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ABSTRACT

Reassessing the Standard of Living in the Soviet Union: An Analysis Using Archival and Anthropometric Data*

Both Western and Soviet estimates of GNP growth in the USSR indicate that GNP per capita grew in every decade – sometimes rapidly – from 1928 to 1985. While this measure suggests that the standard of living improved in the USSR throughout this period, it is unclear whether this economic growth translated into improved well-being for the population as a whole. This paper uses previously unpublished archival data on infant mortality and anthropometric studies of children conducted across the Soviet Union to reassess the standard of living in the USSR using these alternative measures of well-being. In the prewar period these data indicate a population extremely small in stature and sensitive to the political and economic upheavals visited upon the country by Soviet leaders and outside forces. Remarkably large and rapid improvements in infant mortality, birth weight, child height and adult stature were recorded from approximately 1940 to the late 1960s. While this period of physical growth was followed by stagnation in heights and an increase in adult male mortality, it appears that the Soviet Union avoided the sustained declines in stature that occurred in the United States and United Kingdom during industrialization in those countries.

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I. Introduction

Despite the obvious and ultimately fatal shortcomings of the Soviet system of central planning, the Soviet growth model nevertheless achieved impressive rates of economic growth and promoted the rapid industrialization of the USSR, particularly in the decades from the 1930s to the 1960s. Both Western and Soviet estimates of GNP growth in the Soviet Union indicate that GNP per capita grew in every decade in the postwar era, at times far surpassing the growth rates of the developed western economies. By this measure – and according to the propaganda spread by Soviet promoters – the standard of living in the country rose concurrently with rising GNP per capita. Yet due to the highly restricted publication of data and the questionable quality of the data that were published, little is known about the standard of living in the Soviet Union. Some trends, such as the decline in male life expectancy that began in 1965, suggest a deterioration of living standards; however this decline itself remains a puzzle, and little additional evidence has been available to assess other aspects of living standards in the USSR either in the prewar or postwar periods. The question of whether the standard of living rose or fell in the Soviet Union during industrialization and in the postwar period is an important one, as our judgment of the Soviet growth model must rest not only on the rates of economic growth it achieved, but also on whether this growth translated into improved well-being for the population as a whole.

This paper reassesses the standard of living in the Soviet Union using a number of previously unexploited data sources. The focus is on alternative measures of well-being, in particular child and adult heights and infant and adult mortality, all of which directly measure the well-being of a population in terms of health status, nutrition and longevity. These biological indicators are a useful supplement to traditional measures of living standards, such as real

income or wages, because the latter may be misleading if measured incorrectly and in any case can only measure the means by which the good health and nutrition of a population can be achieved. In addition, it is important to examine alternative measures of well-being in the Soviet Union because GNP and other economic data were of unusually poor quality and reliability in that country.

The data used in this paper comprise previously unpublished data on infant mortality in the USSR and across Russia's regions from 1956 to 1979, collected from the Soviet archives, as well as the results of anthropometric studies of newborns, children and adolescents conducted across the Soviet Union from the 1920s to the early 1990s. These data are supplemented by a study of trends in adult heights by year of birth which provides a window on living conditions in the early childhood years of each cohort. These data paint a picture of a society far behind other developed countries in the health status of its population in the prewar period. For example, even in Moscow and St. Petersburg children reached no more than the 20th percentile of U.S. child growth prior to World War II, suggesting widespread stunting of children during that period. But substantial and rapid improvements in child height and birth weight were recorded in subsequent years; as a result by the late 1960s children in some regions reached the 50th percentile of U.S. child growth. A period of stagnation followed, marked by a large and growing infant and adult mortality gap with western countries and by stable or declining birth weights and child heights. Nevertheless the physical growth record of the Soviet population of the twentieth century remains an impressive one, especially in light of the evidence that some countries experienced declining adult stature during some phases of industrialization.

The outline of the paper is as follows. Section II presents a brief overview of what is currently known about economic growth and consumption in the Soviet Union. Section III

describes the new data sources used in the paper; Section IV discusses the use of anthropometric data as an alternative measure of living standards and analyzes the data on child and adult heights. Section V examines the trends in infant and adult mortality in this period, and Section VI concludes.

II. Previous assessments of economic growth and well-being in the USSR

Economic growth in the Soviet Union was the subject of intense scrutiny for many years by the CIA and western Sovietologists, in part due to the importance of the issue for U.S. national security interests, but also due to the extraordinary effort required to make Soviet economic statistics comparable to U.S. measures and to correct for the deficiencies in the data published by TsSU, the Soviet statistical agency. This section of the paper briefly reviews the estimates of national income growth and consumption in the Soviet Union calculated by various investigators, to provide a background against which to assess the alternative measures of well-being presented in the following sections of the paper.

Before turning to the estimates of national income growth in the USSR, it is worthwhile to note some of the shortcomings of Soviet economic data; indeed, as Easterly and Fischer state, "the fundamental problem in evaluating Soviet growth is data quality" (1994, p. 3). The problems fall into three main categories: incentives for misreporting; methodological differences between Soviet and Western national income accounting practices; and selective publication of data.[1]

Regarding incentives for misreporting, the work of all economic units, from factory floor to central ministries, was judged based on the fulfillment of plan targets established annually at

[1]See Ofer (1987) and Fischer (1994) for more detailed discussions of these problems.

all levels. Given this, it is clear that the incentive to over-report pervaded the entire system, raising doubts about the credibility of most reported economic magnitudes. Equally problematic were the differences in methodological approaches to national income accounting between the USSR and developed market economies. For ideological reasons, for example, important components of national income – such as services and interest on capital – were excluded from the national accounts of the Soviet Union (services were excluded because they were considered "nonproductive"; interest on capital because it was not considered a legitimate factor payment). The lack of market prices in the Soviet Union also complicated the task of researchers assessing Soviet growth, and particularly those wishing to compare Soviet growth with growth in developed countries in which prices more closely reflected shadow prices. The third major problem with Soviet economic data was selective publication, in which data considered to be embarrassing were simply suppressed, or definitions changed to suit the purposes of propaganda.

The poor quality and questionable reliability of Soviet economic data means that a high degree of uncertainty surrounds the estimates of GNP growth in the country, and underscores the importance of examining alternative measures of well-being. Anthropometric indicators such as height are also advantageous because they take into account that some economic activity is non-monetized and therefore unmeasured by conventional indicators of living standards. This is particularly beneficial for the Soviet Union, because, as is well-known, increasing shares of economic activity took place in the "second economy" of the USSR as macroeconomic imbalances intensified in the 1970s and 1980s.

Keeping these data-quality caveats in mind, a range of estimates of national income growth for the Soviet Union is shown in Table 1. By any measure this growth record is impressive, particularly in the early postwar years when Soviet economic growth exceeded U.S.

growth by a substantial margin, even using the more conservative Western estimates of Soviet growth. In later years growth began to slow, declining from an average annual rate of 6.0 percent in the 1950s to 2.0 percent in 1980-1985 (using the Bergson/CIA estimates). Comparing the Soviet growth record with that of the OECD and the United States, the growth rate of GNP per capita in the Soviet Union equaled that of the OECD for the 1950-1980 period (3.3 percent annual average) and exceeded that of the U.S. by a significant amount, at 3.3 versus 1.9 percent, respectively, from 1950 through 1980 (Table 2). In the last decade of the period, 1970 - 1980, GNP growth per capita was roughly similar in all three regions, averaging about 2 percent annually over those years. The sources of the slowdown in economic growth in the Soviet Union remain a topic of debate among scholars, with deteriorating productivity growth, low elasticity of substitution in industry, and poor investment decisions likely the most important contributing factors.[2] While it is clear that Soviet growth rates declined after the 1950s, the Soviet growth record in the postwar period nevertheless compares reasonably well with that of the developed market economies.[3] Based on this measure, at least, there was little reason to suspect that living standards may have stagnated during this long period of positive economic growth.

Household consumption data also support the picture of rising living standards throughout this period; the growth in per capita household consumption met or exceeded the growth rates of household consumption in the OECD and the United States over the entire 1950 - 1980 period (Table 2), as Soviet leaders allowed consumption to grow relatively rapidly until the early 1980s. According to Gur Ofer, this created a "radical change in the quality of life in the

[2]See the discussion of this issue in Ofer (1987), Easterly and Fischer (1994), and Allen (2001).

[3]See Allen (2003) for a reassessment of Soviet growth performance from 1928 to 1940. Harrison (2003) and Rosefielde (2003) provide further debate on the postwar growth record, with Khanin (2003) focusing on the high-growth decade of the 1950s. Ofer (2005) provides an overview of the new estimates of Soviet growth and the continuing debate among scholars over Soviet growth performance.

Soviet Union" (Ofer 1987, p. 1790), with an increased variety and quality of goods leading to significant improvements in the standard of living. This progress was further enhanced by the massive expansion of the public health care system and educational facilities across the country, with the vast majority of these services provided for free by the government.[4]

While the consumption growth record seems clear, it should be kept in mind that this growth took place in the context of a relatively low initial level of consumption, particularly in comparison with the U.S. and the OECD. As a result, even with rapid growth the absolute level of household consumption remained well below that of the United States throughout the postwar period. Estimates vary widely, but per capita consumption in the USSR likely reached no more than one-third that of the United States in the mid-1970s, and probably declined in subsequent years. Schroeder and Edwards (1981) estimate Soviet consumption per capita at 34.4 percent that of the United States in 1976, while Bergson (1991) calculates a proportion of 28.6 percent by 1985; even the Soviet statistical agency itself estimated that consumption per capita reached only 30 - 33 percent that of the U.S. in 1980 and fell to 22 - 26 percent by 1985 (Bergson 1991). Most investigators made herculean efforts to correct Soviet consumption measures for the important sources of bias – the persistent shortages of consumer goods, the cost of time spent in search, the poor quality of goods, and the lower level of retail services – but it remains likely that the actual level of consumption was even lower than the estimates given here, and the figures remain controversial. For example, Birman (1983) argues that actual Soviet consumption per capita reached only 22 percent of the U.S. level in 1976 when the data are properly adjusted for measurement problems.

[4]Chernichovsky *et al* (1996) and Tulchinsky and Varavikova (1996) provide useful overviews of the development of the public health service in the USSR.

Given the degree of controversy over these estimates it is difficult to draw clear conclusions regarding household consumption in the Soviet Union. Most analysts would likely agree that the level of per capita consumption in the USSR never exceeded one-third that of the United States, and that the level of consumption fell relative to that of the United States between the mid-1970s and mid-1980s. The lack of reliable information on Soviet consumption again underscores the benefits of examining alternative indicators of well-being in the USSR, such as anthropometric evidence and mortality, both of which are more objective measures of well-being than economic growth or consumption, and which are not subject to the data problems inherent in the more conventional measures of living standards. Because the Soviet statistical agency ceased publication of infant mortality rates and other demographic data in 1974, these indicators of living standards were unavailable to researchers until the mid-1980s when publication of a limited amount of mortality data resumed. These data revealed that male life expectancy had begun to decline in 1965 and that infant mortality rates started to rise in 1971, both nearly unprecedented developments in industrialized countries and both signals that, despite the apparent continuous improvements in economic growth and consumption in the USSR in the postwar period, a significant deterioration in the health of some groups in the population was underway.

III. New data sources

The opening of the Soviet archives has provided researchers with new opportunities for investigating all aspects of life in the Soviet Union, including changes in health status, mortality,

and the standard of living more broadly across the country.[5] The two archives in which the mortality and economic data are housed are the GARF archive (*Gosurdarstvennyi arkhiv Rossiiskoi Federatsii* (State Archive of the Russian Federation)) and the RGAE archive (*Rossiiskii gosudarstvennyi arkhiv ekonomiki* (Russian State Archive of the Economy)), both in Moscow. The infant mortality data in the archives are tabulated on standardized reporting forms and include data on births, stillbirths, and infant deaths (under 1 year) for urban and rural areas by region (*oblast'*) of the Russian Soviet Federal Socialist Republic (RSFSR). Most of the data are hand-written onto the forms and are enumerated simply as the total number of births or deaths in each category. Almost without exception the number of births and infant deaths by region add up to the RSFSR total in the archives and also agree with the published aggregates, indicating that systematic misreporting of deaths did not occur at this level.[6] Births and infant deaths by oblast were collected for 1956 through 1979 from the archives and were used to calculate infant mortality rates (total number of deaths divided by total live births) by region in those years. Additional data collected from the archives include average monthly wages and female employment by region for various years and alcohol purchases in 1959 (from family budget surveys); these data are supplemented by published data on health system capacity, urbanization, retail sales, food consumption and education levels. Data sources are detailed in Appendix 1.

The anthropometric data used in the paper are the birth weights and average heights of children and adolescents collected primarily by researchers at the Semashko Institute of Public

[5]See Gregory and Harrison (2005) for a comprehensive survey of the new findings on the Soviet economic system that have emerged from archival research.

[6]The specific location of each data series by *fond, opis* and *delo* is given in Appendix 1. Infant mortality data for 1969, 1974, and 1976 - 1978 are not in the archives.

Hygiene in studies initiated in the 1920s and continuing through the present day. Much of the data are published in the Semashko Institute volumes (1962, 1965, 1977, 1988, 1998). Most of the studies were conducted in schools by trained researchers according to a standard methodology (see Seglenietse 1973 for a description); researchers in each region measured at least 100 children of each sex at each age for height and weight. The average number of children measured by each sex and age in each region is 165. The birth weight data are also published in the Semashko volumes; these data were collected from maternity ward records and represent averages for each region based on several hundred to several thousand records in each region (the average number of observations for each region is 568). The Semashko data are supplemented by other anthropometric surveys of children in the USSR conducted by researchers and published in Soviet medical journals such as *Sovietskoye zdravookhraneniye* (*Soviet Public Health*) and *Zdravookhraneniye Rossiiskoi Federatsii* (*Public Health in the Russian Federation*); these sources are listed in Appendix 1. The data in these studies appear to be comparable to the Semashko data in terms of methodology, particularly in the standards used for measurement of children. The data in these studies are presented as the average height attained at each age in centimeters and for this paper have been converted into percentiles of U.S. growth standards. These percentiles were calculated by Richard Steckel (1996) and are derived from the standard U.S. growth charts which are based on nationally representative surveys of well-nourished children in the United States taken in the 1960s and early 1970s; these growth charts are widely used and have been adopted by the World Health Organization (WHO) as the standard for evaluating child growth in developing countries.[7] The child height data are supplemented with

[7]See U.S. Department of Health, Education and Welfare (1976) for a description of the surveys and methodology for constructing the growth charts. While a new set of growth charts was issued in 2000, this paper uses the earlier growth charts since the period in which they were developed is more comparable to that under study in this paper.

data on adult heights in Russia from the Russian Longitudinal Monitoring Survey (RLMS).[8] For comparison, data on the heights of (native) adults in the United States are also included in the analysis; these data are from the National Health and Nutrition Examination Surveys (NHANES III) conducted in 1988 - 1994.

IV. Trends in child and adult heights in the Soviet Union

These anthropometric data are used to evaluate the health and nutritional status of the Soviet population over the course of the twentieth century, and, more broadly, to assess the standard of living across regions and in the country as a whole. This use of anthropometric data draws on the pioneering work of researchers such as Robert Fogel and Richard Steckel, which has demonstrated that anthropometric data can provide a wealth of information on the living standards of the past and present, and can be particularly useful when data on traditional measures such as GNP are absent or of questionable quality (Fogel 1986, 1991, 1994; Steckel 1979a, 1979b).[9] More specifically, the influences of past and current nutritional status are reflected in adult heights and body mass indices (a measure of weight for height): adult height is a cumulative measure of nutritional status in infancy, childhood and early adulthood, while the body mass index is an indicator of current nutritional status. Both adult height and the body mass index have been found to be strong predictors of the probability of dying, and the ideal measures of these appear to be constant over time and across countries.

Stature as a measure of living standards has several advantages over more conventional measures. It is a measure of net nutrition in the sense that it takes into account not only the

[8]A detailed description of the sampling design and implementation of the RLMS, as well as data access, is available at the RLMS website at http://www.cpc.unc.edu/rlms.

[9]See Steckel (1995) for a survey of research in this area.

inputs to health – nutrition, health care – but the demands placed on an individual's biological system as well, such as through disease and work intensity in the growing years. Even a mild illness during the growing years will tend to slow growth, and although catch-up growth is possible it will depend on the availability of sufficient caloric and nutrient intake to enable such growth. In addition, stature and family income are usually highly correlated, which one might expect given that family income is closely linked with the ability to purchase health inputs and with the demands on these inputs; height is also especially sensitive to income at low income levels (Steckel 1995). Even within developed countries, however, height still rises with socio-economic class (Eveleth and Tanner 1990). Child height has an advantage as an indicator of welfare over adult height because for adults the causality between income and stature may run in both directions, with healthier (taller) individuals able to be more productive and earn higher wages (see Strauss and Thomas 1998). For children this direction of causality is implausible; in addition children are more sensitive to environmental insults, especially in the years of rapid growth (infancy and the adolescent years, i.e. age 10 to 14). Indeed it appears that adult height is largely determined by age 3 to 4, and is affected even by nutritional inputs during the fetal growth period (Thomas 2001). While genetic influences in part determine individual height, at the population level nearly all differences in average height are the result of environmental influences, enabling one to compare stature across countries and over time. In other words, well-nourished populations tend to follow the same growth curves, whether the population is European, African, or North American in origin (Martorell and Habicht 1986).[10] Because of the comparability of heights across populations and over time, and due to the clear link between

[10]The one exception to this rule appears to be individuals of Far Eastern origin; height differences between Far Eastern populations and other populations may have a genetic basis.

height and nutritional status, stature is viewed as a useful index of the standard of living.

Figures 1a and 1b present the trends in stature of boys and girls aged 4 to 15 as a percentile of U.S. growth standards in Moscow and St. Petersburg between 1910 and 1986. These children were likely to be the most well-nourished in the Soviet Union with access to the best health care in the country. In the prewar period these children were remarkably short in stature, and their growth trajectories were apparently sensitive to some of the cataclysmic events experienced in Russia and the Soviet Union in the twentieth century.[11] During World War I and the Civil War (1914 - 1921), Russian boys in the two cities reached only the 3rd to 5th percentile on U.S. growth charts; girls reached between the 3rd and 10th percentiles. These extraordinarily low measures of the stature of children suggest that stunting was widespread,[12] and that net nutrition was inadequate to support childhood and adolescent growth during this period.

Similar conditions characterized the cities of other Soviet republics: in Kiev and Kharkov (Ukraine), Minsk (Belarussia), Tashkent (Uzbekistan), and Frunze (now Bishkek, Kyrgyzstan), children on average achieved no more than the 8th percentile of growth and in some cases much less in the pre-1921 period (Figures 2a and 2b). These extremely low measures are corroborated by several indicators of the stature of adults born in this period. For example, the average stature of male military recruits born in 1906 - 1910 was 167.5 cm (Mironov 1999), which is roughly the 8th percentile of the height standard for 18-year-old boys (Steckel 1996). The average terminal height of Russian men born in 1913 was approximately 167 cm (Wheatcroft 1999); men in the United States had reached a height of 172.1 cm by 1910 (Costa

[11]Note that the average heights in these surveys are likely biased upward because researchers sometimes excluded children who appeared to be poorly nourished (Sukharev et. al. 1965).

[12]Stunting is defined as height below two standard deviations of the median of the reference population.

and Steckel 1997).

Returning to Figures 1a and 1b, child height declined to even lower levels during the famine of 1932-1933. But children gained in stature during World War II (1941 - 1945) in Moscow and St. Petersburg, as well as in Kiev, Kharkov, and Minsk (Figure 2a). This is surprising given that rationing was implemented in 1941 and that the average daily number of calories consumed by the urban population fell from 3,370 to 2,810 between 1940 and 1944, reaching a trough at 2,555 calories in 1942.[13] A possible explanation for the increase in child height during the war is that rationing led to a more equal distribution of calories across the population, reducing the incidence of malnourishment and stunting during the war years.[14] It is also possible that shorter and weaker children died during the war, so that average heights increased, or that child heights increased after the war due to 'catch-up' growth when food supplies improved. It is worth noting that the experience of increasing child stature during World War II was not unique to the Soviet Union; child height increased in most regions in England and Wales during World War II as well (Floud and Harris 1997).

It is following World War II that a remarkably rapid and sizable increase in the stature of Soviet children occurred. From approximately 1945 to 1965, the average height of children increased from (roughly) the 10th to the 40th percentile of U.S. growth charts. This significant gain in stature occurred across all of the Soviet republics for which data are available (Figures 2a and 2b), including the Baltic republics which were incorporated into the Soviet Union in 1939 (Figure 2c). These large gains in stature also characterized the growth of children across all regions of the Russian republic for which data are available (Figure 3). Figure 3 contains 1,383

[13]Chernyavskii (1964), p. 179, cited in Barber and Harrison (1991), p. 79.

[14]Sen (1998) discusses improved access to food and health care as an explanation for the increase in life expectancy in England and Wales during the war decades of 1911-1921 and 1941-1951.

observations on 59 regions of the Russian republic between 1910 and 1989; the underlying data of this graph represent the average heights of over 235,000 urban boys.[15] (The increase in the stature of girls is nearly identical and is not shown.) Rural boys grew dramatically during this period as well (Figure 4), but the rate of increase was slower and the average percentile attained was lower than that of urban boys.

This extremely rapid increase in the stature of children appeared to halt or possibly regress slightly in the early 1970s. For example, while 10-year-old boys in Moscow had increased in stature from the 21st to the 50th percentile between 1948 and 1959, by 1983 they had fallen to the 43rd percentile. As is evident from Figures 2a, 2b, 2c, 3, and 4, this pattern persists across many regions of the Soviet Union during this period. Soviet researchers themselves commented on this break in the trend of previous decades, even observing that in some regions the change in average child stature had become negative (Maksimova and Yanina 1988). Note that there is no reason that the stature of well-nourished children could not exceed the 50th percentile of U.S. growth charts: the average adult stature of the U.S. population began to lag behind that of many developed countries in the postwar period and is now 3 - 7 cm below that of countries such as Germany, Sweden, Norway, the Netherlands, Denmark, and the United Kingdom (Komlos and Baur 2003).

Similar trends are evident in average birth weights across regions over the period (Figures 5a, 5b). Birth weight is considered to be an excellent indicator of infant health, and due to its sensitivity to socioeconomic influences it is often used as a measure of living standards. As illustrated in these figures, average birth weights increased from the mid-1950s until about 1970 – particularly for boys – then appear to have declined from 1970 onward. It should be noted,

[15]A key to the region codes in Figures 3, 4 and 5 follows Figures 5a and 5b on page 38.

however, that the average birth weights shown in Figures 5a and 5b for 1970 – roughly 3500 grams – exceeds the median birth weight in the U.S. in that year, which was approximately 3300 grams (U.S. Bureau of the Census, 1995).

The trends in birth weight and child height are corroborated by a study of current adult heights in Russia taken from the Russian Longitudinal Monitoring Survey. As noted above, adult height is largely determined in early childhood (i.e., age 3 to 4) including the fetal period; like child stature adult stature also reflects the cumulative effects of nutrition and exposure to disease in early childhood. Figure 6 illustrates the trend in adult heights by exact date of birth and by sex over the 1937 - 1982 period, and includes a similar graph for the United States for comparison.[16] The first feature to note from Figure 6 is the large increase in the stature of individuals (especially men) born during World War II, which parallels the child growth data discussed previously. Figure 6 also supports the evidence of significant gains in stature among individuals born from the early 1950s through the late 1960s; the increase in stature averaged about 1.8 cm per decade for men and 1.3 cm per decade for women between 1940 and 1970, which is comparable to or exceeds the average rates of increase in stature in developing countries in the twentieth century. For example, Strauss and Thomas (1998) demonstrate that average stature in Vietnam, Brazil and Côte d'Ivoire increased by between .75 cm and 1.5 cm per decade between 1910 and 1960. By the late 1960s men in Russia and the U.S. attained an average height of about 177 cm, and female height in Russia exceeded that of the U.S. by about one centimeter.

[16]The samples used are for prime-age adults (age 22 - 55) and contain 8,368 observations for Russian men, 9,215 observations for Russian women, 3,315 observations for (native) U.S. men and 4,111 observations for (native) U.S. women. The Russian sample uses measured height by exact date of birth for Rounds 1 (1992) and 5 (1994) of the RLMS, which are independent random samples of the Russian population. The sample also includes new entrants to the surveys from later rounds. The graph illustrates locally weighted smoothing (or lowess) estimates of the relationship between stature and exact date of birth. Lowess is a nonparametric estimator that uses a small amount of data near the point in order to generate smoothed values of height. The procedure is described in Cleveland (1979).

The trends in Figure 6 also suggest a break in the secular increase in heights that begins around 1970, particularly for women. The timing of this change in trend is the same as the timing of the stagnation in child heights discussed above, and is nearly identical to the timing of the increase in infant mortality rates in the Soviet Union (discussed below).

Given the Soviet Union's proclaimed commitment to equality, it is of interest to examine how the gains in health status reflected in the increase in stature were distributed across the population. To investigate this issue, Table 3 presents the results of regressions of adult height on a dummy variable for year of birth for individuals born between 1937 and 1982. On average during this period men gained 1.6 cm in each decade; men at the 10^{th} percentile gained 1.5 cm while men at the 90^{th} percentile gained nearly 1.8 cm. The average decadal gain in stature for women was smaller (1.2 cm), with women at the 10^{th} percentile gaining 1.0 cm and women at the 90^{th} percentile gaining 1.25 cm. These results indicate that, for both men and women, inequality in height increased between 1937 and 1983. Dividing the period into pre- and post-1970 confirms that the increases in stature were confined to the pre-1970 period; after 1970 the gains for men are statistically insignificant and for women the coefficients are zero or close to zero and statistically insignificant.

To summarize, the evidence presented above indicates widespread stunting of children born in the prewar period, rapid growth in stature among individuals born in the 1940s, 1950s and 1960s, and a marked slowdown or halting of growth for individuals born in the early 1970s. These trends are consistent across nearly all Soviet republics and Russian regions for which data are available. The substantial and rapid increases in height across most regions and birth cohorts in the USSR in the 1940-1969 period indicate that significant improvements likely occurred in the nutrition, sanitary practices, and public health infrastructure in the country in that period. The

increase in heights occurred concurrently with high economic growth rates and rapid industrialization, as the Soviet economy was transformed from a predominantly agricultural to an industrialized economy between 1928 and the early 1960s. By this measure the Soviet experience compares favorably with that of the United States and United Kingdom, where sustained declines in adult stature were recorded during some phases of industrialization.[17]

V. Trends in infant and adult mortality in the USSR

Infant mortality rates supplement the anthropometric data because they are a reasonably good proxy for low birth weight and have been widely used as a measure of the quality of life across countries, and are available across all of Russia's regions for most of the years between 1956 and 1979. Infant mortality rates in the Soviet Union have attracted the attention of demographers and social scientists for years, particularly after 1986 when the Soviet statistical agency resumed publication of mortality data (which ceased in 1974; see Anderson and Silver 1990), revealing a large increase in infant mortality rates in the Soviet Union beginning in the early 1970s.[18]

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[17]For example, the height of English soldiers fell by about 2 cm between 1760 and 1790 (Komlos 1998), and average male adult height in the U.S. fell by over 3 cm between 1830 and 1880 (Haines et. al. 2003).

[18]This increase in infant mortality rates is controversial among demographers; some argue that it was an artefact of improved birth and death registration in the less developed regions of the USSR, while others argue that it was real and reflected deteriorating conditions in the public health infrastructure (see, for example, Jones and Grupp (1983), Anderson and Silver (1986), and Velkoff and Miller (1995)). The archival data cannot resolve this issue completely, but they can shed light on the controversy because they show the trends in infant mortality rates across all regions of Russia. If the increase in infant mortality rates was due only to improved registration of births and infant deaths, one would not expect infant mortality rates to have increased in the more developed regions of Russia which had achieved essentially complete vital event reporting decades earlier. The archival data indicate that infant mortality rates rose in many developed regions of the country, including Moscow which registered a 14 percent increase in infant mortality between 1971 and 1975. The largest increase in infant mortality was registered in Khabarovskii Krai (in the far east), at nearly 60 percent, followed by Altaiskii Krai in Western Siberia at almost 50 percent. However there is no obvious regional pattern in the increases in

Before the 1970s, however, the infant mortality rate in Russia fell rapidly: between 1935 and 1960 the infant mortality rate fell from over 200 to 36.6 per 1,000 births (see Figure 7, which compares infant mortality rates in the RSFSR and the United States).[19] This period of significant decline in the infant mortality rate is nearly identical to the period of rapid increase in child heights, birth weight, and adult stature documented in the previous section, just as the period of rising infant mortality rates coincides with the slowdown in the rate of increase of average stature in the population. Thus, the evidence consistently indicates that the health status and living conditions of infants and children in the Soviet Union improved dramatically from approximately 1940 to 1969, and stopped improving or began to deteriorate between 1970 and 1979.

What caused the improvement and subsequent stagnation in population health status in the Soviet Union? The improvement in infant and child health is likely related at least in part to the development of the national health care system in the Soviet Union, which expanded significantly in this period and provided free health care in even the remotest regions of the country. While the Soviet health care system eventually earned a well-deserved reputation for poor quality and service, it was particularly effective at controlling infectious diseases which undoubtedly contributed to improved child health. The significant increase in female education levels in this period – the share of women with secondary or more education increased from 9.3 to 34.5 percent between 1939 and 1959 – may also have played a role in improving child health

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infant mortality rates, with large increases registered in such diverse regions as Moscow, Novgorod and Saratov, and improvements recorded in other areas such as Leningradskaya oblast and Tyumenskaya oblast (in Western Siberia).

[19]Note that Soviet infant mortality rates are not directly comparable to Western infant mortality rates, because the Soviet data exclude live-born infants of less than 28 weeks gestation, less than 1000 grams in weight, and less than 35 centimeters in length who die within 7 days of birth (which are included in the WHO-recommended definition of infant mortality). Anderson and Silver (1986) estimate that Soviet infant mortality rates would be 22 to 25 percent higher if the data were adjusted to include these deaths.

status. Other factors that may have contributed include urbanization, the expansion of the retail sales system, improvement in the caloric and nutrient content of the food supply, and the increase in female employment.

Table 4 presents the results of regressions testing the relationship between the (log) changes in these variables and the infant mortality rate between 1959 and 1970 and between 1970 and 1979. These periods are chosen to represent a decade of sustained improvement in child health, and a decade of stagnation in child health, respectively; these years are also selected because data on population and education are available for 1959, 1970 and 1979 from population censuses conducted in those years. (Data sources for the variables used in the regressions in Tables 4 and 5 are given in Appendix 1.)

Columns (1) through (7) of the top panel of Table 4 indicate that urbanization, the increase in female employment and education, the increase in capacity of the hospital system, and the increase in retail sales are all (independently) negatively and significantly correlated with the decline in infant mortality between 1959 and 1970. When these variables are included in a regression together (col. 8), only the measure of changes in health system capacity (hospital beds per capita) and retail sales remain negatively and statistically significantly correlated with the log change in infant mortality rates. This suggests that the expansion of the health care and retail sales networks did contribute to the decline in infant mortality rates in this period. Since retail sales in the Soviet Union disproportionately comprise food purchases,[20] this result indicates that improved nutrition may explain some of the improvement in child health status. This possibility is investigated further below.

[20]For example, according to household budget surveys in 1980 the average household spent 35 percent of its income on food (Goskomstat RSFSR 1990, p. 143).

Column 9 adds a variable for the change in per capita consumption of alcohol, for which fewer observations are available. These limited data indicate a positive and statistically significant relationship between alcohol consumption and infant mortality, suggesting that the infant mortality rate might have fallen further during this period had alcohol consumption not increased.

Turning to the bottom panel of Table 4, the results are similar but weaker: independently, the average monthly wage, female employment, urban share, retail sales, and female higher education are all negatively and statistically significantly correlated with the log change in the infant mortality rate between 1970 and 1979, but when entered together none of these variables remain statistically significant. Per capita alcohol consumption is statistically insignificant as well. This provides little evidence on the causes of the slowdown of improvement in population health status. Other factors may have been at work; for example the increase in military expenditures during this period may have crowded out domestic consumption. It is also possible that the growth of the 'second' economy in the Soviet Union in this period reduced the accessibility or affordability of basic consumer goods for some families, resulting in a deterioration of the health status of some children. Unfortunately it is impossible to test either of these hypotheses given the lack of data on military expenditures or growth of the second economy.

A further test of the factors explaining the changes in population health status is to investigate the correlates of the stature of adults from the Russian Longitudinal Monitoring Survey. This survey asked respondents whether they currently live in the place they were born; for individuals who did not move, their adult height can be related to measures of urbanization, health system capacity, and so on for the region in which they were born in the year in which they

were born (note that there are insufficient observations on female employment and alcohol consumption in these years for these variables to be included in these regressions). The results of these regressions are presented in Table 5 for men (panel A) and women (panel B).

The results are similar to those of the infant mortality regressions: urbanization, increased education, and the expansion of the hospital and retail sales networks (the latter for women only) are correlated with adult stature when entered into the regressions separately. Individuals born in regions with higher infant mortality rates also tend to be shorter on average (col. 5). When entered together, however, only the education variables, infant mortality rate (men) and retail sales (women) remain statistically significant. It is worth noting that in most of the height and infant mortality regressions there is no evidence of a relationship between regional wages and health status, which conflicts with evidence noted previously regarding the positive correlation between height and income. A possible explanation is that in the Soviet Union, with its (largely) free health care and education, one might expect a weaker relationship between height and income than in other countries.

A final issue to explore regarding the improvement in infant and child health in the USSR is the role of increased food and nutrient supply. The negative correlation between retail sales and infant mortality rates indicates this may be a factor, but ideally one would like a cleaner test of this hypothesis. Unfortunately few data are available on the caloric or nutrient content of food by regions for this period, and data on food consumption is limited as well. Regarding the latter, data on per capita consumption of broad categories of food (e.g. meat, milk, eggs) are available by region for 1965, 1970, and 1980. Regressions of the log change in the infant mortality rate between 1965 and 1970, or between 1970 and 1980 on these measures show little support for the hypothesis that food consumption (by this measure) mattered: all of the coefficients on food

(entered separately into the regressions) are statistically insignificant.

Time-series evidence on calories and protein supply over a longer time period is more supportive of the hypothesis. Estimates of available calories and available calories from animal sources indicate that child height increased as calories increased, and that the relationship between changes in calories from animal sources and child growth is particularly strong (see Figures 8a and 8b). This is especially evident during the famine of 1932-1933, when child height declined sharply as calories from animal sources declined. Unfortunately it is impossible to test this hypothesis more extensively given the limited data available, so firm conclusions on the role of calories in the improvement in child health status cannot be made at this point

Finally, it is of interest to note that the changes in life expectancy in Russia mirror the changes in infant and child health status discussed previously. As illustrated in Figures 9a and 9b, male and female life expectancy increased substantially between 1940 and the early 1960s (at least in part due to falling infant mortality); by 1965 female life expectancy nearly equaled that of U.S. women and male life expectancy fell below that of U.S. men by only 2.5 years. Around 1965, however, male life expectancy began to decline and female life expectancy failed to improve, resulting in a gap of nearly 8.5 years in life expectancy between Russian and U.S. men by 1980, and a gap of 4.3 years for women in that same year. The decline in male life expectancy was largest in the Russian republic, but a similar pattern of deterioration occurred in the other republics as well. The unfavorable trends in mortality and life expectancy in the Soviet Union in the postwar period have long been known and, some have argued (e.g., Eberstadt 1993), should have been taken as the first signal that the impressive rates of economic growth in the USSR either were exaggerated or failed to translate into an improved standard of living for the population.

V. Conclusion

Did the standard of living rise or fall in the Soviet Union over the twentieth century? The conventional measures of GNP growth and household consumption indicate a long, uninterrupted upward climb in the Soviet standard of living from 1928 to1985; even Western estimates of these measures support this view, albeit at a slower rate of growth than the Soviet measures. The alternative measures of well-being examined in this paper largely support the evidence of improving population welfare throughout much of the twentieth century, despite the many cataclysmic events that marked this period. Four different measures of population health show a consistent and large improvement between approximately 1940 and 1969: child height, birth weight, adult height and infant mortality all improved significantly during this period. These four biological measures of the standard of living also corroborate the evidence of some deterioration in living conditions beginning around 1970, when infant and adult mortality was rising and child height and birth weight stopped increasing and in some regions began to decline.

The significant improvements in population well-being before 1970 may in part be related to the expansion of the national health care system, public education, and improved caloric and protein supply during this period. Moreover, these improvements occurred during a period of rapid industrialization, indicating that the Soviet Union managed to avoid the decline in adult stature that occurred in some other countries during their industrialization phases. While the Soviet experiment of the twentieth century undoubtedly failed and in countless ways harmed the lives of Soviet citizens, the record of Soviet health achievement prior to 1970 remains an impressive one.

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Appendix 1: Data sources

Archival data:

Births and infant deaths by RSFSR oblast:

1956: RGAE, F. 1562, op. 27, d. 209
1957: RGAE, F. 1562, op. 27, d. 352
1958: RGAE, F. 1562, op. 46, d. 1561; d. 489
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Table 1. Estimates of national income (GNP) growth in the Soviet Union, 1928 - 1985 (annual rates of growth)

	Khanin	Bergson/CIA	TsSU
1928-1985	3.3	4.3	8.8
1928-1941	2.9	5.8	13.9
1950s	6.9	6.0	10.1
1960s	4.2	5.2	7.1
1970s	2.0	3.7	5.3
1980-85	0.6	2.0	3.2

Source: Fischer (1994), Table 7.4.

Table 2. Comparisons of Soviet and Western economic performance, 1950 - 1980 (annual rates of growth)

	Soviet Union			E-OECD		United States	
	1950-80	1960-80	1970-80	1950-80	1970-80	1950-80	1970-80
GNP per capita	3.3	3.1	2.1	3.3	2.3	1.9	2.0
Household consumption per capita	3.7	3.2	2.6	3.2	2.6	2.1	2.3

Notes: Soviet data are Western estimates. Data for E-OECD and the U.S. are GDP rather than GNP. Household consumption is at established prices for the Soviet Union, at factor cost for E-OECD and the United States.

Source: Ofer (1987), Table 2.

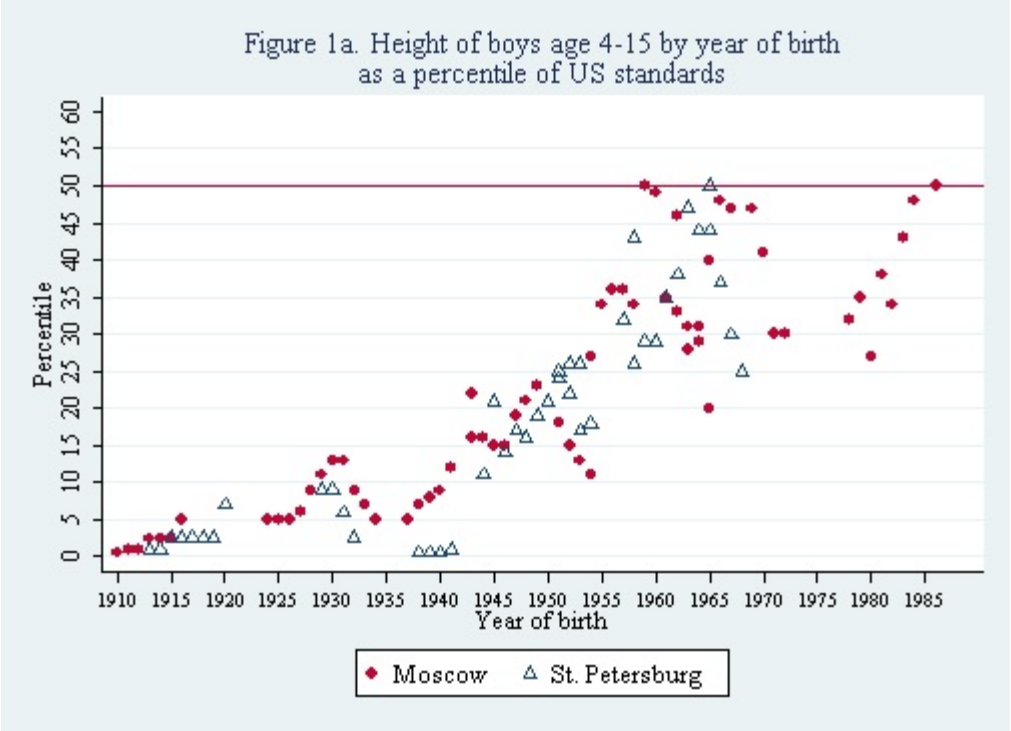


Figure 1a. Height of boys age 4-15 by year of birth
as a percentile of US standards
Percentile
0 5 10 15 20 25 30 35 40 45 50 55 60
1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985
Year of birth
Moscow
St. Petersburg

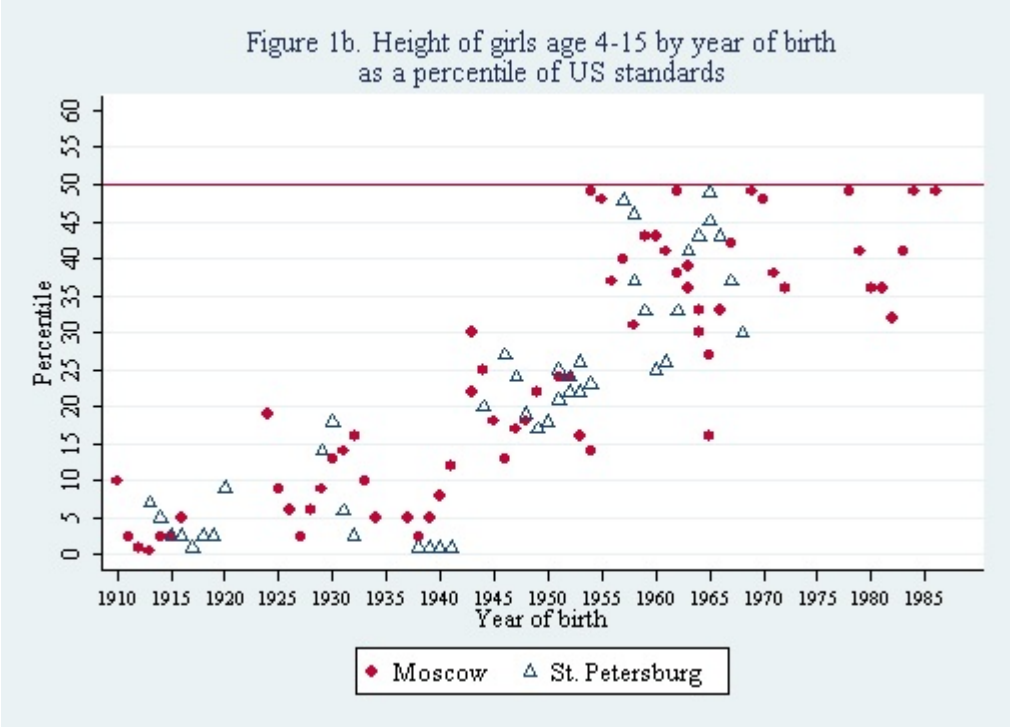


Figure 1b. Height of girls age 4-15 by year of birth
as a percentile of US standards
Percentile
0 5 10 15 20 25 30 35 40 45 50 55 60
1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985
Year of birth
Moscow
St. Petersburg

Figure 2a. Height of boys age 4-15 by year of birth
as a percentile of US standards

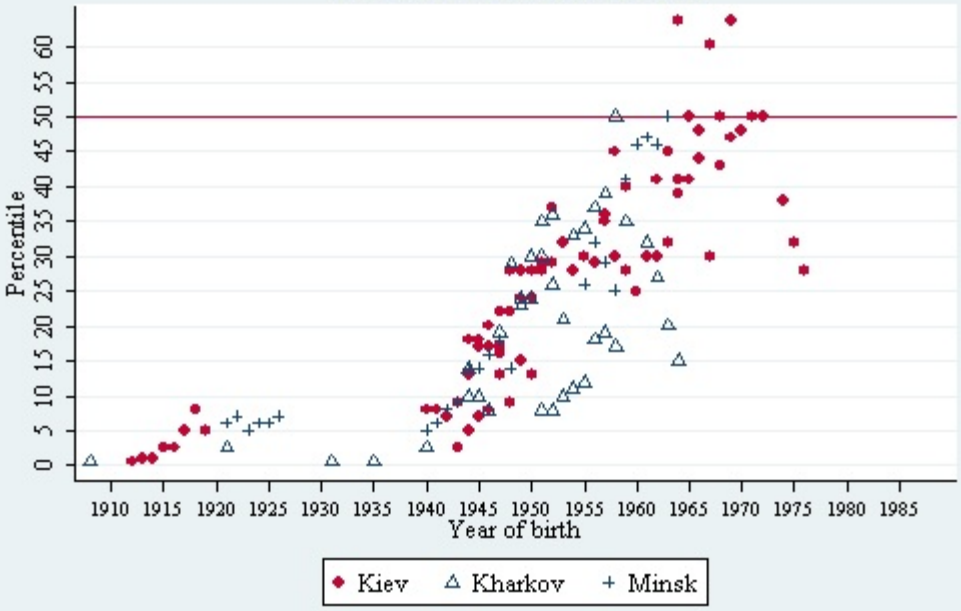
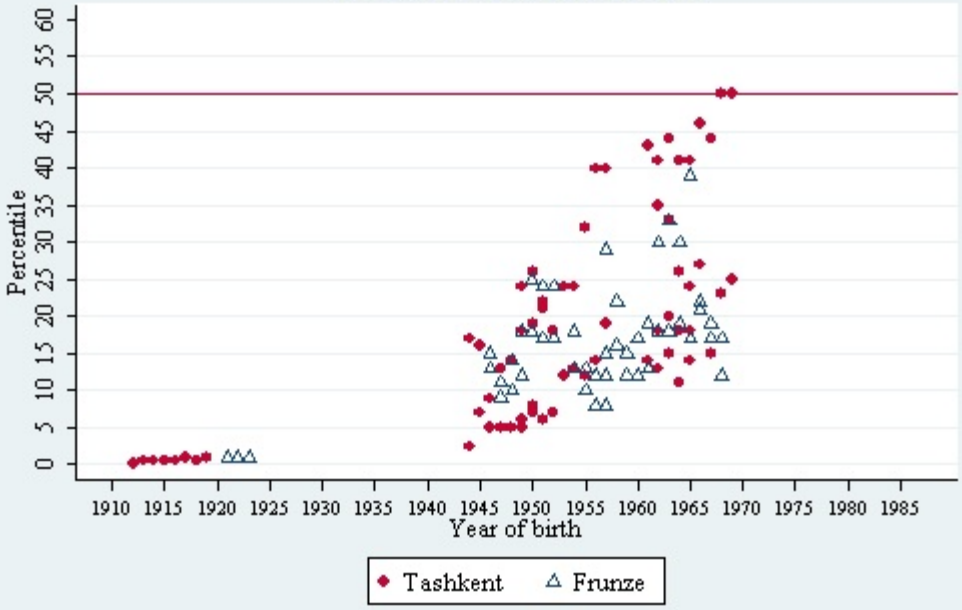


Figure 2b. Height of boys age 4-15 by year of birth
as a percentile of US standards



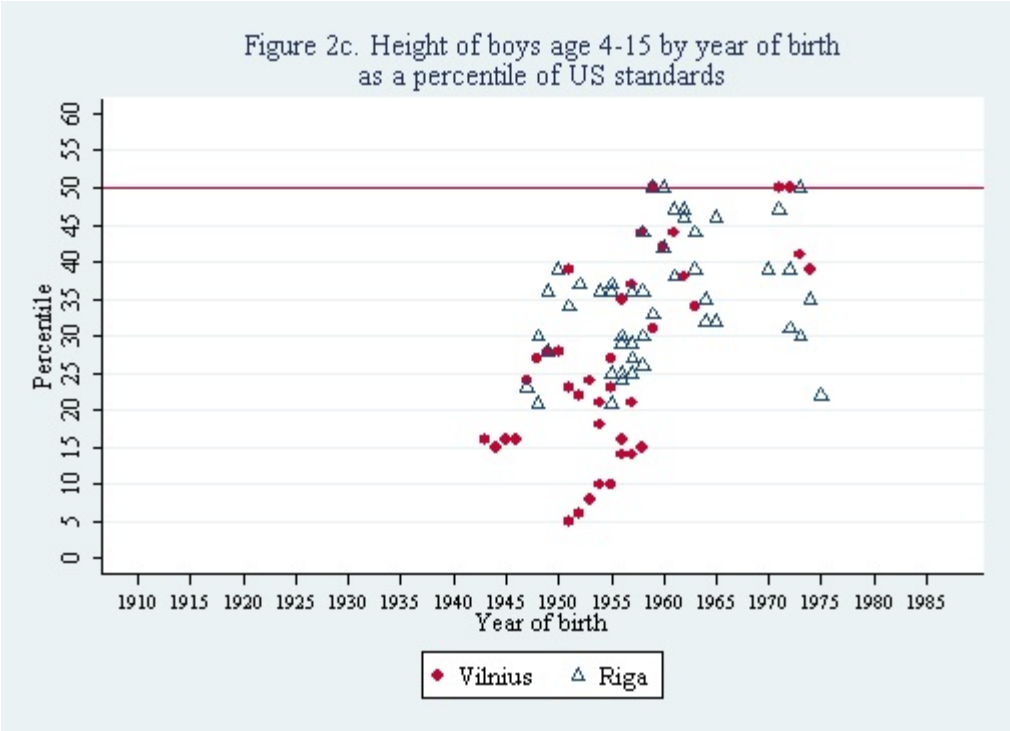


Figure 2c. Height of boys age 4-15 by year of birth
as a percentile of US standards
Percentile
0 5 10 15 20 25 30 35 40 45 50 55 60
1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985
Year of birth
Vilnius
Riga

Figure 3. Height of urban boys age 4-15 by year of birth
as a percentile of US standards, RSFSR republics

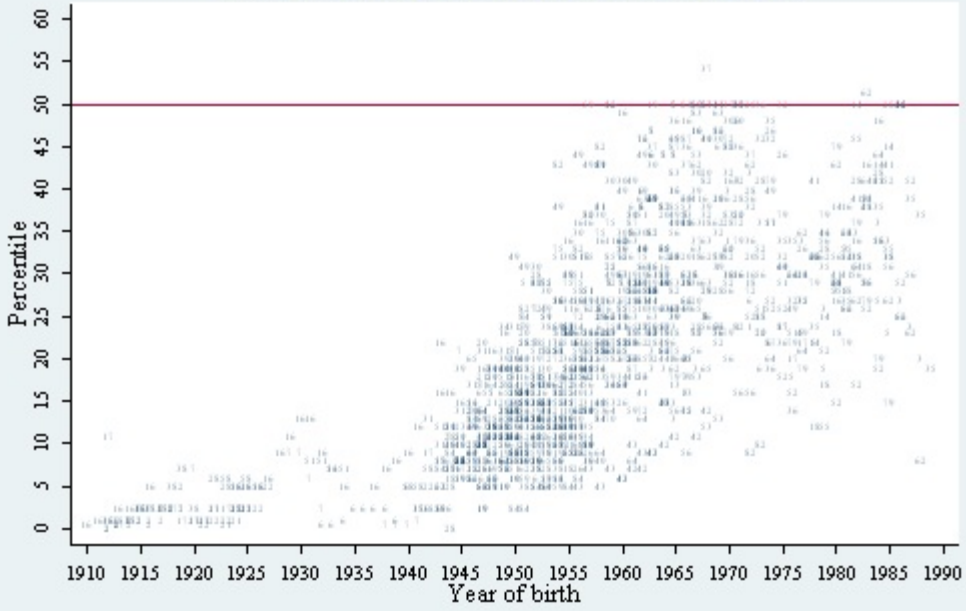


Figure 4. Height of rural boys age 4-15 by year of birth
as a percentile of US standards, RSFSR republics

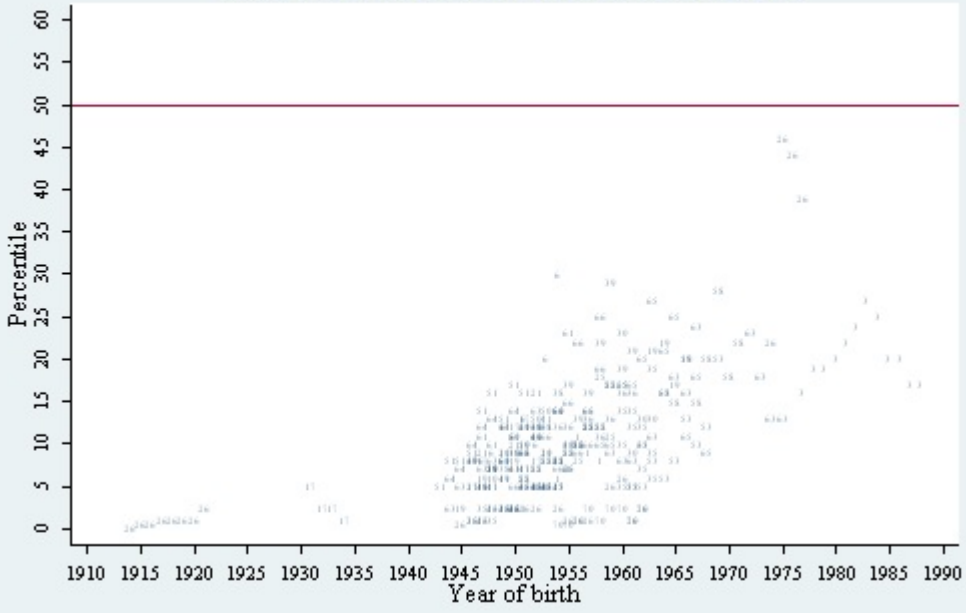


Figure 5a. Birthweight of urban boys by year of birth, RSFSR republics

Figure 5b. Birthweight of urban girls by year of birth, RSFSR republics

Key to region codes:

Northern region
1 Karelia rep.
2 Komi rep.
3 Arkhangelskaya obl.
4 Nenetsky a.o.
5 Vologodskaya obl.
6 Murmanskaya obl.

Northwestern region
7 St. Petersburg
8 Leningradskaya obl.
9 Novgorodskaya obl.
10 Pskovskaya obl.

Central region
11 Bryanskaya obl.
12 Vladimirskaya obl.
13 Ivanovskaya obl.
14 Kaluzhskaya obl.
15 Kostromskaya obl.
16 City of Moscow
17 Moskovskaya obl.
18 Orlovskaya obl.
19 Ryazanskaya obl.
20 Smolenskaya obl.
21 Tverskaya obl.
22 Tulskaya obl.
23 Yaroslavskaya obl.

Volga-Vyatsky region
24 Marii el rep.
25 Rep. of Mordovia
26 Chuvashskaya rep.
27 Kirovskaya obl.
28 Nizhegorodskaya obl.

Central Chernozem region
29 Belgorodskaya obl.
30 Voronezhskaya obl.
31 Kurskaya obl.
32 Lipetskaya obl.
33 Tambovskaya obl.

Povolzhsky region
34 Rep. of Kalmykiya
35 Rep. of Tatarstan
36 Astrakhanskaya obl.
37 Volgogradskaya obl.
38 Penzenskaya obl.
39 Samarskaya obl.
40 Saratovskaya obl.
41 Ulyanovskaya obl.

North Caucuses
42 Rep. of Adygeya
43 Rep. of Dagestan
44 Kabardino-Balk. rep.
45 Karachaevo-Cherk. rep.
46 North Ossetia
47 Chechenskaya rep.
48 Ingushetiya rep.
49 Krasnodarskii krai
50 Stavropolskii krai
51 Rostovskaya obl.

Urals
52 Rep. of Bashkortostan
53 Udmurtskaya rep.
54 Kurganskaya obl.
55 Orenburgskaya obl.
56 Permskaya obl.
57 Komi-Permyaskii a.o.
58 Sverdlovskaya obl.
59 Chelyabinskaya obl.

West Siberia
60 Altai rep.
61 Altaiskii krai
62 Kemerovskaya obl.
63 Novosibirskaya obl.
64 Omskaya obl.
65 Tomskaya obl.
66 Tyumenskaya obl.
67 Khanty-Maniiskii a.o.
68 Yamalo-Nenetskii a.o.

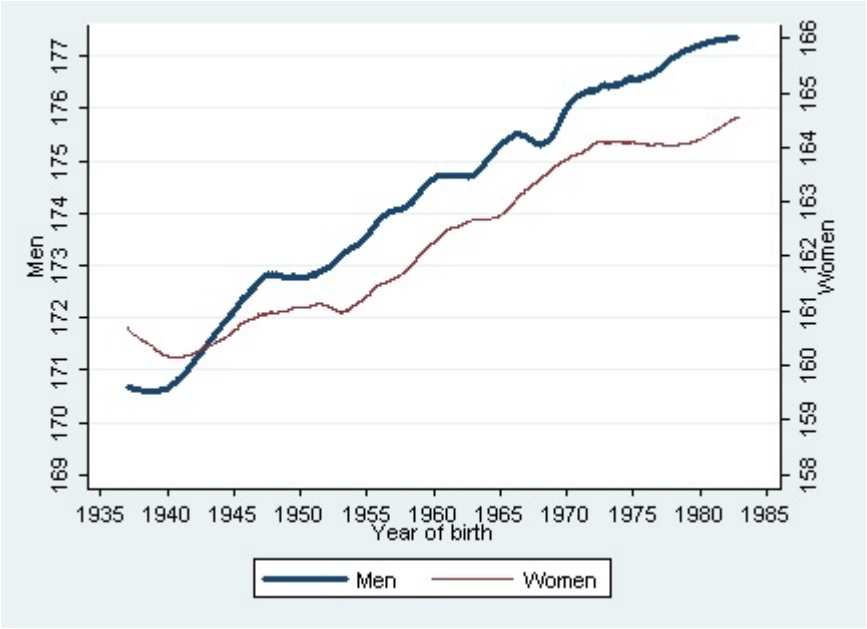
East Siberia
69 Rep. of Buryatia
70 Tuva rep.
71 Rep. of Khakasiya
72 Krasnoyarskii krai
73 Taimyrskii a.o.
74 Evenkiiskii a.o.
75 Irkutskaya obl.
76 Ust-Ordynskii a.o.
77 Chitinskaya obl.
78 Aginskii-Buryatskii a.o.

Far East
79 Sakha rep.
80 Evreiskaya a.o.
81 Chukotskii a.o.
82 Primorskii krai
83 Khabarovskii krai
84 Amurskaya obl.
85 Kamchatskaya obl.
86 Koryakskii a.o.
87 Magadanskaya obl.
88 Sakhalinskaya obl.

89 Kaliningradskaya obl.

Figure 6. Male and female adult heights by year of birth, Russia and United States (ages 22 - 55)

Russia, 1937 - 1982



United States, 1935 - 1970

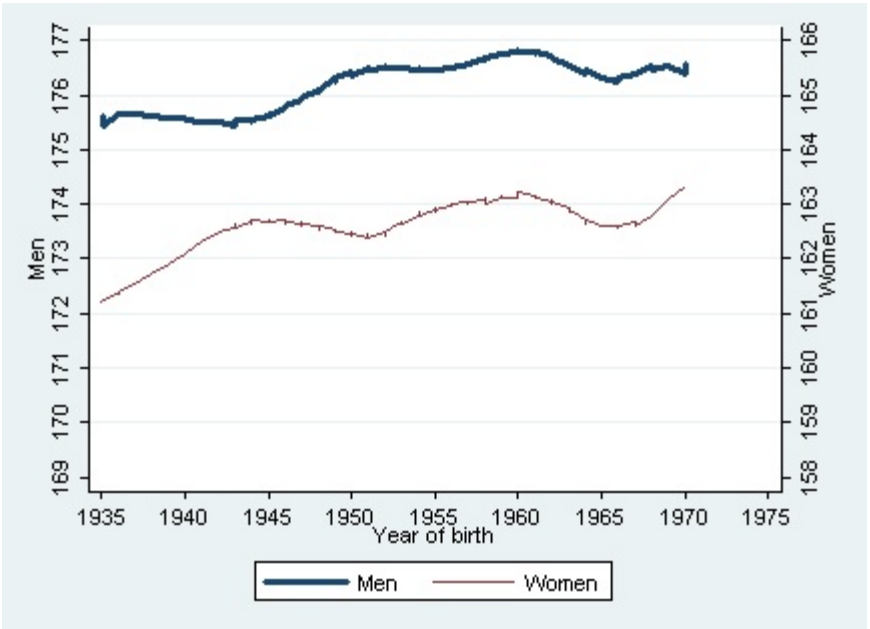


Table 3. Annual Rates of Growth of Adult Stature, Russia

	1937 - 1982		1937 - 1970		1971 - 1982	
	Men	Women	Men	Women	Men	Women
10^{th} percentile	.150 (.013)	.100 (.009)	.175 (.014)	.117 (.014)	.180 (.140)	0.00 (.050)
Mean	.159 (.010)	.117 (.008)	.165 (.009)	.117 (.007)	.076 (.064)	-.014 (.060)
90^{th} percentile	.176 (.015)	.125 (.012)	.182 (.019)	.100 (.013)	.017 (.117)	.071 (.128)
N	8368	9215	7126	7972	1242	1243

Coefficients from regressions of height of men and women aged 22 - 55 on year of birth. Standard errors in parentheses. For quantile regressions, standard errors are bootstrapped based on 100 repetitions.

Figure 7. Infant Mortality Rates, RSFSR and U.S.

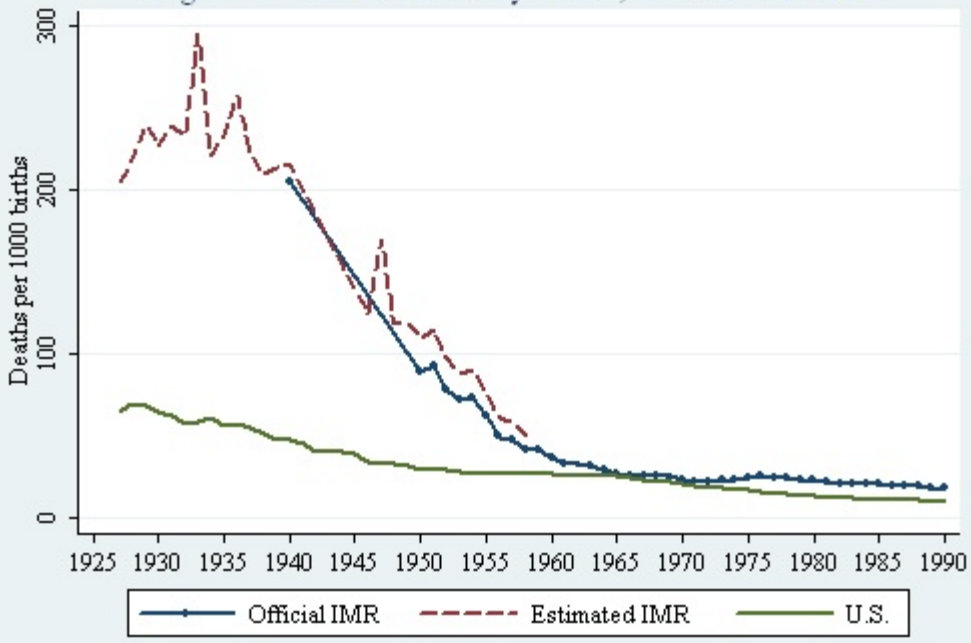


Table 4. Correlates of log change in infant mortality rates, RSFSR regions

Independent variables (log changes)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1959 - 1970									
Average monthly wage (1970 rubles)	-.151 (.225)								
Emplt/pop., female		**-.435** (.187)						.161 (.209)	.136 (.146)
% urban population			**-.633** (.186)					.167 (.313)	.371 (.743)
Hospital beds per capita				**-.961** (.206)				**-.801** (.261)	**-.907** (.355)
Retail sales per capita (1970 rubles)					**-.769** (.200)			**-.690** (.282)	**-1.06** (.367)
Share of female pop. with higher education						**-.819** (.194)		-.001 (.320)	.135 (.567)
Alcohol consumption, liters per capita							.197 (.128)		**.147** (.079)
N	71	71	72	72	72	72	32	71	32
R^2	.004	.112	.182	.286	.223	.230	.120	.358	.555
1970 - 1979									
Average monthly wage (1970 rubles)	**-.764** (.288)								
Emplt/pop., female		**-.702** (.254)						-.471 (.371)	-.480 (.390)
% urban population			**-.633** (.253)					-.300 (.346)	-.292 (.354)
Hospital beds per capita				-.224 (.183)				.112 (.234)	.126 (.246)
Retail sales per capita (1970 rubles)					**-.437** (.218)			-.176 (.245)	-.166 (.256)
Share of female pop. with higher education						**-.379** (.180)		.289 (.257)	.285 (.262)
Alcohol consumption, liters per capita							-.186 (.119)		-.022 (.111)
N	87	72	87	87	70	87	71	71	71
R^2	.111	.140	.141	.022	.066	.069	.024	.128	.128

Note: Robust standard errors are reported in parentheses. Bold: statistically significant at the 10% level or less.

Table 5. Correlates of Adult Stature, Russia, 1937 - 1982
Dependent variable: height in cm

A. Men

Independent variables: regional values	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average monthly wage (1970 rubles)	2.31 (1.86)						
% urban population		**.037** (.011)					-.001 (.028)
Hospital beds per capita			**.039** (.020)				-.006 (.023)
Retail sales per capita (1970 rubles)				.068 (.071)			-.028 (.019)
Infant mortality rate					**-.082** (.035)		**-.062** (.027)
Share of pop. with higher ed.(m or f)						**.018** (.006)	**.022** (.007)
Share of pop. with spec. sec. ed. (m or f)						**.064** (.023)	**.065** (.030)
Share of pop. with secondary ed. (m or f)						**-.041** (.018)	**-.055** (.017)
Share of pop. with incomplete sec. ed.						.007 (.009)	.007 (.008)
N	2545	2749	2762	2696	2758	2773	2683
R^2	.032	.044	.039	.034	.039	.051	.052

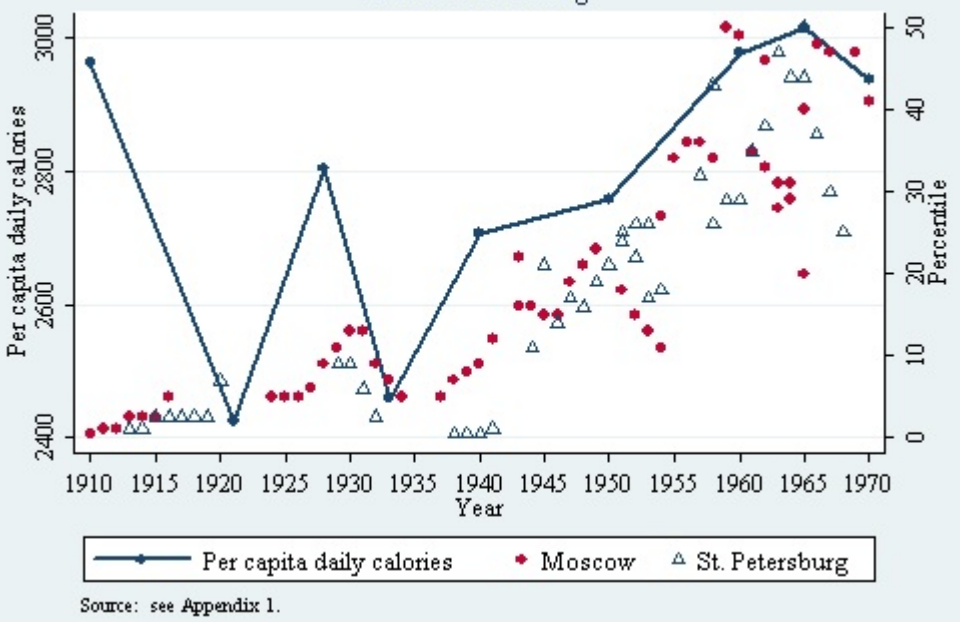
All regressions include a full set of dummy variables for year of birth. Omitted education variable is primary (or less) education. Standard errors are corrected for clustering.

B. Women

Independent variables: regional values	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average monthly wage (1970 rubles)	1.55 (1.31)						
% urban population		**.032** (.008)					-.007 (.020)
Hospital beds per capita			**.029** (.017)				-.019 (.017)
Retail sales per capita (1970 rubles)				**.124** (.057)			**.053** (.020)
Infant mortality rate					**-.055** (.023)		-.024 (.020)
Share of pop. with higher ed.(m or f)						**.014** (.007)	**.022** (.007)
Share of pop. with spec. sec. ed. (m or f)						-.002 (.017)	-.008 (.015)
Share of pop. with secondary ed. (m or f)						-.003 (.014)	-.017 (.015)
Share of pop. with incomplete sec. ed.						.010 (.008)	**.022** (.009)
N	2446	2653	2652	2594	2640	2662	2572
R^2	.034	.048	.042	.042	.040	.057	.054

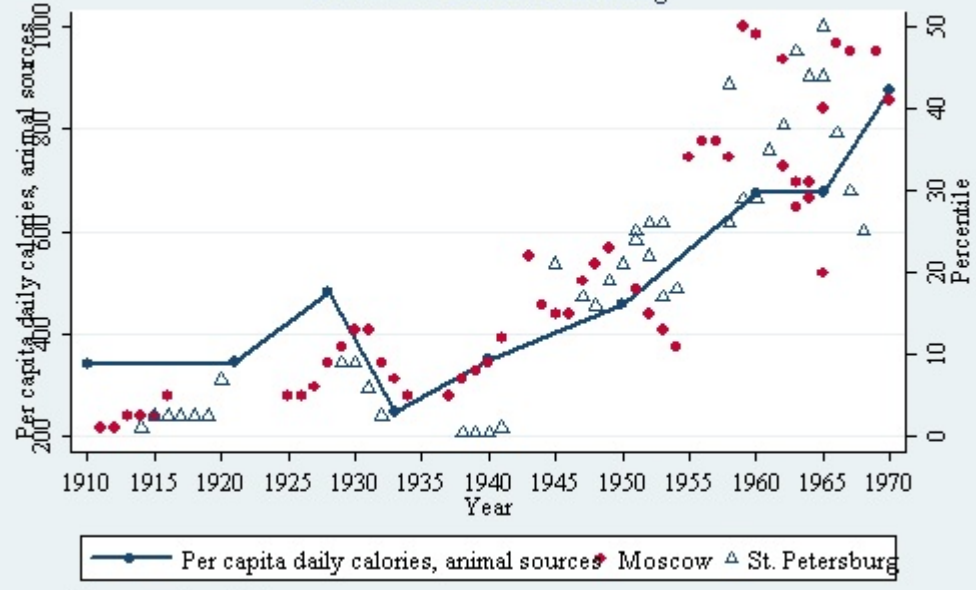
All regressions include a full set of dummy variables for year of birth. Omitted education variable is primary (or less) education. Standard errors are corrected for clustering.

Figure 8a. Calories and child stature in Moscow and St. Petersburg



Source: see Appendix 1.

Figure 8b. Calories from animal sources and child stature in Moscow and St. Petersburg



Source: see Appendix 1.

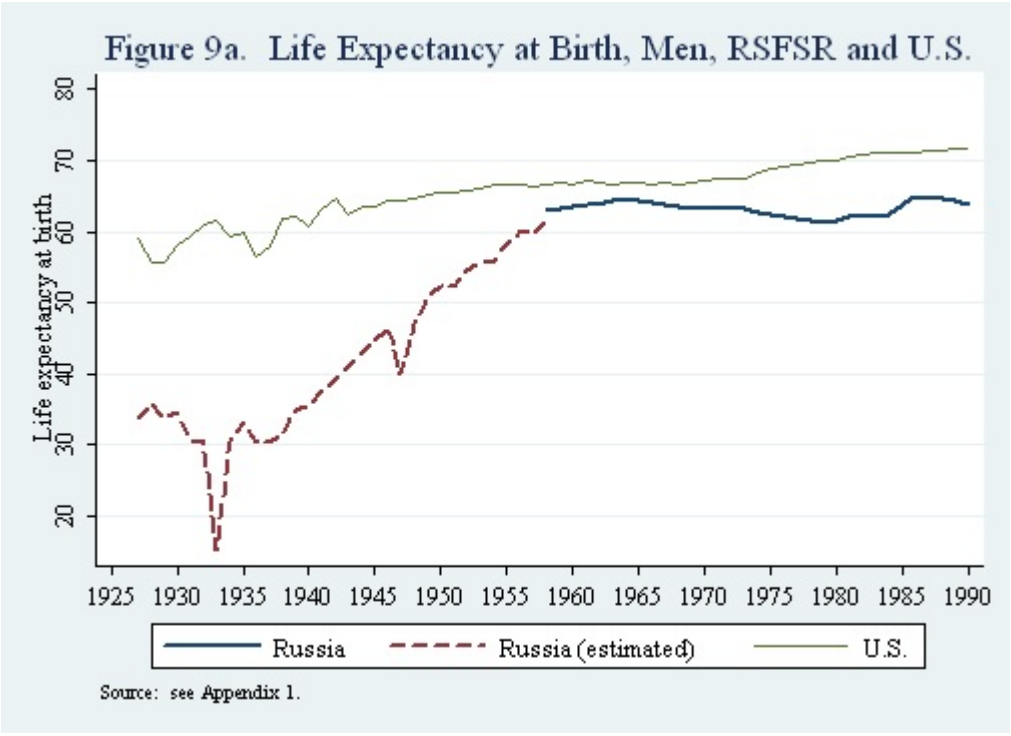


Figure 9a. Life Expectancy at Birth, Men, RSFSR and U.S.
Life expectancy at birth
20
30
40
50
60
70
80
1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990
Russia
Russia (estimated)
U.S.
Source: see Appendix 1.

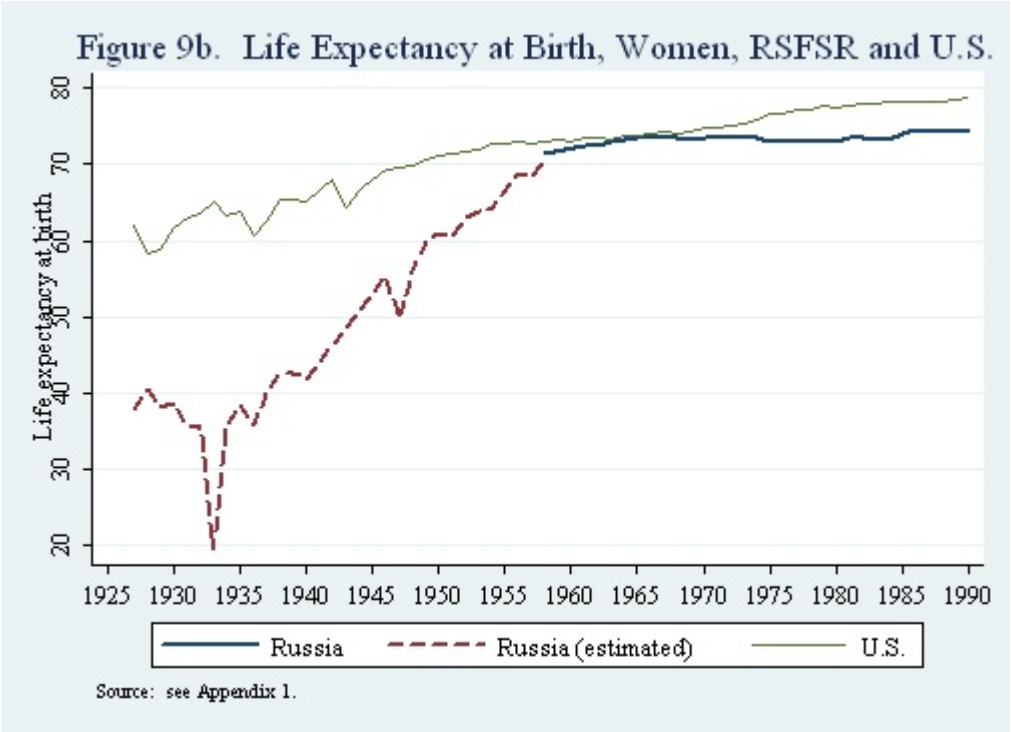


Figure 9b. Life Expectancy at Birth, Women, RSFSR and U.S.
Life expectancy at birth
20
30
40
50
60
70
80
1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990
Russia
Russia (estimated)
U.S.
Source: see Appendix 1.