000, and the medium variant forecasts 1.38 in 2015; and only 1.4 even in 2050.

Table 7 indicates results of international comparison concerning crude birth rates based on United Nations data (medium variant). Russia showed the largest decline in birth rate from 1985-1990 to 1990-2000 (minus 34%). Observing the change from 1985-1990 to 1995-2000, we can notice that Armenia (minus 51%), and Latvia (minus 51%), saw larger decreases than Russia (minus 45%) (7% decrease in Japan). The birth rate in Russia is predicted to stay at a low level until 2050.

Table 8 is the United Nations data concerning TFR (medium variant). Except for the United States, all countries display a clear trend of decline in the number of births. The countries with the highest rate of decline in TFR from

1985-1990 to 1995-2000 are Armenia (46%), Latvia (46%), Estonia (43%), Russia (42%), Romania (42%), Bulgaria (41%), i.e. an extreme decline can be observed in the countries in transition except for those in Central Asia. Therefore, a substantial fall in TFR is not a characteristic phenomenon that can be observed only in Russia, but a common trend that can be seen in most of the countries in transition. The United Nations medium variant TFR forecast of 1.18 between 2010 and 2015 is even more pessimistic than that of the Russian Statistics Office. On the other hand, for the period 2045-2050 the UN's forecast of 1.75 is more optimistic than the Russian projections.

Table 9 shows the United Nations data (medium variant) concerning mortality rate. Russia showed the highest increase in mortality rate, a 22% increase, from 1985-1990 through 1990-1995, followed by the Ukraine (20%), and Belarus (18%). Meanwhile, during 1995-2000, Ukraine had a higher mortality rate of 14.7% than Russia with 14.3%. Unlike in Russia, Ukraine, and other former Soviet republics, mortality rate in Eastern European countries, such as the Czech Republic and Poland declined in the 1990s; with the exception of Hungary which had a relatively high mortality rate of 14%. The transition in general did not seem to affect the mortality rates.

Table 10 indicates the results of the calculation of birth-death ratios derived from the United Nations (medium variant) data.

Russia suffered the largest change from 1.47 to 0.80 (▲46%) between the periods of 1985-1990 to 1990-1995, followed by Estonia from 1.31 to 0.81 (▲38%), Latvia from 1.25 to 0.78 (▲38%), Belarus from 1.57 to 1.00 (▲36%), and the Ukraine from1.24 to 0.81 (▲35%). Due to a sharp decrease in the number of births

and a large increase in the number of deaths, these former Soviet republics, except for Belarus, show a change in natural population increase from plus to minus in the early transition. In other words, we can see the emerging population crisis. Birth-death ratios through 1995-2000 in Russia, Ukraine, Estonia, Latvia, and Belarus decreased to 0.62, 0.61, 0.65, 0.57, and 0.69, respectively. This means that Belarus also experienced a negative natural population growth during this period.

Among Eastern European countries, Bulgaria's birth-death ratio showed a decrease from 1.08 in 1985-1990, to 0.80 in 1990-1995, and further down to 0.56 in 1995-2000, displaying signs of a population crisis. Romania's birth-death ratio also decreased from 1.49 in 1985-1990 to 1.00 in 1990-1995, and down to 0.86 in 1995-2000.

Meanwhile in Hungary, the birth-death ratio had been below 1 and a decrease in population could be observed even before the transition period. Although this trend intensified during the 1990s, the transition process itself did not seem to have a strong influence on it. The same can be said about the Czech Republic. In Poland, the birth/death ratio had been relatively high at 1.58 during 1985-1990, but the drop was larger in the 1990's than in the Czech Republic and Hungary.

The birth-death ratio in Russia, Ukraine, Belarus, and Estonia are not expected to improve after 2000 and it is estimated to be 0.47~0.62 in 2045-2050. The population in Caucasus region is also expected to decrease after 2000. Among the former Soviet Republics, only the five central Asian countries will not experience a population decrease in the 21st century.

3 Population loss in the 1990s

As we have seen in the previous section, the Russian population crisis in the 1990s developed through the unusual situation of concurrent decrease in the number of births and an increase in the number of deaths. Regarding the death rates, the especially steep rise in the male death rate is a distinctive characteristic of the crisis. In what age group was the death rate high and what is the size of population loss of the 1990s? In this section we will focus on the male cases.

Table 11 indicates male death rates by age group. Table 12 indicates the premature deaths due to the crisis calculated from the data in table 1-11 and time-series data on the male population by age group. The upper section of this table shows the number of premature deaths. Here, the death rates for 1990 by age group were applied to 1991-2000 mid-year population data in each year. These figures were subtracted from the actual deaths in the respective age group for each year. The lower part of the table indicates the share of the number of premature deaths in the number of actual deaths by each age group, namely, premature death rate.

Looking at the total number of male premature deaths, a total of 1.3 million premature deaths were recorded during 1992-1996 (the premature death rate is 23%), while 1.99 million men died earlier during 1992-2000 (the premature death rate is 20%). This means that 1 out of 5 men was a victim of the transition process. The number of premature deaths in the 15-59 yrs. age group (the age 15 group is included, the quasi working age population) was 860,000 during 1992-1996 and 1.39 million during 1992-2000. The number of premature deaths in the 60 yrs and over age group (eligible old age pension recipients) was 430,000

during 1992-1996, and 600,000 during 1992-2000. This is to say, that the number of premature deaths in the working age group was twice the number of premature deaths in the old age population. Premature deaths during the transition process in Russia are characterized by the fact that they primarily affect the population in the working age group.

When we look at premature death rate, we can observe a rapid growth from 9% in 1992 to 25% in 1993, followed by a peak of 31% in 1994. It gradually decreased during 1995-1998 from 27% to 20%, then to 14%, and finally to 11%, but once again began to increase, and reached 17% in 1999 and 21% in 2000.

The 40-44 yrs age group suffered the highest premature death rate during 1993-1996, when the death rate showed a sharp rise, reaching as high as 50% (i.e. 1 out of 2 deaths). The second highest figures were recorded in the 35-40 yrs age group. It can be said that, during this period the death rates in all age groups between 20-54 yrs were markedly high. We can especially take notice of the fact that the highest premature death rate between 1996-2000 were recorded in the 20-24 yrs group (48% in 2000), followed by the 25-29 yrs group (45% in 2000). The premature deaths of young people in their 20s greatly contributed to the rise in death rate in recent years.

During 1993-1995, the premature deaths of middle-aged people in their early 40s became a social problem. The social implications of the premature deaths of young people in their early 20s during 1999-2000 will need further investigation. We would like to point out that the death rate of school children in age group 5-9 yrs during 1996-2000, as well as death rate of the elderly in the 70 yrs and over group during 1997-2000 improved.

4 Dependency Ratios

Dividing the Russian population into three demographic groups; child, working-age and aged groups, based on the tradition of demographics, we analyze the relationship between each group. The Russian system relies on working- age and pension eligibility age as follows:

child population: aged under 16, males and females

working-age population: aged 16-59 ,males; aged 16-54, females

aged-population: aged 60 and over, males; aged 55 and over, females

The international standard for demographic grouping is as follows:

child population: aged under 15, males and females

working- age population: aged 15-64, males and females

aged-population: aged 65 and over, males and females

The child and aged population groups are considered as dependent population. Demographic structure ratios, which show how much burden is imposed by these two groups on the working-age population, are defined as follows:

child dependency ratio = child population/working- age population ×100

old-age dependency ratio = aged- population /working- age population ×100

dependency ratio = (child population + aged-population)/working- age population ×100

In Russia, instead of dependency ratios, the demographic burden coefficient (*koeffitsient demograficheskoi nagruzki*) is commonly used, making the

factor in the above formula ×1,000.

Figure 7[7] shows changes in dependency ratios, using the UN data (medium variant) with the population sorted by international standard.[8]

The old-age dependency ratio showed a gradual rise from 9.5 in 1950 to 11.7 in 1970 and to 15.0 in 1980. After 1980 the ratio stabilized until 1990 but again increased to 17.9 in 1995 and reached 18.0 in 2000. In 1995 the index rose because the working- age population decreased by 0.6 million whereas the aged- population increased by 3 million. According to the medium variant, the ratio will stabilize until 2015 (19.5 in 2005, 17.6 in 2010, and 19.0 in 2015) but after that it will go through a rapid increase overtaking the child dependency ratio and will reach 47.0 in 2050.

The child dependency ratio dropped considerably from 1965 until 1980, then showed a slight increase until 1990 and again declined sharply. The decrease will continue until 2010, and then stabilize until 2035. It is predicted to show some increase afterwards. The sharp decline in the child population is caused by a sharp decline in the fertility rate.

Table 13, based on the Russian Statistics Office data, displays dependency ratios in the international standard system and in the Russian system. (Note that the ratio is in terms of the end-year.) Figure 8 is a graphical display of the Russian system.

When the international standard is employed, the data by the Russian Statistics Office show little difference from that of the UN. The ratios in the two data series are very close as for the actual results. The projected figure for the old-age dependency ratio for the year 2015 is 19 in both projections, but for the

child dependency ratio, UN's 19 is less than that of the Russian Statistics Office's 23.

The Russian system's old-age dependency ratio showed a slight increase from 33.6 in 1990 to 36.2 in 1996. Then it decreased to 34.3 in 2000. The population ratio of the aged in the entire population was 20.6% in that year. The population crisis of 1993-1995 showed a slightly increase in the old-age dependency ratio but the crisis in 1999-2000 on the other hand, brought about a slight decreased in the ratio. Looking back through the 1990s the population crisis had been neutral to the change in the old-age dependency ratio.

Medium variant projections of old-age dependency ratio is expected to grow after 2005 and reach 36.2 (the level of 1996) in 2010. It will reach 42 in 2015. The crisis in the 1990s seems to restrain the increase in the old-age dependency ratio in Russia until 2015. The crisis of the 1990s worked to relax the pension burden for the period of 2000-2015. This is because the excessive number of premature deaths of the people in their 30s, 40s and 50s during the first half of the 1990s makes the ratio of the aged- population smaller in 2000-2015 than it would have been without the crisis. Also, the drop in the birth rate beginning in the 1990s will begin to show an effect on the ratio of the working-age population with a time-lag.

According to Goskomstat (2002) the impact of the decrease in the working-age population ratio caused by the low fertility rate and the increase in the population ratio of the old-age will begin to take its toll after 2020. The old-age dependency ratio will rise from 45.5 in 2020 to 70.8 in 2050. (The low and high variants are 83.6 and 66.9 respectively.) The aged-population ratio in the same year

is predicted to be 35.2%. (The low and high variants are 40.9% and 33 % respectively.) The restraining effect that the crisis of 1990s had over the increase in the old-age dependency ratio, will be overshadowed by a long term population crisis which has been brought about by the low fertility rate, triggered by the population crisis in the 1990s. Therefore the aging of the population is expected to take place in the future.

The child dependency ratios by the Russian Statistics Office as well as by the UN show a rapid decline from 42.9 in 1990 to 32 in 2000. In 1998 the child dependency ratio became lower than the old-age dependency ratio, and the difference continued to grow. The medium variant projection of the child dependency ratio shows a continuing decline from 2000 to 2007. It will stabilize for a while and again begin to drop from 2010 coming to 28.9 in 2015. After 2015, a slight recovery in the fertility rate and the decrease in the ratio of the working-age population will push the index up and after a rapid growth in 2040, the number will reach 30.4 in 2050 (the low estimate is 20.9 and the high estimate is 35.9 respectively).

Table 14 shows an international comparison of each dependency ratio using the UN data (medium variant, international standard). The increase in the old-age dependency ratio from 1990 to 2000 in Russia (from 15 to 18, a 20% increase) was over the European average (19 to 21, an 11% increase). But East European countries such as Romania (15 to 19, a 27% increase), Bulgaria (19 to24, a 26% increase), Belarus (16 to 20, a 25% increase) showed increases greater than Russia. The increase in three Caucasian nations was much higher (between 36% and 44%). Japan during the same period also went through a large increase (18 to

25, 39%). With regards to the increase in the old-age dependency ratio during the period of 2000 to 2015, the increase in Russia (18 to 19, 6% increase) will be smaller than that of the European average (21 to 26, 24% increase) or the East European average (19 to 21, 11% increase). This is because the average life expectancy in Russia will still be relatively low and the mortality rate high. The fluctuation margin in Poland will be similar to that of Russia. However, during the same period the ratio in the Czech Republic and Hungary will not show any change. The rise of the old-age dependency ratio in Japan (25 to 42, a 68% increase) is estimated to be exceptionally high during the same period. From 2015 to 2050, the expected increase in the old-age dependency ratio of Russia will be over that of the East European average but under those of Moldova and Slovakia. The old-age dependency ratio of the 2050 estimates in Czech Republic (61), Bulgaria (53), Hungary (52), Slovakia (50), and Ukraine (49) will be larger than that of Russia (47). At all events, with the exception of three Caucasian nations and the USA, Russia is expected to face critical aging society problems just as the other nations.

The downward turn in child dependency ratio between 1990 and 2000 in Russia (34 to 26, down by 24%) was larger than those in the European average (34 to 26, down by 16%) and Japan (26 to 22, down by 15%). However, it was smaller than that of the Eastern European average (35 to 26, down by 26%). The fall between 2000 and 2015 is expected to be around the level of the East European average. The 2050 ratio shows Russia (23), to be below all the other countries in the table except Ukraine (22). However, the difference is small, because the birth rate continues to decline in Russia, and a fall in the working-age population is

expected as well.

From the above we can say that when the international standard system is used, the change in the age structure ratio in Russia is relatively small in view of an international comparison. The reason for the slow pace is the population crisis of 1990s and the long term population crisis interacting, as previously stated, in a complex way.

5 An Estimate of Population in 1995 using the Cohort Component Method

In order to look into the population crisis of 1990s, population by age group and by sex for the year 1995 (mid-year value) is estimated through the data of 1985 and 1990 (mid-year value) using the cohort component method (cohort change rate). (Actual data is calculated using the beginning of the year data provided by the Russian Statistics Office). The estimate is made in the following two stages.

(1) Finding the separate cohort change rate for each sex in different age groups from 1985 to 1990(basic year), then applying the rate to find the number of 5-99 year old persons in age groups of five years for the year 1995. (We exclude the population over 100 years).

(2) Finding the number of the birth ratio for mothers in age groups of five years (15 to 49 year olds) for the year 1990 and also finding the average birth sex ratio for the years 1989 to 1991. (Goskomstat(1998)). The estimation is based on the following formula: cumulative number of births over five years=number of females

in each age group of five years(15 to 49years old) for the year 1990 ×birth ratio by age group ×5 . We use the average birth ratio of males and females to estimate the population by genders for 0 to 4 years old.

The estimates are shown on the left-hand 3 columns in Table 15. The right-hand three columns in the table are the results of the actual values subtracted from the 1995 estimates. From this table, the population loss owing to the population crisis of 1995 could be estimated as 2.7 million in total, which consists of 1.6 million males and 1.1 million females. The population loss caused by the drop in the fertility rate during the first half of 1990s accounts for the larger part of population loss, 1.97 million in total. When the 0-4 year old age group is excluded, the loss is 0.61 million for males and 0.13 million for females, the total being 0.74 million. The population loss for males 20- 59 is 0.46 million.

By using the estimated value to calculate the child dependency ratio and the old-age dependency ratio based on the international standard system, the values come to 33.4 and 18 respectively. Compared to the actual values in Table 13, the child dependency ratio becomes higher but the old-age dependency ratio shows little change. When the quasi-Russian system is used, the ratio comes to 35 which are also not very far from the actual value. (In general, the old-age dependency ratio using the quasi-Russian system tends to be smaller than the one using the Russian system.) Therefore, it could be stated that the estimate is indifferent to the changes in the old-age dependency ratio. In other words, the effect of the crisis could be found only in the child dependency ratio.

The drawback of using a simple cohort component system to estimate the

population is that it is strongly affected by demographic migration. The actual population of 5-14 years old is larger than that of the estimate. A large population inflow in this age group during the 1990-1995 period accounts for the difference. The reason the estimate is far greater than the actual value for both genders in 20 -24 years old age group is attributed to the fact that a large number of people left Russia from this group between 1985 and 1990. For 30-34 years old males and 30-44 years old females, it is presumed that the inflow from 1990 to 1995 was large. For 90-94 years old it is more rational to think that the improvement in the index is due to the change in the method for taking statistics, rather than to think that there was a change in the life span. (e.g. elderly of uncertain age, etc.)

We could not get enough time-series data on the demographic migration regarding sex and age for this estimate, which made it difficult to eliminate the effect of such migration shifts. This is a remaining issue. Therefore we can state that we simply presented the estimate as a reference for forthcoming studies.

6 Concluding Remarks: How can we dream with Russia?

We clarified some aspects of Russia's population crisis of the 1990s in its early transition and suggested possible scenarios of its long term crisis shown by the paths to 2050. We provided a new estimate of male's premature deaths of the 1990s in Russia, presenting an estimate of the 1995 population based on the cohort component methods. It should be noted that this paper did not employ any results of the 2002 population census of Russia. Revising the paper through a full use of the census is a remaining issue. If we employ the new census data, future

population projections would be slightly revised in an upward direction. A pessimistic forecast of the population path to 2050 would be relaxed. However, it can be stated that possible revisions of the projections to 2050 would not bring about marked changes in the properties of the population crisis in the long run shown in the paper. Judging from population paths to 2050, it is rather difficult to dream with Russia. A shrinking population hampers Russia's growth projections. Nevertheless, Wilson and Purushothaman (2003) showed a world of "dreaming with BRICs." A reappraisal of this dream is another remaining issue of this paper.

Notes

***The Japanese version of this paper appeared in 2002 as an outcome of Project on Intergenerational Equity (PIE) (under Prof. N. Takayama). It was written as a constitutive part of the study project report "The Intergenerational Equity under the Transition to a Market Economy" (under Prof. Y. Nishimura). I would like to thank the Russian Statistics Office for the provision of valuable data.**

1. **Data sources for Fig. 1: GDP: RSE (2000,2001), SEP,Dec.2001, Jan. 2002**
   Birth-death ratios: DER(2001, p.55), SEP, Jan. 2002, p.243
   Pension: Goskomstat.
2. **As a basic index of population crisis, we emphasize on birth・death ratio.(B/D; B=number of births, D=number of deaths). As a substitute index for the usual natural growth index(=B-D) use of ln B-ln D=ln (B/D) is rational. Therefore, monotonicity of ln (・) makes it possible to use B/D as substitute index as well. Here number of births / number of deaths = crude birth rate/crude death rate.**

3. **Data sources for Fig. 3 : DER(2001,p.105), Goskomstat (2001, p.113)**
4. **Data sources for Fig. 4: DER(2001, p.55), Goskomstat(2001, p.113)**
5. **Data sources for Fig. 5: DER(2001, p.55), UN(2001a, p.338)**
6. **Data sources for Fig. 6: DER(2001, p.94), Goskomstat(2001, p.132)**
7. **Data sources for Fig. 7: UN (2001a, Table A.35, Corrigendum). The old-age dependency ratio quoted in the above book is in error. Refer to the list of errata.**
8. **When the UN data (medium variant) is employed, quasi-old-age dependency ratio using Russian standard of ((number of male over 60 + female over 55) / (number of male 15-59 + female 15-54) × 100) makes 33.5 for the year 2000, 41 for 2015 and 89.2 for 2050. The numbers for the years 2000 and 2015 are not very far from those of the Russian Statistics Office. But for the year 2050, the UN forecast is far greater. This is due to the fact that as previously stated, the UN forecasts a longer life expectancy.**

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Fig. 1 The Crisis of the 1990s in Russia

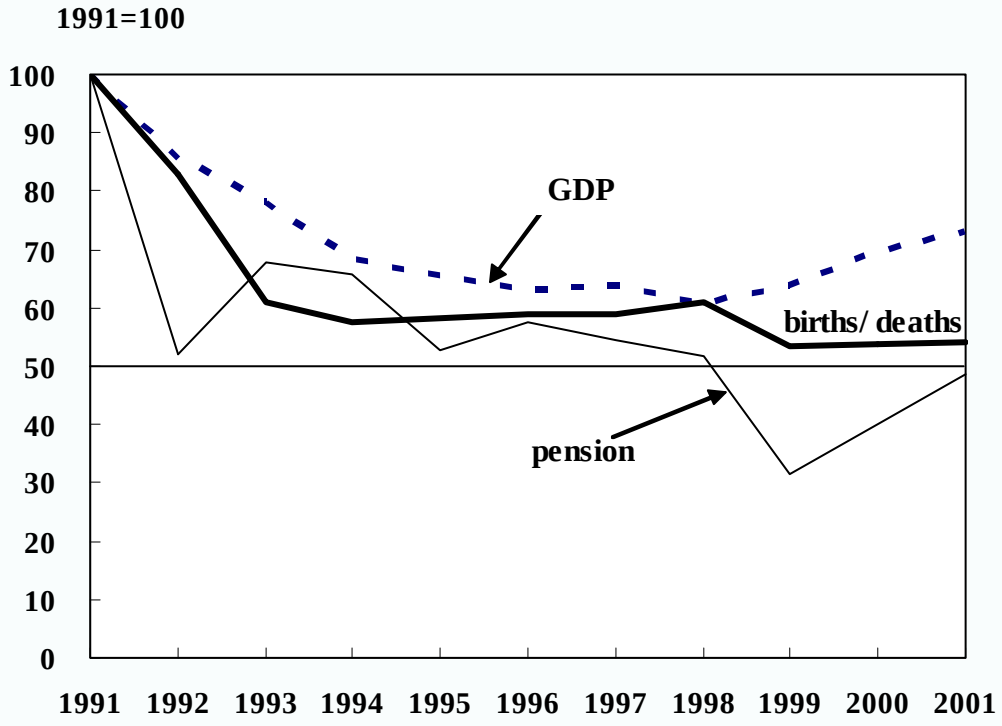

Fig. 2 Actual and Projected Population of Russia 1950-2050 (UN data)

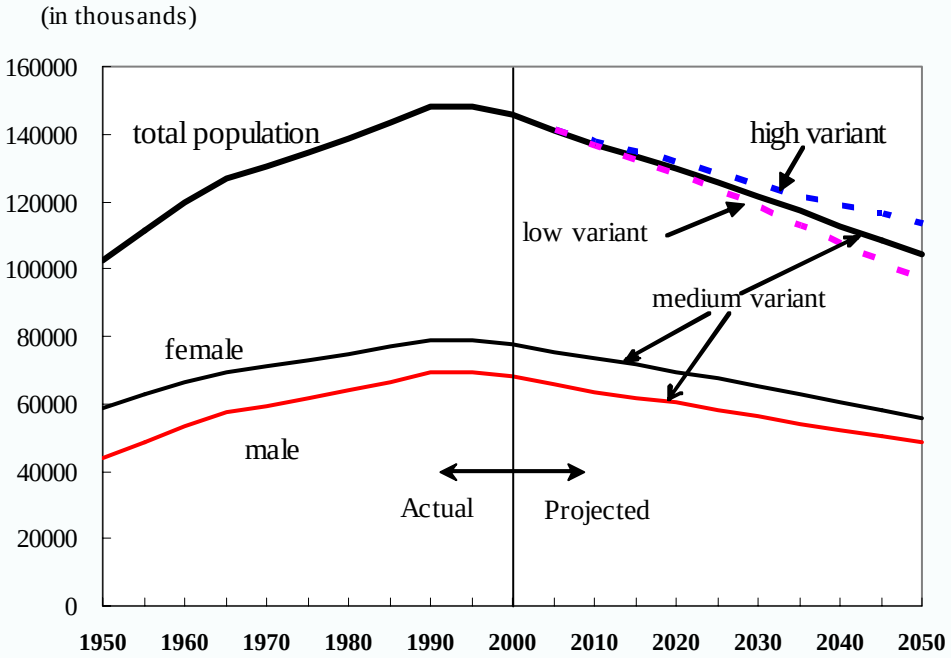

Fig. 3 Average Life-expectancy in Russia 1970-2015 (Goskomstat data)

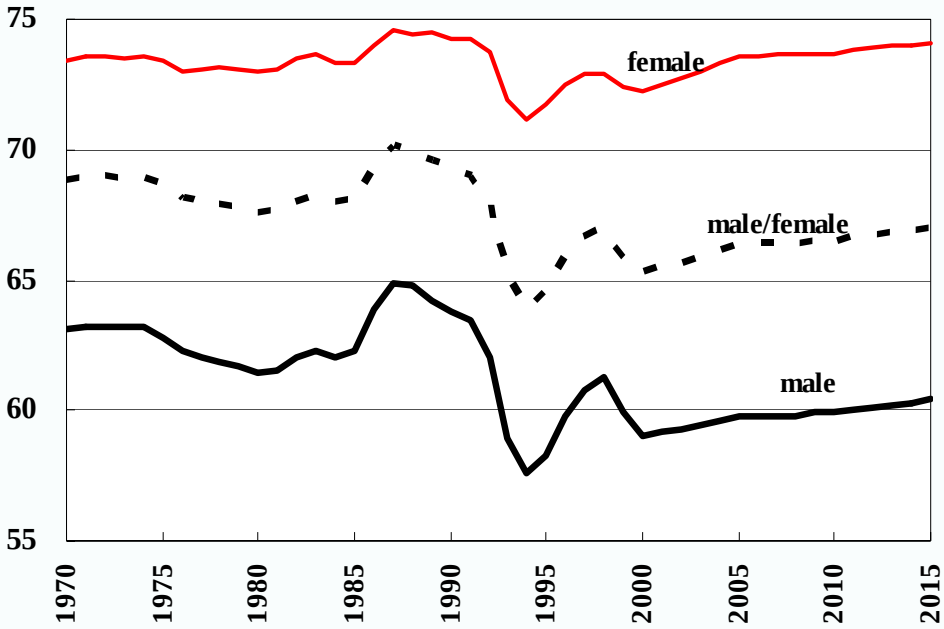

Fig. 4 Crude Birthrate, Crude Death Rate, Natural Increase Rate (Goskomstat data)

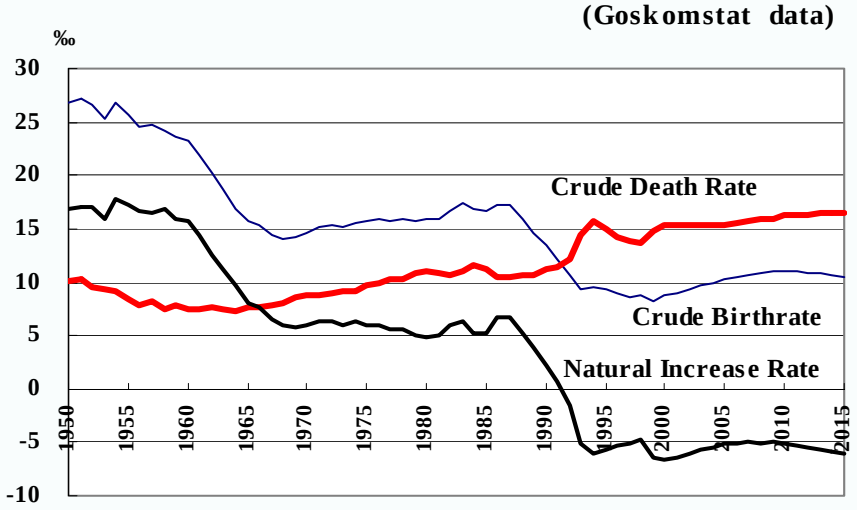

Fig. 5 Changes in the Infant Death Rate

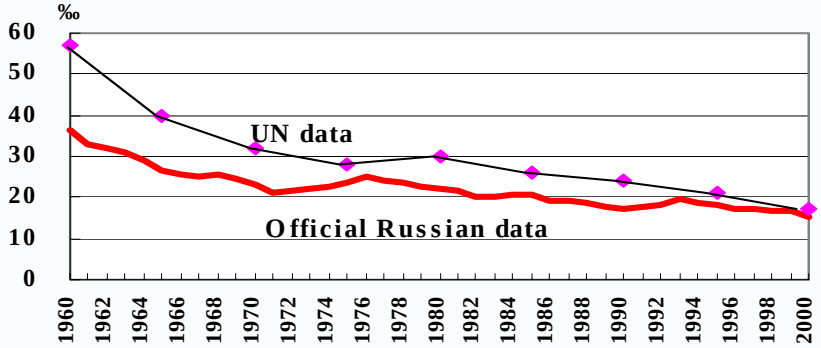

Fig. 6 Changes in the Total Fertility Rate (Goskomstat data)

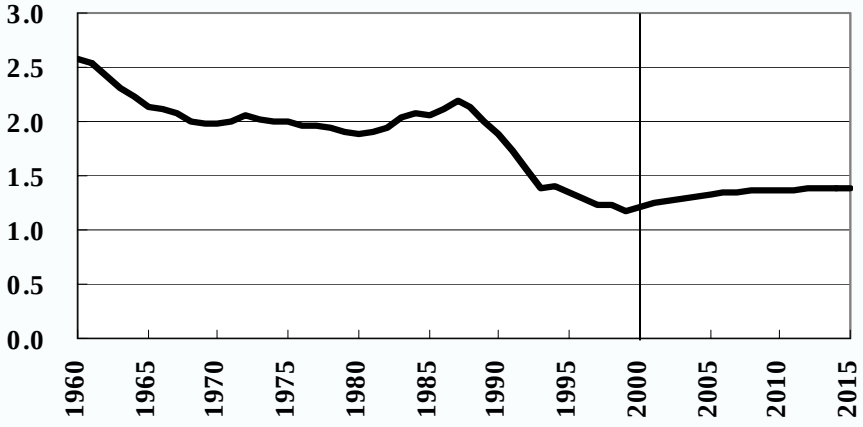

Fig. 7 Changes in the Dependency Ratios
(International Standard /UN Data) : 1950-2050

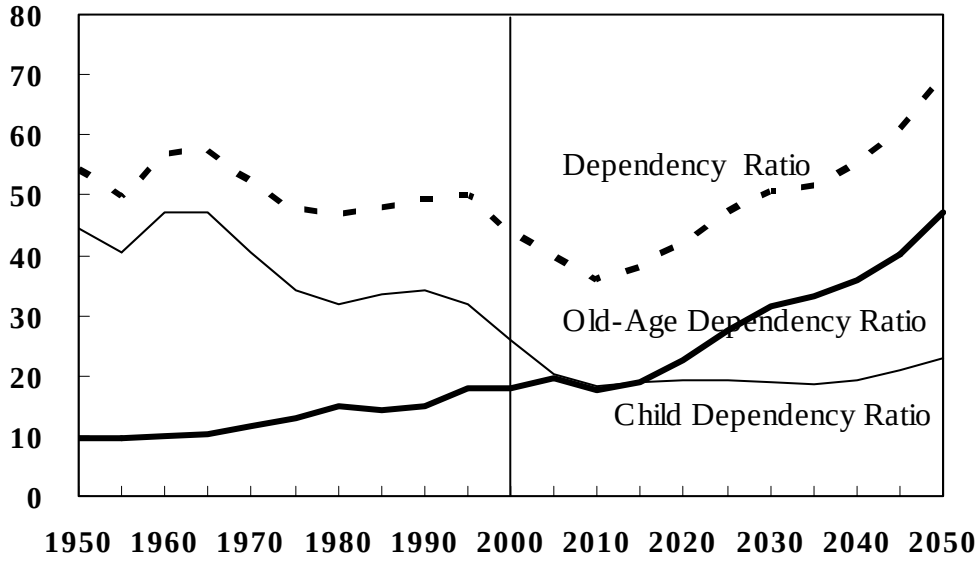

Fig. 8 Changes in the Dependency Ratios
(Russian Standard / Goskomstat dat)

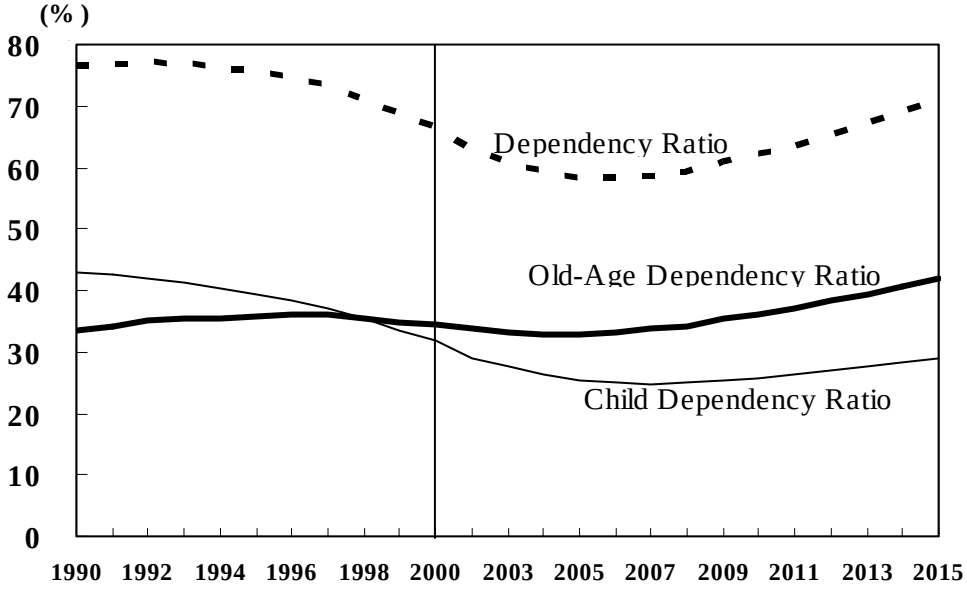

Table 1 Top Ten Countries Whose Population is Projected to Decrease Between 2000 and 2050 (medium variant)

Rank Order		Population (*thousands*)		Difference	
		2000	2050	Absolute (*thousands*)	Percentage
1	Russia	145491	104258	▲ 41233	▲ 28
2	Ukraine	49568	29959	▲ 19609	▲ 40
3	Japan	127096	109220	▲ 17876	▲ 14
4	Italy	57530	42962	▲ 14568	▲ 25
5	Germany	82017	70805	▲ 11212	▲ 14
6	Spain	39910	31282	▲ 8629	▲ 22
7	Poland	38605	33370	▲ 5235	▲ 14
8	Romania	22438	18150	▲ 4288	▲ 19
9	Bulgaria	7949	4531	▲ 3419	▲ 43
10	Hungary	9968	7486	▲ 2481	▲ 25

Source: http://www/un.org/esa/population/publications/wpp2000/wpp2000at.xls (Table 15)

Table 2 Demographic Trends in Russia: 1989-2015

	Mid-year; *population in thousands*		
	Total	Male	Female
1989	146,825	68,597	78,228
1990	147,913	69,266	78,647
1991	148,245	69,481	78,764
1992	148,310	69,562	78,748
1993	148,146	69,528	78,618
1994	147,968	69,480	78,488
1995	147,774	69,387	78,386
1996	147,373	69,159	78,214
1997	146,938	68,926	78,012
1998	146,534	68,717	77,816
1999	145,943	68,406	77,538
2000	145,189	67,990	77,199
2002	143,643	-	-
2003	142,920	66,681	76,239
2004	142,241	66,276	75,965
2005	141,606	65,889	75,717
2006	140,991	65,504	75,487
2007	140,375	65,126	75,249
2008	139,766	64,758	75,008
2009	139,160	64,392	74,768
2010	138,536	64,016	74,520
2011	137,910	63,642	74,268
2012	137,269	63,263	74,006
2013	136,598	62,871	73,727
2014	135,913	62,473	73,441
2015	135,203	62,064	73,139

Notes:

1. Calculated using the data supplied by *DER* (2001, p. 31), Goskomstat (2001, p. 27) and Goskomstat. The total population for the year 2015 is the mid-year value from Goskomstat (2001, p. 8).

2. End-year values for 2002-2015 are medium variant values.

3. t mid-year value: = [(t -1) end-year value + t end-year value] / 2
= [t beginning-year value + (t +1) beginning-year value] / 2.

Table 3 Differences Between the Russian Official Data and UN Data

(*thousands*)

			Goskomstat (mid-year data)	UN (mid-year data)	Difference
1990	Total		147,913	148,292	-379
1995	Total		147,774	148,141	-367
2000	Total		145,189	145,491	-302
2015	Total	low-variant	129,323	132,048	-2,726
		medium-variant	135,203	133,314	1,889
		high-variant	138,876	134,563	4,313
		Male medium variar	62,064	61,881	183
		Female medium varia	73,139	71,433	1,706

Source: *DER* (2001,p.31), Goskomstat (2001,p.8), and UN (2001a).

Table 4 Population by Age Group: Russia (mid-year)

(*thousands*)

	1990			1995			2000		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total Population	147,913	69,266	78,647	147,774	69,387	78,386	145,189	67,990	77,199
Age Groups									
0 - 4	11,515	5,877	5,638	7,889	4,048	3,840	6,357	3,263	3,094
5 - 9	11,691	5,941	5,751	11,651	5,949	5,703	7,952	4,078	3,874
10 - 14	10,755	5,456	5,299	11,822	6,007	5,815	11,727	5,983	5,744
15 - 19	10,185	5,180	5,005	10,829	5,494	5,336	11,858	6,016	5,842
20 - 24	9,525	4,880	4,645	10,242	5,255	4,987	10,794	5,446	5,347
25 - 29	11,724	5,955	5,769	9,518	4,873	4,645	10,263	5,241	5,023
30 - 34	12,951	6,522	6,429	11,688	5,886	5,802	9,490	4,819	4,671
35 - 39	12,023	5,994	6,030	12,830	6,381	6,449	11,555	5,746	5,809
40 - 44	9,653	4,754	4,900	11,799	5,785	6,014	12,553	6,133	6,420
45 - 49	6,128	2,919	3,208	9,346	4,500	4,846	11,391	5,444	5,948
50 - 54	10,421	4,828	5,593	5,800	2,668	3,132	8,875	4,125	4,751
55 - 59	7,714	3,433	4,281	9,708	4,297	5,412	5,371	2,344	3,027
60 - 64	8,789	3,580	5,208	6,954	2,910	4,044	8,761	3,626	5,135
65 - 69	5,292	1,632	3,661	7,619	2,859	4,759	5,970	2,284	3,686
70 - 74	3,317	933	2,384	4,357	1,210	3,148	6,149	2,059	4,090
75 - 79	3,397	832	2,564	2,450	609	1,841	3,228	788	2,441
80 - 84	1,871	392	1,480	2,106	448	1,658	1,523	332	1,191
84 - 89	749	127	623	881	161	719	993	189	804
90 - 94	167	25	142	250	41	210	287	54	233
95 - 99	34	5	29	29	6	23	76	17	59
over 100	11	1	10	7	2	5	17	5	11
male & female 0-15	36,045	18,330	17,716	33,575	17,128	16,448	28,466	14,560	13,906
male 16-59 female 16-54	83,959	43,409	40,550	84,134	44,014	40,120	86,692	44,077	42,615
male over 60 female over 55	27,909	7,527	20,381	30,064	8,246	21,819	30,031	9,353	20,677

Note: Compiled by the author using the data supplied by Goskomstat.

Table 5 Average Male Life Expectancy by Country

(age)

	1985-1990	1990-1995	1995-2000	2010-2015	2045-2050
European Average	69.2	68.5	69.1	72.2	77.7
E. European Average	65.6	63.0	63.0	66.7	74.3
Belarus	66.6	64.5	62.8	66.3	74.4
Bulgaria	68.3	67.7	67.1	68.9	75.3
Czech Republic	67.8	68.8	70.9	74.3	78.4
Hungary	65.5	64.8	66.3	70.2	76.1
Poland	66.9	67.0	68.6	72.0	76.9
Republic of Moldova	64.1	63.6	62.8	66.8	74.6
Romania	66.5	65.8	66.5	69.0	74.2
Russian Federation	64.9	60.8	60.2	64.0	73.1
Slovakia	67.1	67.8	68.8	71.6	76.6
Ukraine	65.5	62.2	62.7	66.7	74.0
Kazakhstan	63.6	60.5	58.6	63.6	73.0
Kyrgyztan	63.5	63.2	62.8	68.3	74.9
Tajikistan	65.8	64.2	64.2	68.2	74.8
Turkmenistan	60.8	61.9	61.9	66.9	74.4
Uzbekistan	64.5	64.3	65.3	69.3	75.5
Armenia	67.4	68.0	69.3	71.9	76.6
Azerbaijan	65.4	65.6	67.2	70.7	76.2
Gerogia	67.5	68.5	68.5	71.3	76.3
Estonia	65.9	62.9	64.3	68.3	74.7
Latvia	65.7	62.4	63.7	68.2	74.6
Lithuania	67.2	64.3	66.1	70.0	76.1
USA	71.4	72.2	73.6	76.4	80.0
Japan	75.5	76.2	77.0	79.3	83.5

Note: Compiled from UN (2001a, Table A.30).

Table 6 Difference of Average Life Expectancy Between Sexes by Country (Female Life Expectancy - Male Life Expectancy)

(age)

	1985-1990	1990-1995	1995-2000	2010-2015	2045-2050
European Average	7.6	8.3	8.3	7.4	6.1
E. European Average	9.0	10.5	10.6	9.1	6.8
Belarus	9.0	10.4	11.6	9.9	6.8
Bulgaria	6.4	7.0	7.7	7.2	5.8
Czech Republic	7.3	7.4	6.8	6.4	6.0
Hungary	8.1	9.1	8.8	7.9	6.4
Poland	8.5	8.9	8.4	7.6	6.4
Republic of Moldova	6.6	7.3	7.5	5.9	5.1
Romania	6.2	7.4	6.8	6.3	5.5
Russian Federation	10.0	12.3	12.3	10.6	7.4
Slovakia	8.1	8.4	8.0	7.0	5.8
Ukraine	8.7	9.8	10.8	8.8	6.8
Kazakhstan	9.5	9.8	11.4	9.5	6.7
Kyrgyztan	7.8	8.6	8.3	6.2	5.8
Tajikistan	5.2	6.0	6.0	5.0	5.0
Turkmenistan	6.7	7.0	7.0	5.9	5.4
Uzbekistan	6.2	6.4	6.0	5.2	5.2
Armenia	4.8	6.6	6.1	5.9	5.3
Azerbaijan	8.2	8.4	7.3	6.4	5.6
Gerogia	7.8	8.3	8.3	7.3	6.1
Estonia	9.1	11.3	11.3	9.7	6.8
Latvia	9.2	11.6	11.7	9.6	6.7
Lithuania	9.2	11.3	10.6	9.3	6.9
USA	7.0	6.7	5.8	5.6	5.3
Japan	5.8	6.2	6.8	7.9	8.9

Note: Compiled from UN (2001a, Table A.30).

Table 7 Crude Birth Rate by Country

(‰)

	1985-1990	1990-1995	1995-2000	2010-2015	2045-2050
European Average	13.7	11.5	10.1	9.0	9.1
E. European Average	15.5	11.3	9.2	9.1	9.1
Belarus	15.9	11.9	9.2	9.5	9.4
Bulgaria	13.0	10.2	8.0	7.8	8.8
Czech Republic	12.9	11.5	8.8	8.0	8.9
Hungary	12.0	11.7	9.8	8.4	9.6
Poland	16.0	13.2	10.5	10.0	10.7
Republic of Moldova	21.2	15.5	12.3	11.4	10.2
Romania	16.1	11.4	10.3	9.8	10.5
Russian Federation	16.0	10.6	8.8	9.0	8.7
Slovakia	16.3	13.7	10.8	9.7	8.4
Ukraine	14.4	11.2	8.9	8.4	8.2
Kazakhstan	24.6	19.7	16.9	16.0	11.7
Kyrgyztan	33.2	27.5	23.2	18.9	13.9
Tajikistan	40.2	34.0	28.8	21.3	14.1
Turkmenistan	35.7	32.5	28.6	19.9	13.9
Uzbekistan	36.0	30.9	24.4	20.1	13.6
Armenia	22.7	17.7	11.2	9.8	7.8
Azerbaijan	26.5	23.4	16.1	12.9	10.4
Gerogia	17.5	14.2	11.7	9.9	9.6
Estonia	15.6	11.0	8.7	9.2	10.1
Latvia	15.5	11.3	7.7	8.6	9.8
Lithuania	15.9	13.4	10.2	8.7	9.7
USA	16.0	15.6	14.5	12.8	12.6
Japan	10.5	9.7	9.8	8.3	7.9

Note: Compiled from UN (2001a, Table A.21).

Table 8 Total Fertility Rate by Country

(‰)

	1985-1990	1990-1995	1995-2000	2010-2015	2045-2050
European Average	1.83	1.58	1.41	1.34	1.81
E. European Average	2.10	1.60	1.28	1.22	1.84
Belarus	2.04	1.66	1.27	1.26	1.86
Bulgaria	1.92	1.48	1.14	1.17	1.89
Czech Republic	1.92	1.64	1.18	1.22	1.97
Hungary	1.82	1.73	1.37	1.26	1.97
Poland	2.15	1.89	1.46	1.32	2.10
Republic of Moldova	2.64	2.12	1.61	1.34	1.90
Romania	2.28	1.50	1.32	1.37	2.05
Russia	2.13	1.52	1.23	1.18	1.75
Slovakia	2.15	1.87	1.40	1.31	1.70
Ukraine	1.96	1.58	1.26	1.15	1.70
Kazakhstan	3.03	2.46	2.10	1.90	1.90
Kyrgyztan	4.02	3.45	2.89	2.10	2.10
Tajikistan	5.41	4.43	3.72	2.33	2.10
Turkmenistan	4.55	4.03	3.60	2.31	2.10
Uzbekistan	4.40	3.60	2.85	2.10	2.10
Armenia	2.58	2.10	1.39	1.14	1.70
Azerbaijan	2.83	2.64	1.94	1.44	1.90
Gerogia	2.26	1.87	1.58	1.34	1.90
Estonia	2.18	1.59	1.24	1.27	2.00
Latvia	2.09	1.63	1.12	1.18	2.00
Lithuania	2.09	1.78	1.38	1.19	2.00
USA	1.92	2.05	2.04	1.90	2.10
Japan	1.66	1.49	1.41	1.43	1.75

Note: Compiled from UN (2001a, Table A.24).

Table 9 Crude Death Rate by Country

(‰)

	1985-1990	1990-1995	1995-2000	2010-2015	2045-2050
European Average	10.6	11.2	11.5	12.1	15.7
E. European Average	11.1	12.7	13.4	13.8	16.7
Belarus	10.1	11.9	13.4	13.7	16.2
Bulgaria	12.0	12.8	14.3	15.5	17.6
Czech Republic	12.9	11.7	10.9	11.2	16.5
Hungary	13.8	14.3	14.0	13.4	16.1
Poland	10.1	10.3	9.9	10.6	14.8
Republic of Moldova	10.1	10.8	11.8	11.3	14.0
Romania	10.8	11.4	12.0	13.1	16.0
Russian Federation	10.9	13.3	14.3	14.7	17.3
Slovakia	10.5	10.0	9.9	10.5	15.5
Ukraine	11.6	13.9	14.7	14.8	17.5
Kazakhstan	7.8	9.3	10.0	9.6	11.5
Kyrgyztan	7.7	7.5	7.6	6.7	8.9
Tajikistan	7.3	7.1	6.7	5.8	8.0
Turkmenistan	8.2	7.5	7.2	5.9	8.2
Uzbekistan	7.2	6.8	6.2	5.7	8.5
Armenia	6.8	6.8	7.3	8.4	15.8
Azerbaijan	6.6	6.7	6.2	7.0	12.5
Gerogia	8.7	8.9	9.4	11.1	15.2
Estonia	11.9	13.5	13.3	13.7	16.3
Latvia	12.4	14.5	13.4	14.2	17.2
Lithuania	10.4	11.7	11.2	11.9	15.9
USA	8.7	9.0	8.5	8.3	10.8
Japan	6.3	6.9	7.6	9.8	14.3

Note: Compiled from UN (2001a, Table A. 27).

Table 10 Birth-Death Ratio by Country

	1985-1990	1990-1995	1995-2000	2010-2015	2045-2050
European Average	1.29	1.03	0.88	0.74	0.58
E. European Average	1.40	0.89	0.69	0.66	0.54
Belarus	1.57	1.00	0.69	0.69	0.58
Bulgaria	1.08	0.80	0.56	0.50	0.50
Czech Republic	1.00	0.98	0.81	0.71	0.54
Hungary	0.87	0.82	0.70	0.63	0.60
Poland	1.58	1.28	1.06	0.94	0.72
Republic of Moldova	2.10	1.44	1.04	1.01	0.73
Romania	1.49	1.00	0.86	0.75	0.66
Russian Federation	1.47	0.80	0.62	0.61	0.50
Slovakia	1.55	1.37	1.09	0.92	0.54
Ukraine	1.24	0.81	0.61	0.57	0.47
Kazakhstan	3.15	2.12	1.69	1.67	1.02
Kyrgyztan	4.31	3.67	3.05	2.82	1.56
Tajikistan	5.51	4.79	4.30	3.67	1.76
Turkmenistan	4.35	4.33	3.97	3.37	1.70
Uzbekistan	5.00	4.54	3.94	3.53	1.60
Armenia	3.34	2.60	1.53	1.17	0.49
Azerbaijan	4.02	3.49	2.60	1.84	0.83
Gerogia	2.01	1.60	1.24	0.89	0.63
Estonia	1.31	0.81	0.65	0.67	0.62
Latvia	1.25	0.78	0.57	0.61	0.57
Lithuania	1.53	1.15	0.91	0.73	0.61
USA	1.84	1.73	1.71	1.54	1.17
Japan	1.67	1.41	1.29	0.85	0.55

Note: Compiled from UN (2001a, Tables A.21 and A.27).

Table 11 Male Mortality Rate by Age Group: Russia

(‰)

	1980-1981	1985-1986	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
average	11.9	11.0	11.6	11.9	13.1	16.1	17.8	16.9	15.8	15.0	14.8	16.3	17.4
age groups													
0-4	6.5	6.0	4.4	4.4	4.3	4.5	4.6	4.6	4.5	4.5	4.5	4.6	4.4
5-9	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
10-14	0.7	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6
15-19	1.8	1.4	1.6	1.7	1.8	2.1	2.1	2.4	2.2	1.9	1.9	2.0	2.2
20-24	3.2	2.5	2.6	2.7	3.2	3.8	4.0	4.3	4.2	3.9	4.1	4.5	5.0
25-29	4.3	3.0	3.3	3.5	4.2	5.1	5.5	5.4	5.0	4.6	4.6	5.2	6.0
30-34	5.4	3.9	4.3	4.5	5.5	7.0	7.7	7.4	6.6	5.9	5.8	6.5	7.0
35-39	7.9	5.0	5.6	5.9	7.1	9.3	10.6	10.0	8.6	7.7	7.5	8.4	9.1
40-44	9.8	8.1	7.6	8.0	9.8	13.3	15.2	14.1	12.2	10.6	10.2	11.5	12.6
45-49	13.7	10.7	11.7	11.6	13.5	17.8	20.8	19.3	17.0	14.8	14.4	16.2	17.7
50-54	17.9	16.2	16.1	16.5	19.4	25.3	29.1	27.3	23.7	20.4	19.5	22.3	24.4
55-59	24.7	22.7	23.4	23.3	25.3	31.3	36.2	34.0	31.1	29.5	28.6	31.5	33.7
60-64	35.5	32.8	34.2	34.6	36.9	45.3	51.0	47.1	43.1	40.0	38.1	42.5	45.0
65-69	48.8	48.0	46.6	47.3	49.4	59.4	64.2	61.3	58.3	56.9	55.3	59.0	60.4
over 70	100.9	97.6	103.6	104.0	105.7	118.8	121.4	112.0	105.1	100.0	97.0	100.8	101.9

Source: *RSE* 2001, p.126.

Table 12 An Estimate of Premature Deaths of Russian Males

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	1992-1996	1992-2000
	(*thousands*)											
0 - 4	0.0	▲ 0.5	0.4	0.8	0.8	0.4	0.4	0.3	0.7	0.0	2.0	3.3
5 - 9	0.6	0.0	0.0	0.0	0.0	▲ 0.6	▲ 0.5	▲ 0.5	▲ 0.4	▲ 0.4	▲ 0.6	▲ 2.4
10 - 14	0.6	0.6	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0	2.4	2.4
15 - 19	0.5	1.1	2.7	2.7	4.4	3.3	1.7	1.7	2.4	3.6	14.2	23.6
20 - 24	0.5	3.0	6.2	7.4	8.9	8.5	6.9	8.0	10.3	13.1	34.0	72.4
25 - 29	1.1	4.5	8.8	10.7	10.2	8.4	6.5	6.7	9.9	14.1	42.6	79.9
30 - 34	1.3	7.6	16.6	20.0	18.2	12.8	8.4	7.5	10.6	13.0	75.3	114.9
35 - 39	1.9	9.4	23.5	31.9	28.1	19.2	13.4	11.9	16.9	20.1	112.1	174.4
40 - 44	2.2	12.3	32.5	44.0	37.6	27.0	17.8	15.7	23.8	30.7	153.3	241.4
45 - 49	▲ 0.3	5.9	23.8	40.9	34.2	25.8	15.8	14.2	24.1	32.7	130.7	217.4
50 - 54	1.8	12.8	29.4	34.7	29.9	18.6	11.1	10.2	22.2	34.2	125.4	203.2
55 - 59	▲ 0.4	7.3	32.8	55.0	45.5	32.8	24.2	17.7	22.7	24.1	173.5	262.2
60 - 64	1.4	9.1	34.4	48.9	37.5	25.7	17.4	12.7	29.1	39.2	155.6	253.9
65 - 69	1.5	7.0	34.8	50.3	42.0	33.7	28.8	22.9	30.0	31.5	167.9	281.3
70+	0.9	4.9	36.2	44.1	20.8	3.9	▲ 10.2	▲ 20.3	▲ 9.2	▲ 5.9	109.9	64.4
Total	13.6	85.1	282.8	392.0	318.9	219.5	141.7	108.8	193.2	250.1	1,298.3	1,992.2
	(Estimated number of premature death / Actural number of age-specific death; %)											
0 - 4	0	▲ 2	2	4	4	2	2	2	4	0	2	2
5 - 9	13	0	0	0	0	▲ 17	▲ 17	▲ 17	▲ 17	▲ 17	▲ 3	▲ 6
10 - 14	14	14	14	14	14	0	0	0	0	0	12	8
15 - 19	6	11	24	24	33	27	16	16	20	27	25	23
20 - 24	4	19	32	35	40	38	33	37	42	48	33	37
25 - 29	6	21	35	40	39	34	28	28	37	45	34	35
30 - 34	4	22	39	44	42	35	27	26	34	39	37	35
35 - 39	5	21	40	47	44	35	27	25	33	38	39	36
40 - 44	5	22	43	50	46	38	28	25	34	40	41	38
45 - 49	▲ 1	13	34	44	39	31	21	19	28	34	35	31
50 - 54	2	17	36	45	41	32	21	17	28	34	34	31
55 - 59	▲ 0	8	25	35	31	25	21	18	26	31	26	25
60 - 64	1	7	25	33	27	21	15	10	20	24	23	21
65 - 69	1	6	22	27	24	20	18	16	21	23	21	20
70+	0	2	13	15	7	1	▲ 4	▲ 7	▲ 3	▲ 2	8	2
Total	2	9	25	31	27	20	14	11	17	21	23	20

Note: 1. Mid-year population in 1991-2000: Year *t* 's mid-year male population in age group, from data supplied by Goskomstat = (*t* -1 end-year population + year *t* 's end-year population) / 2. (For years 1993-2000 use data from each annual *DER*.)

2. Year *t* 's mid -year male population in age group ✕ year *t* 's death rate (Table 11) / 1000 = year *t* 's actual number of deaths. (Number of deaths for the years 1990 and 1993-2000 could be found in the annual DERs. Here we used caluculated values.)

3. Year *t* 's number of premature male death in age group = Year *t* 's number of actual death in age group - year *t* 's mid-year male population in age-group ✕ death rate in 1990 / 1000.

Table 13 Dependency Ratios in Russia (data from Goskomstat)

(end-year value)

	Russian System			International Standard System		
	Child Dependency Ratio	Old-Age Dependency Ratio	Dependency Ratio	Child Dependency Ratio	Old-Age Dependency Ratio	Dependency Ratio
1989	43.0	32.9	75.9	34.4	14.7	49.1
1990	42.9	33.6	76.4	34.2	15.2	49.4
1991	42.6	34.2	76.8	33.9	15.9	49.8
1992	42.0	35.0	77.1	33.5	16.6	50.1
1993	41.2	35.4	76.7	32.8	17.3	50.1
1994	40.4	35.6	76.0	32.2	17.7	49.9
1995	39.4	35.9	75.3	31.4	18.1	49.5
1996	38.3	36.2	74.5	30.4	18.4	48.7
1997	37.0	36.1	73.1	29.2	18.5	47.7
1998	35.5	35.6	71.0	27.8	18.3	46.1
1999	33.7	35.0	68.6	26.4	18.1	44.5
2000	32.0	34.3	66.4	25.2	18.1	43.3
2001	-	-	-	-	-	-
2002	29.1	33.7	62.8	-	-	-
2003	27.6	33.1	60.7	-	-	-
2004	26.4	32.9	59.3	-	-	-
2005	25.5	32.8	58.3	20.7	19.9	40.6
2006	25.0	33.2	58.2	-	-	-
2007	24.8	33.7	58.5	-	-	-
2008	24.9	34.3	59.2	-	-	-
2009	25.3	35.4	60.7	-	-	-
2010	25.8	36.2	62.0	20.6	17.5	38.1
2011	26.3	37.2	63.5	-	-	-
2012	26.9	38.3	65.2	-	-	-
2013	27.5	39.5	67.0	-	-	-
2014	28.2	40.7	68.9	-	-	-
2015	28.9	42.0	70.9	22.7	19.2	41.9

Sources: DER annuals, Goskomstat (2001) , and data supplied by Goskomstat.

Note: Russian system: child (0-15), working-age (male 16-59；female 16-54), old-age (male over 60, female over 55).
International standard system: child (0-14), working- age (male/female 15-64), old-age (male/female over 65).

Table 14 An International Comparison of Dependency Ratios (International Standard System)

	Child Dependency Ratio				Old-Age Dependency Ratio				Dependency Ratio			
	1990	2000	2015	2050	1990	2000	2015	2050	1990	2000	2015	2050
European Average	31	26	20	25	19	21	26	51	50	47	46	76
E. European Average	35	26	19	24	16	19	21	48	51	45	40	72
Belarus	35	27	20	25	16	20	19	46	51	47	39	71
Bulgaria	31	23	17	25	19	24	26	53	50	47	43	78
Czech Republic	32	24	19	25	19	19	27	61	51	43	46	86
Hungary	30	25	19	25	21	21	25	52	51	46	44	77
Poland	39	28	21	28	15	18	21	49	54	46	42	77
Republic of Moldova	44	34	23	25	13	14	14	39	57	48	37	64
Romania	36	27	22	27	15	19	20	45	51	46	42	72
Russian Federation	34	26	19	23	15	18	19	47	49	44	38	70
Slovakia	39	28	21	23	16	17	19	50	55	45	40	73
Ukraine	32	26	18	22	19	20	22	49	51	46	40	71
Kazakhstan	50	41	32	28	10	10	11	28	60	51	43	56
Kyrgyztan	65	57	36	31	9	10	9	25	74	67	45	56
Tajikistan	81	70	40	30	8	8	7	22	89	78	47	52
Turkmenistan	73	65	42	30	6	7	7	21	79	72	49	51
Uzbekistan	74	61	38	31	8	8	7	24	82	69	45	55
Armenia	47	35	19	21	9	13	13	50	56	48	32	71
Azerbaijan	53	45	23	25	8	11	11	39	61	56	34	64
Gerogia	37	31	21	25	14	19	21	47	51	50	42	72
Estonia	33	26	20	27	18	21	24	47	51	47	44	74
Latvia	32	26	18	26	18	21	26	50	50	47	44	76
Lithuania	34	29	18	26	16	20	24	51	50	49	42	77
USA	33	33	29	31	19	19	19	35	52	52	48	66
Japan	26	22	22	24	18	25	42	72	44	47	64	96

Note: Compiled from UN (2001a, Table A.35, Corrigendum).

Table 15 Estimated Population of 1995, using the Cohort Component Method

Age	Estimated Value of 1995 (thousands)			Estimated Value -Actual Value (thousands)		
	Total	Male	Female	Total	Male	Female
0 - 4	5,035	4,821	9,856	986	981	1,967
5 - 9	5,904	5,685	11,589	▲ 44	▲ 18	▲ 62
10 - 14	5,968	5,787	11,755	▲ 40	▲ 27	▲ 67
15 - 19	5,502	5,346	10,848	8	10	19
20 - 24	5,319	5,086	10,405	65	99	164
25 - 29	4,912	4,667	9,579	39	22	61
30 - 34	5,878	5,791	11,669	▲ 8	▲ 11	▲ 19
35 - 39	6,439	6,429	12,868	58	▲ 19	38
40 - 44	5,834	5,976	11,810	48	▲ 37	11
45 - 49	4,564	4,838	9,402	64	▲ 7	57
50 - 54	2,745	3,133	5,878	77	1	78
55 - 59	4,415	5,432	9,846	118	20	138
60 - 64	3,005	4,086	7,090	95	42	137
65 - 69	2,967	4,777	7,744	108	18	126
70 - 74	1,236	3,167	4,403	26	20	46
75 - 79	616	1,864	2,480	7	23	29
80 - 84	449	1,663	2,111	1	5	6
85 - 89	162	720	882	1	1	1
90 - 94	31	182	213	▲ 10	▲ 28	▲ 38
95 - 99	6	38	44	0	15	15
Total	70,985	79,489	150,473	1,599	1,108	2,707
5 - 99				613	127	740
male 20 - 59				461		

Note: Calculated by the author.