

# **UNCOUNTED COSTS OF WORLD WAR II: THE EFFECTS OF CHANGING SEX RATIOS ON MARRIAGE AND FERTILITY OF RUSSIAN WOMEN**

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TITLE VIII PROGRAM

## **Project Information\***

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**Council Grant Number:** 820-4g  
**Date:** February 15<sup>th</sup>, 2007

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\* The work leading to this report was supported in part by contract or grant funds provided by the National Council for Eurasian and East European Research, funds which were made available by the U.S. Department of State under Title VIII (The Soviet-East European Research and Training Act of 1983, as amended). The analysis and interpretations contained herein are those of the author.

## **Executive Summary**

The Soviet Union suffered devastating population losses during World War II, currently estimated at 27 million or nearly 14 percent of the prewar population. The disproportionate deaths of young men resulted in a drastic change in sex ratios among the population surviving the war. For example, the ratio of men to women in the 20-29 age group declined from .96 to .70 between 1941 and 1946. I use this large, exogenous change to identify the effects of unbalanced sex ratios on marital, fertility and health outcomes among women in the Russian republic in the postwar period. The results indicate that women in cohorts or regions with lower sex ratios experienced lower rates of marriage and fertility, and higher rates of out-of-wedlock births, abortions, and deaths from abortions than women in cohorts or regions less affected by war deaths.

## I. Introduction

In many ways the Soviet Union was built on the backs of Russian women. Pulled into the labor force by the intense industrialization drive of the 1930s and indispensable for fueling the Soviet war machine of the 1940s, the experience of Soviet and Russian women of the twentieth century was profoundly different from that of women in other industrialized countries. These differences are evident in the high female labor force participation rates, low fertility rates, and strikingly high abortion rates recorded in the Soviet Union over its history. Yet beyond these aggregate trends, much remains unknown regarding the changing lives of Soviet women over the past century. For example, why was the ‘fertility transition’ accomplished so early and so rapidly in the Soviet Union? How did abortion become the primary means of contraception in the country and how did this affect the subsequent fertility and well-being of women? Why was the proportion of out-of-wedlock births so high in the postwar period?

This paper examines the effect of one cataclysmic event, the massive loss of life in World War II, on the subsequent marital and fertility careers of Russian women. For women in the age cohorts most affected by the war, these losses resulted in extremely unbalanced sex ratios (the number of men divided by the number of women) in the population: for women in the 20-29 age group, for example, the ratio of men to women in the population fell from .96 in 1941 to .70 in 1946. Using previously unpublished census data and vital statistics registration data collected from the Soviet archives combined with recent household survey data, this paper uses this large, exogenous change in the sex ratio to identify the effects of highly unbalanced sex ratios on the marital, fertility and health outcomes of the Soviet population in the postwar period. The results indicate that women in age cohorts or regions with lower sex ratios experienced lower rates of marriage and fertility, and higher rates of out-of-wedlock births, than women in cohorts or

regions less affected by war deaths. The evidence also suggests that unbalanced sex ratios affected the number of abortions reported by individual women, the death rate from abortions, and may have negatively affected the health and well-being of children of women in cohorts with highly unbalanced sex ratios.

Beyond illuminating the effects of unbalanced sex ratios on women's lives in the Soviet Union, the results in this paper are also relevant for understanding the effects of unbalanced sex ratios in other populations. For example, any country experiencing large-scale emigration or involved in war will likely encounter unbalanced sex ratios among younger cohorts, given that both emigrants and soldiers are disproportionately young and male. Unbalanced sex ratios also characterize some populations within the United States, such as the high and increasing number of women relative to men obtaining a college education and the low ratio of available men to women in the African-American population resulting from the high incarceration and mortality rates of young African-American men.<sup>1</sup> Most previous research on unbalanced sex ratios examines the impact of high sex ratios, i.e. more men than women, in the population. One contribution of this paper to the literature is that it provides evidence on the effects of low sex ratios in the population. The results of the paper also suggest that the long-term effects of war on society are underestimated, given that few if any such estimates take into account the negative impact of war on future family formation and bargaining power within the household.

The paper proceeds as follows. The next section discusses what is currently known about the impact of World War II on the Soviet population, including the effect on sex ratios, the regional distribution of war losses, and the immediate demographic consequences of the war.

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<sup>1</sup>See Goldin, Katz and Kuziemko (2006) for an analysis of the gender gap in U.S. higher education. Wilson (1987) discusses the causes and consequences of unbalanced sex ratios in the U.S. African-American population.

This section also describes the Soviet Union's changing policies on abortion, divorce, and family allowances that may have affected marriage and fertility decisions in the postwar period. Section III reviews the economic theory and recent literature on the effects of changing sex ratios in the population. Section IV describes the identification strategy and data used in the paper and presents the results of the cross-regional regressions. Section V presents the results of regressions using recent household surveys, and Section VI concludes.

## II. The impact of World War II on the Soviet population

### *a. Overall losses and the effect of the war on sex ratios*

On June 22, 1941, Hitler's *Wehrmacht* invaded the Soviet Union to initiate what would become the most brutal and costly war between two countries in history. The surprise attack on the woefully unprepared Red Army led to devastating losses for the Soviet Union in the early phase of the war: within the first six months, the Red Army had lost nearly 5 million men – the size of the Soviet Union's entire prewar army – and had lost territory equal to the size of the United States between the East Coast and Springfield, Illinois (Glantz 2005).

The Soviet Union mobilized all possible resources in its subsequent fight for survival and ultimate victory. The need for manpower dictated a significant loosening of the age and nationality restrictions on conscription of Soviet citizens; it is reported that men “well under” the age of 18 and exceeding 55 years of age were conscripted into the Red Army, with Russians and non-Russians alike required to serve (Glantz 2005). Over 1 million women served in the war as well, many in the medical services but the figure also includes over 500,000 women soldiers (Glantz 2005). Including individuals serving at the beginning of the war, a total of 34.5 million people were drafted into the armed forces during the war, of which nearly 8.7 million died in

combat (Krivosheev et. al. 1997).

The total losses sustained by the Soviet Union during World War II remain a topic of controversy among scholars, and an exact accounting of the deaths may never be known. The most reliable figures were reported in the findings of an expert commission established by Mikhail Gorbachev in 1989. These authors estimate the total population loss at 26 to 27 million, out of a population of 196.7 million on the eve of World War II in 1941, or roughly 13.5 percent of the prewar population (Andreev et. al. 1990).<sup>2</sup> The losses in the Russian republic, the largest republic in the Soviet Union in terms of population and the primary region of interest in this paper, were similar in magnitude: approximately 13.6 million died, or 12.3 percent of the 1941 population. To put these losses in context, the total civilian and military casualties in Germany during World War II were 5 to 7 million (6 - 9 percent of the 1939 population), followed by France (600,000) and England (400,000 - 500,000), both less than 2 percent of the prewar population for those countries.

Although people of all ages fell victim to the war, whether due to death in military operations, at the hands of occupiers, or due to the widespread undernutrition and disease that accompanied the war, the wartime casualties were nevertheless heavily concentrated among young men; it is estimated that 20 million of the 26 to 27 million excess deaths were male (Ellman and Maksudov 1994). Russian demographers calculate that the probability of surviving between 1941 and 1946 for men aged 25 to 34 fell from .96 – the probability in the absence of the war based on 1940 mortality rates – to .61 (Andreev et. al. 1993). By 1946 women aged 20-

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<sup>2</sup>These losses relate to the ‘excess deaths’ that occurred between 1941 and 1945, i.e. total deaths during the war minus the deaths that would have been predicted to occur in the absence of war. The 26-27 million figure likely includes an estimated net wartime emigration of 2.7 million people (Harrison 2003). For the debate on how Soviet war deaths should be counted and related issues, see Ellman and Maksudov (1994), Harrison (2003) and Haynes (2003a, 2003b).

39 outnumbered men in the Soviet Union by approximately 10.2 million (Andreev et. al. 1993). This resulted in large changes in the sex ratio among some groups of the population. This is illustrated in Figure 1, which shows the ratio of men to women by 5-year age group in 1941 and 1946 by year of birth in Russia.<sup>3</sup> The cohorts most affected by the war were those entering their late teenage years or early twenties at the beginning of the war, i.e. individuals born in 1917 to 1926, and extended to include those in their thirties, born in the first decades of the twentieth century. An alternative view of the change in sex ratios is given in Figure 2, which illustrates the sex ratio in the 20-24 and 20-29 age groups faced by an individual at age 20 by year of birth. While women in the prewar Soviet Union already contended with sex ratios below 1.0 – likely due to the revolutions of 1905 and 1917, World War I (1914-1917), civil war (1918-1922) and the political purges of the 1930s, all of which disproportionately affected men – the sex ratio fell dramatically for individuals born around 1925, from .91 to .65 for the 20-29 age group. The sex ratio at this age returned to approximately 1.0 for those born in 1940 and after.<sup>4</sup>

*b. Regional distribution of losses and population redistribution*

The war profoundly changed the regional distribution of the population along with the age and sex structure of the population. The western regions of the Soviet Union experienced the bulk of the fighting and occupation by German forces – an estimated 45 percent of the Soviet population lived under German occupation at some point during the war (Goskomstat SSSR

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<sup>3</sup>The data and figures in this and following sections are for the Russian republic (the RSFSR) rather than the Soviet Union as a whole, since the empirical analysis uses Russian census data and primarily focuses on the Russian republic. The sex ratios in Figures 1 and 2 are calculated using the yearly estimates of the distribution of the population by sex and five-year age group from Andreev et. al. (1998). The regional sex ratios in Figure 3 are from data collected from the 1959 Census contained in the GARF archive in Moscow (see Appendix 1 for details).

<sup>4</sup>The sex ratio at birth is approximately 1.05. This ratio typically declines over time within cohorts due to higher male mortality.



1990) – and also experienced the greatest war losses.<sup>5</sup> The losses in the western regions combined with the evacuation of tens of millions of people eastward contributed to an overall population shift eastward during the war: the share of the population in the western Soviet Union declined by 3.6 percentage points between 1939 and 1951, while the share in the eastern Soviet Union rose by 3.6 percentage points (Rowland 1997). In addition over 1,500 factories were relocated from the western regions to east of the Volga River during the war. Most of the evacuated people and factories were relocated to the Urals, Western Siberia and Kazakhstan (Barber and Harrison 1991).

Limited data are available to assess in detail the regional redistribution of the population due to the war. Prewar regional population data are available from the 1939 Census, but the earliest postwar regional population estimates are for 1951 (published in Goskomstat SSSR 1988). The first detailed regional population data, i.e. the age and sex structure of the population by region, only become available with the first postwar census taken in 1959. Based on the 1939 Census and 1951 population estimates, the greatest population losses occurred in Kaliningrad oblast, in which the population fell from over 1 million in 1939 to 455,000 in 1951, the city of Leningrad, in which approximately 700,000 civilians died during the 900-day siege of the city, mostly due to starvation (Cherepenina 2005), and Smolensk oblast which was located on the main invasion route between Poland and Moscow. Regions experiencing population growth in this period were primarily those in the east, particularly the Urals, Western Siberia and the Far East, due to the evacuation of people and industries to those regions. Positive population growth also occurred in the northwestern region of Komi, likely due to the increase in coal production in

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<sup>5</sup>The line of furthest German advance extended from the northwest Caucasus and North Caspian region in the south, to Rostov and Stalingrad (now Volgograd) in the Central and Volga regions, to a few miles west of Moscow, and extended to Leningrad (now St. Petersburg) and a few miles east of the Finnish border in the northwest.

that region, also the site of a forced labor camp at the Pechora Coal Basin (Rowland 1997).

Despite the elapsed time between the end of the war and the first postwar census, the census data nevertheless document the profound impact of the war on the age and sex structure of the population at the regional level. This is illustrated in Figure 3, which shows the variation in sex ratios by region for 1959 for individuals aged 25-29 and 35-39 in that year. Sex ratios for the 35-39 year-old cohort are significantly below one in most regions and are much lower than those for the age 25-29 cohort that was largely unaffected by war deaths. Sex ratios for both groups are highest in the North, East Siberia and Far East, which attract disproportionately male workers to work in the natural resource sectors of the economy located in those regions.

*c. Immediate demographic consequences of the war*

Besides the massive loss of civilian and military lives during the war, an additional demographic cost was the decline in births during the war years. Given the large-scale mobilization and lack of home leave during the war for all soldiers, it is not surprising that the birth rate fell sharply between 1940 and 1945, from 34.6 per 1,000 population in 1940 to 26.0 in 1946. Analysts estimate that approximately 11.5 million babies were not born in the Soviet Union during the war who would have been born otherwise (Ellman and Maksudov 1994). Demobilization after the war took three years, which further delayed the return to any type of normal family-formation patterns until well into the late 1940s and early 1950s. This is evident in the sharp increase in age at first marriage for Russian women in the cohorts most affected by the war: women born in 1915, for example, married at an average age of 23.2, while women born in 1921 were slightly older than 25 at first marriage. An additional likely consequence of the 'male deficit' was an increase in the spousal age gap, but no data are available on this issue

until 1959, at which point the average age gap between men and women at first marriage was approximately two years; this gap persisted with little change well into the 1990s (Avdeev and Monnier 2000).

Data from the 1994 Microcensus also indicate that women in the cohort most affected by the war – those born in the mid-1920s – did not have markedly lower rates of completed fertility than women in neighboring cohorts. Some Russian demographers argue, in fact, that the war ultimately had little impact on the marital and fertility careers of Russian women: most women eventually married and had two children on average (Scherbov and Van Vianen 2001). The analysis presented below suggests in contrast that the unbalanced sex ratios from the war likely did significantly affect other aspects of fertility and family formation, for example out-of-wedlock births, female headship and abortion rates.

*d. Family policies, divorce and abortion in the Soviet Union*

Alarmed at the devastating population losses suffered by the country and the continually declining birth rate, the Soviet government implemented a strongly pro-natalist family policy in 1944. This legislation imposed a tax on single people and married couples with fewer than three children, excluding those who lost children during the war or those attending school full-time. ‘Motherhood medals’ and special privileges were bestowed upon women with five or more children. A modest program of child benefits for married women with large families implemented in 1936 was expanded to include married women with smaller families as well as unmarried mothers with one or more children. Far from discouraging out-of-wedlock births, in fact, the 1944 law absolved fathers of any financial or legal responsibility for children fathered outside of marriage; unmarried mothers were prohibited from naming the father or claiming

financial support for their children. Instead, the state provided unmarried mothers with a monthly payment for each child until the child reached twelve years of age.<sup>6</sup> The 1944 Family Code also made the procedure for divorce so much more expensive and complicated that it has been described as effectively a “prohibition on divorce” (Avdeev and Monnier 2000).

Soviet policies on divorce and family had been radically different during much of the prewar period. When the Bolsheviks came to power in 1917 they intended to break down the traditional ‘bourgeois’ structure of the family to equalize the status of men and women and implemented a number of policies toward this end in subsequent years. The 1918 Family Code secularized marriage and made divorce obtainable upon the simple request of either spouse (Engel 2004). In 1920 the Soviet Union became the first country in the world to legalize abortion; the procedure was legal and free if performed in a hospital, and the practice became widespread in the 1920s (Engel 2004). Some analysts trace the current extensive use of abortion in Russia to this early legalization of abortion, which in the absence of alternative contraception options became widely accepted as a primary means of fertility control (Popov 1993).

The political climate began to change dramatically by the mid-1930s, however, and the 1936 Family Law outlawed abortion and made divorce more complicated. In the same year a secret directive ordered that all contraceptive devices be withdrawn from sale (Engel 2004). It was not until 1955 that abortion was again legalized, largely in response to the widespread use of illegal abortion and high mortality rates from abortion (Popov 1993). Because the state failed to

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<sup>6</sup>In contrast, married women received a lump sum at birth for the third and subsequent children, and monthly payments from the first through fifth birthdays for the fourth and subsequent children. Child payments for married and unmarried children implemented under the 1944 law were halved in 1948 and remained at the same nominal level until 1974, falling to approximately 8 percent of the annual wage in that year. For details on the payments received by number of children and mother’s marital status, see Heer 1977. The tax on single people and married couples with fewer than three children was repealed in 1957 (Avdeev and Monnier 2000).

increase the availability of contraceptives as a substitute for abortion (Engel 2004) – and in fact in 1974 the Ministry of Public Health effectively prohibited the use of the pill except in cases of medical necessity (Popov 1993) – abortion became one of the primary means of birth control for women in the Soviet Union and abortion rates rose to extremely high levels. For example, in 1975 (the first year in which comparable data are available), the number of abortions per 1,000 women aged 15-49 was 126.3 in the Soviet Union and 21.7 in the United States.

### III. Effects of sex ratios on social and economic outcomes: theory and recent evidence

A change in sex ratios like that experienced in the Soviet Union will first and foremost affect the marriage market. As emphasized by Gary Becker in his 1981 model of marriage and family formation, the sex ratio is a key determinant of the marriage prospects and distribution of the gains from marriage between men and women. A decrease in the sex ratio will reduce the demand for wives, leading to a decrease in female marriage rates, an increase in male marriage rates, and a transfer of the surplus generated by marriage from women to men. As further noted by Angrist (2002), even if marital status is ultimately unaffected by a change in sex ratios, a change in the probability of marriage alone may lead to changes in individual behavior. For example, less competition in the marriage market among men may induce men to invest less in characteristics that are attractive to mates, such as education, while a woman facing less favorable marriage prospects may invest more in labor market skills under the presumption that she will be less likely to rely on a spouse for support.

The significant improvement in men's bargaining position in the marriage market and women's weakened bargaining position resulting from the decrease in sex ratios likely also affected fertility behavior as well. Women may have felt increased pressure to have sexual

relations before marriage, which given the lack of contraceptives in the Soviet Union likely led to an increase in out-of-wedlock births, female-headed households, unwanted pregnancies and abortions. The predicted relationship between sex ratios and overall fertility is unclear, however: in countries with high fertility rates such as developing countries, a low sex ratio and reduced female bargaining power may induce women to have more children than they would otherwise desire. In a low-fertility country like Russia, low sex ratios may lead to lower fertility if women's labor supply is higher due to their weakened bargaining power. A further prediction is that highly unbalanced sex ratios may lead to a lower quality of marital matches, in turn leading to higher divorce rates.

Beyond changing the relative bargaining position of men and women in the marriage market, changing sex ratios also affects the relative bargaining strengths of spouses within existing marriages. This point is made in Chiappori et. al. (2002), who argue that the sex ratio can be thought of as an external 'distribution factor' that affects spouses' bargaining positions within marriage. In the highly unbalanced sex ratio environment of the Soviet Union, this implies that married men have better outside opportunities than women and a stronger bargaining position. The male behavioral response may well be to reduce labor supply and increase alcohol consumption; it is also possible that domestic abuse and spousal homicide would increase in this situation. With few outside options, women may rationally decide to remain in such relationships. Finally, the weakened bargaining position of women within marriage may reduce the welfare of children, given the evidence that women devote a greater share of household resources to the well-being of children than men (Duflo 2000; Qian 2005).

Empirical research on the effect of unbalanced sex ratios on the well-being of men and women has been hampered by the problem that unbalanced sex ratios in many populations are

not exogenous to existing social and economic conditions. For example, the unbalanced sex ratio between young African-American men and women is due to high incarceration and mortality rates of men, which in turn is related to high rates of poverty, low levels of educational attainment and other social and economic factors (ref). Angrist (2002) avoids this problem by examining the effect of unbalanced sex ratios in the U.S. immigrant population, which was driven largely by exogenous changes in U.S. immigration policy. His results provide evidence of a positive relationship between sex ratios and the likelihood of marriage for women, and a negative relationship with female labor supply. The results also indicate that high sex ratios benefit children, as theory predicts.

Francis (2005) analyzes the effect of an exogenous change in the sex ratio of Taiwan due to the massive influx of mainland Chinese after the Communist victory in 1949. The evidence in this paper also supports the idea of a strong positive effect of sex ratios on the well-being of women and children: higher sex ratios in Taiwan are associated with a higher bride price relative to the dowry, lower female labor force participation in the first year of marriage, and a higher fraction of children who are female. Like these two papers, the empirical analysis in this paper examines the effect of a large, exogenous change in sex ratios; in contrast to other papers, this paper is one of the few to analyze the effects of very low sex ratios in a population on the outcomes of women and children.

#### IV. Empirical strategy, data and cross-region results

The empirical strategy uses the variation in sex ratios across regions and cohorts to identify the effects of changing sex ratios on various economic and social outcomes. At the national level the change in sex ratios across cohorts is taken to be exogenous to existing

economic and social conditions at the time: as is well known, the German attack on the Soviet Union in June 1941 was a surprise to Soviet leaders as well as to the population as a whole.<sup>7</sup>

There was virtually no emigration from the country or immigration into the country in the early postwar period, so national sex ratios would have been unaffected by these trends.

Much of the empirical analysis exploits regional differences in sex ratios, however, and it is possible that cross-regional migration occurred in the early postwar period that was correlated with both sex ratios and existing economic conditions in the regions. For example, the sex ratio for the 25-29 age group in Magadan in the Far East was 1.470 in 1959, reflecting the ‘attraction’ of the region (in the far northeastern corner of the RSFSR) to younger men due to the Kolyma gold fields; Magadan is also one of the notorious sites of forced labor camps (Rowland 1997). However, the sex ratio in the cohorts affected by the war is also unusually high in Magadan – 1.091 for the 35-39 age group – so that the difference in the two sex ratios is similar to that of regions which did not attract migrants. While data are limited the evidence also suggests that cross-regional migration rates were low, likely due to the scarcity of housing in the Soviet Union and the use of residence permits in many cities, and were uncorrelated with the regional population losses during the war. For example, the net urban migration rate for Russia was 24.3 per 1,000 population in 1950 and 16.6 in 1959; the net rural migration rate was even lower (Goskomstat of Russia 1998). The correlation between the change in population by region between 1939 and 1951, a proxy for the physical and population losses suffered in each region – and the urban in-migration rate in 1960 is .08.

Two types of data are used in this analysis: regional data from the first postwar Soviet

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<sup>7</sup>The German-Soviet Non-Aggression Pact was signed on August 23, 1939. On the unpreparedness of the Red Army for war in 1941, see Glantz (1998). Memoirs of Soviet citizens during the war also describe the surprise of the attack; see, for example, Leder (2001).



census conducted in 1959, and household survey data from Russia in the 1990s. The former data provide insight into the relationship between sex ratios and the marital status, fertility and other demographic outcomes of individuals in 1959; the Russian survey data provide information into events over the course of women’s lifetimes, such as total fertility and the number of abortions, and can also be used to investigate second-generation effects of changing sex ratios.

The basic 1959 census data, such as education levels and marital status of the population by region, were published in and collected from the census volume *Tsentral’noe Statisticheskoe Upravlenie* (1963). Detailed census data on the distribution of the population by region and five-year age group are unpublished and were collected from the GARF (*Gosurdarstvennyi Arkhiv Rossiiskoi Federatsii* (State Archive of the Russian Federation)) archive in Moscow. These data were combined with registration data on the number of births and out-of-wedlock births in each region by five-year age group, and registration data on the number of deaths in each region due to abortion, suicide and homicide by five-year age group, also collected from the Soviet archives in Moscow, to calculate birth- and death-rates by five-year age group and region.<sup>8</sup> Descriptive statistics for the regional data are given in Table 1.

Two types of regressions using the 1959 census data are presented: simple cross-regional regressions and regressions which ‘stack’ the data by age group and region. The simple cross-regional regressions take the following form:

$$Y_j = \beta R_j + X'_j \alpha + \gamma_j + \epsilon_j$$

where  $R_j$  is the sex ratio for ages 16 and over (or 16-54) in region  $j$ ,  $X'$  is a vector of regional control variables,  $\gamma_j$  is a vector of dummy variables for large regions roughly equivalent to U.S. census regions, and  $Y_j$  is various outcomes such as marital status and female headship. The

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<sup>8</sup>The specific location of each data series used in the paper is given in Appendix 1.

stacked regional regressions use the same specification but stack the data by five-year age group. For example, the regressions using the birth rate by five-year age group as the dependent variable relates the birth rate for women aged 15-19, 20-24, 25-29, 30-34, 35-39, and 40-44 to the sex ratio for those same age groups on the right-hand-side, along with controls for regional levels of wages, urban migration rates, population density, doctors per capita, and female education levels.

Figures 4, 5 and 6 are scatter diagrams showing some of the basic relationships between regional sex ratios and demographic outcomes in 1959. Figure 4 illustrates the strong positive relationship between sex ratios and the share of women married in the population. Figure 5 shows the same relationship for men, but the correlation is much weaker than for women and with a negative sign, as theory predicts. Figure 6 suggests that regions with lower sex ratios had much higher shares of female-headed households than regions with higher sex ratios, again as would be expected based on theory.

These relationships are confirmed in the cross-regional regression results presented in Table 2. The proportion of women married is positively and significantly related to the sex ratio among the population aged 16 and over; for men the relationship is negative and statistically significant. Women in regions with higher sex ratios are also more likely to be dependent on their spouse for support, as the theory suggests: higher sex ratios improve women's bargaining position in the marriage market and increase the likelihood that men provide the sole means of support within the household. Similarly, in regions with lower sex ratios women are more likely to be the head of the household. The male employment rate is positively related to the sex ratio as expected. Theory also predicts that the female employment rate should be negatively related to the sex ratio, but this relationship is not evident in the data.

These simple cross-region regressions exploit only the variation in sex ratios across

regions and do not use the large, exogenous variation in sex ratios between cohorts created by the war. The stacked regional regressions presented in Table 3 use this variation in sex ratios between age cohorts to better identify the effects of sex ratios on other outcomes for which data by age cohort are available. The results indicate that fertility is higher in age cohorts with higher sex ratios, and the share of out-of-wedlock births is lower, as would be expected; these results are statistically significant at less than the 1 percent level. The third row in Table 3 regresses the death rate from abortions on the sex ratio and other regional controls. The death rate from abortions is calculated as the number of abortions in each age group divided by the number of women in each age group; the number of women obtaining abortions (of any age) is unavailable by region for 1959. The results indicate that women in age cohorts and regions with lower sex ratios were more likely to die from abortion than women in age cohorts and regions with higher sex ratios. This result could reflect that women in low-sex ratio age cohorts simply had more abortions than women in higher-sex ratio cohorts (as theory would suggest), or that they had a higher death rate from abortion than women in higher sex ratio cohorts. Since data are unavailable on the abortion rate by region or age group, it is impossible to distinguish between these two possibilities.

Table 3 also shows the results of regressions relating suicide and homicide rates to sex ratios.<sup>9</sup> The predicted sign for the female suicide rate is negative: a lower sex ratio reduces female bargaining power in the marriage market and within marriage, leading to poor marriage prospects and likely worse ‘quality’ matches in the marriage market. Women with few options in the marriage market and few outside options trapped in a poor-quality marriage may be more

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<sup>9</sup>There is a mechanical negative correlation between sex ratios and the homicide or suicide rate for men and a positive mechanical correlation for women: e.g., as the male homicide rate rises, the sex ratio falls and vice versa for women. Given the low rates of homicide and suicide relative to the overall death rate, it is assumed that this mechanical relationship is not driving the results presented in Table 3.

likely to commit suicide. The coefficient on the suicide rate for women shown in Table 3 is positive and statistically insignificant; however for urban women the relationship is negative and significant at the 1.7 percent level (results not shown). For rural women the relationship is positive and statistically significant, a result which is difficult to explain. For men it may also be the case that higher sex ratios result in poorer quality matches in the marriage market, thus leading to more troubled marriages and a higher suicide rate. This is suggested by the results in Table 3 showing a negative and statistically significant relationship between the male suicide rate and the sex ratio.

As noted previously it is also possible that very low sex ratios lead to higher rates of domestic abuse and spousal homicide, suggesting a negative relationship between sex ratios and homicide rates for women. However, the coefficient on the female homicide rate is positive, perhaps indicating that spousal homicide was not of significant magnitude in the Soviet Union (data on spousal homicide are unavailable) and a different relationship is at work. It is unlikely that spousal homicide is driving the positive coefficient for the male homicide rate in Table 3.

#### V. Results using the Russian Longitudinal Monitoring Survey

An alternative approach to examining the effect of changing sex ratios on the population is to link the sex ratio at marriageable age for each individual to that individual's outcomes over their life course. This approach uses recent household survey data for Russia taken in the 1990s, the Russian Longitudinal Monitoring Survey (RLMS) to examine whether the sex ratio a woman faced at age 20 affected her subsequent fertility, child mortality and abortion experience, and whether the sex ratio affected the health outcomes of her children. The RLMS is a nationally representative panel survey taken between 1994 and 2004; most of the analysis here uses the

1994-1998 data which contain information on births and abortions for each woman interviewed. All women aged 40 and over interviewed in 1994 are included in the analysis, as well as new female participants in the survey aged 40 and over in the 1995, 1996 and 1998 rounds.

The key variable of interest is the sex ratio faced by each woman when she was approaching marriageable age, defined here as the sex ratio for the age 20 to 29 age group when each woman was age 20. This sex ratio is calculated using the annual estimates of the age and sex structure of the RSFSR population contained in Andreev et. al. 1998; because these are national sex ratios they are unaffected by problems of cross-regional migration that may affect the regional results presented in the previous section.

The regressions take the following form:

$$Y_i = \beta R_i + X_i' \gamma + \mu_i + \epsilon_i$$

where  $Y_i$  is the outcome of interest,  $R_i$  is the sex ratio for the 20 to 29 age group for each individual at age 20, and  $X_i$  is a number of individual-level control variables.  $X_i$  includes a variable for the share of each woman's reproductive years during which abortion was legal; a Russian/non-Russian ethnicity dummy variable; marital status at the time of the survey; highest education level obtained; and year-of-birth dummy variables (in two-year intervals).  $\mu_i$  is a group of large-region dummy variables. The outcome variables include the total number of births reported by each woman, whether or not a woman had an infant who died, and the total number of abortions reported by each woman.

The results of these regressions are reported in Table 4, Panel A, for women aged 40 and over and 50 and over separately. For the total number of births, there is a negative (but statistically insignificant) relationship between this measure of fertility and the sex ratio. This is the opposite sign of the relationship between fertility and sex ratios shown in the cross-regional

regressions, which showed a positive and statistically significant coefficient. A further contradictory result is given by the coefficient on the proxy for child mortality. Here, if sex ratios affect intra-household bargaining power, as one would expect, and women are more likely to devote resources to children than are men as suggested in the literature, then the expected sign on the sex ratio is negative: a higher sex ratio leads to more resources for women and children, so fewer infants should die in this environment. For the group of women aged 40 and over the sign on the coefficient is negative but statistically insignificant; it is positive but insignificant for women aged 50 and over. The expected sign for the number of abortions is negative: with a lower sex ratio and weaker prospects in the marriage market as well as a weaker intra-household bargaining position, women may be more likely to have unprotected sex resulting in unwanted pregnancies and more abortions. For both the 40 and 50 and over groups the coefficient is negative; it is statistically significant at less than the 5 percent level for women aged 50 and over. Note that while it would be desirable to test the effect of the sex ratio on the marriage and divorce probabilities of women (and men) over their lifetimes, the RLMS only contains information on the current marital status of individuals so these relationships cannot be tested.

A final test of the effect of sex ratios on the population is whether there are second-generation effects. If sex ratios affect female bargaining power within the household and women are more likely to devote resources to their children's upbringing than are men, then children will be worse off in a low-sex ratio environment than in a high-sex ratio environment faced by their mothers. As a result, the low sex ratios caused by the war may have resulted in children having more health problems and poorer nutrition than they otherwise would have had. Because adult height is largely determined in by age 2 or 3 and is significantly influenced by the diet and health conditions in the early childhood years, final attained adult height is a good proxy for children's

health status in the early years of life. Panel B of Table 4 uses the adult height for individuals aged 22 - 50 years as the dependent variable to test whether there are second-generation effects of sex ratios. Adult heights are related to the sex ratio for the age 20-29 cohort in each individual's year of birth, which proxies for the bargaining position of the individual's mother in the year the child was born. The expected sign on the coefficient is positive: higher sex ratios should increase female bargaining power and therefore the well-being of children. As shown in Table 4 the coefficient is positive but is statistically insignificant at conventional levels.

## VI. Conclusion

World War II exacted a devastating toll on the Soviet population. Tens of millions of people died, mostly men, leaving behind a population of women who survived but faced highly unfavorable conditions in the marriage market and within marriage. The results presented in this paper suggest that the effects of the war impacted these women's lives for decades, leading to more out-of-wedlock births, higher rates of female headship and higher rates of abortion and deaths due to abortion than would have been the case absent the war. The evidence is suggestive but inconclusive that the unbalanced sex ratios had negative effects on the second generation, reducing the well-being of the children of women in the cohorts most affected by the war. While it is impossible to test for other effects of the unbalanced sex ratios on the population, it is likely that they affected male behavior as well and may explain in part some of the problems that plague Russian marriages, such as high rates of alcohol consumption and domestic abuse.

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Fig. 1 Sex Ratios By Year of Birth, 1941 and 1946  
RSFSR

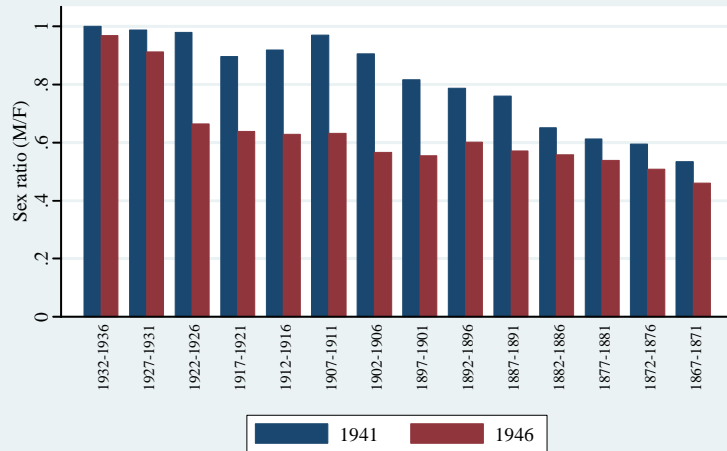


Fig. 2 Sex ratios at age 20 by year of birth

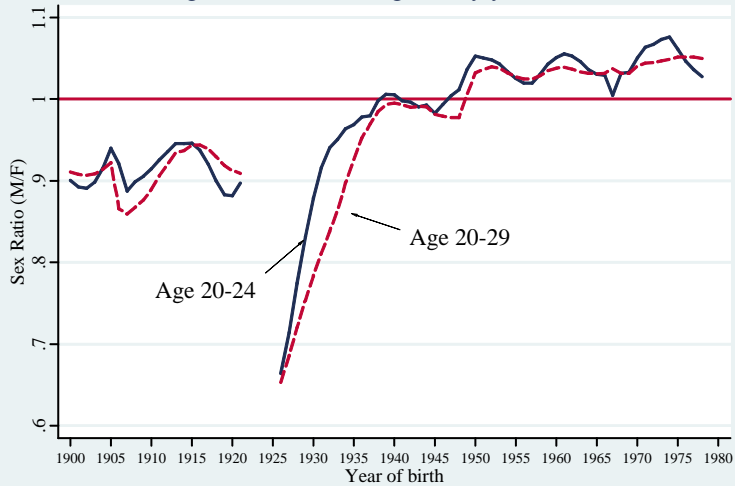


Fig. 3 Sex Ratios by Region, Ages 25-29 and 35-39, 1959

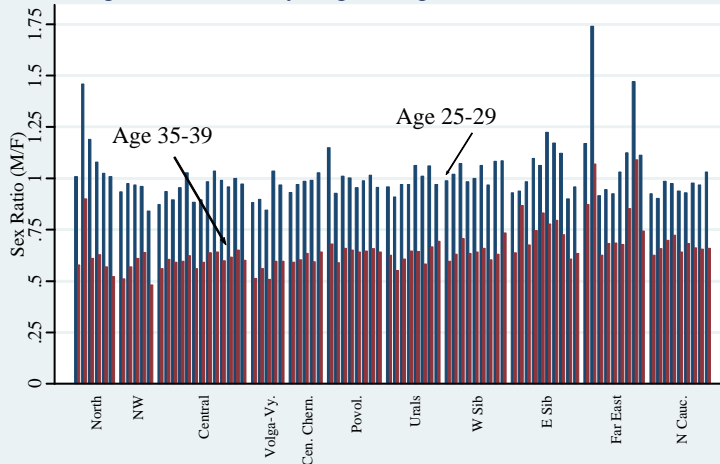


Fig. 4 Correlation Between Sex Ratio and Marital Status, Women, 1959

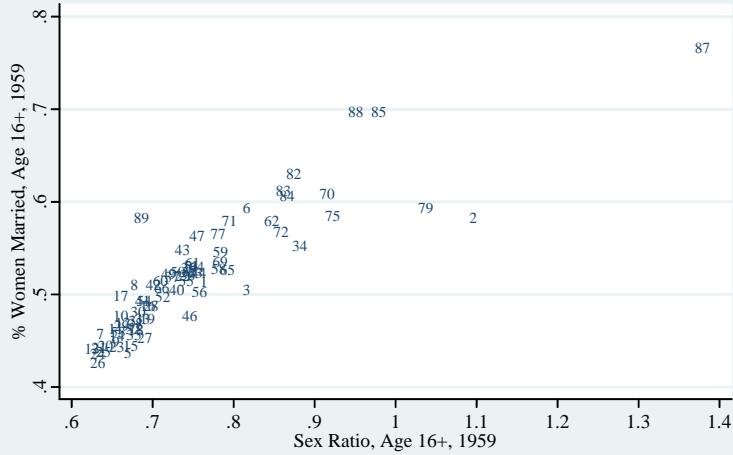
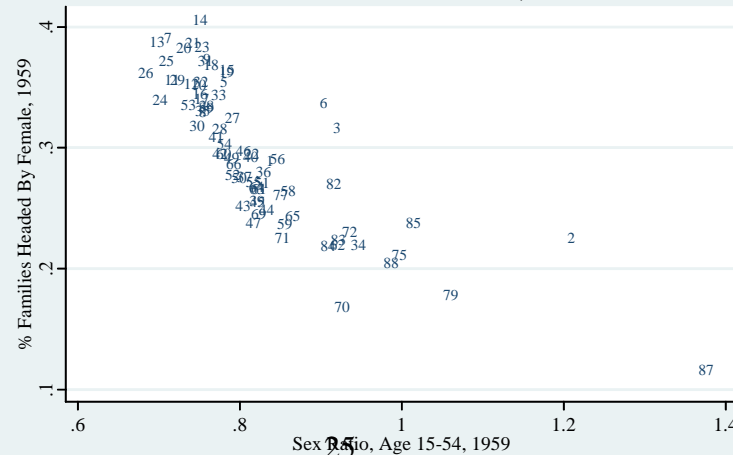


Fig. 5 Correlation Between Sex Ratio and Marital Status, Men, 1959



Fig. 6 Correlation Between Sex Ratio and Female-Headed Households, 1959



**Table 1. Descriptive Statistics**

			Mean	Standard dev.	N
<u>1959 regional data:</u>					
Sex ratios:					Age 15-54
			.824		
			.110		
					77
					Age 16 and over
			.750		
			.120		
					77
Proportion women dependent, age 16-54			.159		
			.060		
					77
Proportion families headed by a woman			.297		
			.060		
					77
Proportion married, age 16+:					Men
			.687		
			.028		
					77
					Women
			.518		
			.065		
					77
Emplt/Pop:	Men (16-59)	.625			.130

	71			
Women (16-54)		.498	.137	72
Average monthly wage, rubles			82.6	26.6
		72		
% women age 10+ with education level:				
		Higher		
		1.8	1.1	77
			Incomplete higher	
				0.9
			0.4	77
			Specialized secondary	
				5.4
			1.5	77
		Secondary		5.2
		1.8	77	
		Incomplete secondary		19.7
		3.3	77	
		Primary		26.1
		2.3	77	
Net urban migration rate per 1,000 pop., 1960		20.9	13.2	72
Density (pop. per 1 square km)			30.1	38.7
		74		

1959 regional data by 5-year age groups:

Sex ratios:

	Age 15-19
	1.013
	.075
	77
	Age 20-24
	1.020
	.141
	77
	Age 25-29
	.994
	.104
	77
	Age 30-34

.840  
 .081  
 77  
 Age 35-39

.643  
 .090  
 77  
 Age 30-39

.762  
 .081  
 77  
 Age 40-44

.645  
 .158  
 77  
 Age 40-49

.645  
 .186  
 77  
 Age 50-59

.564  
 .202  
 77

Age-specific birth rate (births per 1000 women in each age group)

Age 16-44

93.4  
 63.4  
 450  
 Age 16-19

29.4  
12.2  
75  
Age 20-24

172.1  
29.5  
75  
Age 25-29

157.5  
32.8  
75  
Age 30-34

110.7  
30.0  
75  
Age 35-39

67.8  
25.3  
75  
Age 40-44

23.0  
13.6  
75



**Table 2. Cross-regional regressions, 1959**

<b>Dep. variable:</b>	<b>Sex ratio coef.</b>	<b>N</b>	<b>R2</b>
Proportion women married, age 16+	.338*** (.064)	71	.916
Proportion men married, age 16+	-.107*** (.033)	71	.729
Proportion women age 16-54 who are dependent	.270*** (.074)	71	.858
Proportion families headed by a woman (age 15-54)	-.403*** (.053)	71	.906
Proportion women employed, age 15-54	.167 (.189)	70	.909
Proportion men employed, age 15-59	.260* (.153)	70	.903

\* Statistically significant at the 10% level; \*\*5% level; \*\*\*1% level. Robust standard errors in parentheses. The sex ratio in each regression corresponds to the definition of the dependent variable, for example with the proportion women married age 16+ as the dependent variable, the sex ratio is the number of men aged 16 and over divided by the number of women aged 16 and over. All regressions include controls for the average monthly wage in 1959, net urban migration rate in 1960, population per square km (1959), female or male education levels in 1959, and large-region dummy variables. Regressions are weighted by the relevant regional population, e.g. women aged 16 and over for the proportion of women aged 16 and over married.

**Table 3. Stacked regional regressions, 1959**

<b>Dep. variable:</b>	<b>Sex ratio coef.</b>	<b>N</b>	<b>R2</b>
Age-specific birth rate, 16-44	172.1*** (6.59)	420	.341
% births out-of-wedlock, 16-44	-.143*** (.025)	420	.407
Death rate from abortion, women aged 15-39	-11.07*** (1.68)	284	.249
Suicide rate, women aged 15-59	.605 (1.28)	426	.296
Suicide rate, men aged 15-59	-33.86*** (2.71)	426	.524
Homicide rate, women aged 15-59	4.65*** (.593)	426	.242
Homicide rate, men aged 15-59	9.00*** (1.18)	426	.436

\* Statistically significant at the 10% level; \*\*5% level; \*\*\*1% level. Robust standard errors corrected for within-region clustering in parentheses. All regressions include controls for the percentage married in 1959, average monthly wage in 1959, net urban migration rate in 1960, population per square km in 1959, number of doctors per capita in 1960, female or male education levels in 1959, and large-region dummy variables. Regressions on the birth rate and share of out-of-wedlock births also include a control for the female employment to population ratio. Regressions are weighted by the regional population in each age group.

**Table 4. Regressions using the Russian Longitudinal Monitoring Survey, 1994 - 2004**

**Panel A: Fertility, Child Mortality and Abortions**

<b>Dep. variable:</b>	<b>Sex ratio coef. (SR 20-29 at age 20)</b>	<b>N</b>	<b>R2</b>
Total number of births, women aged 40+	-3.91 (3.91)	3637	.156
Total number of births, women aged 50+	-7.39 (4.75)	2527	.173
Had an infant who died, women aged 40+	-.885 (1.18)	3378	.154
Had an infant who died, women aged 50+	.929 (1.72)	2334	.153
Number of abortions, women aged 40+	-8.89 (8.80)	3637	.086
Number of abortions, women aged 50+	-21.0** (8.97)	2527	.102

**Panel B: Second-Generation Effects**

<b>Dep. variable:</b>	<b>Sex ratio coef. (SR 20-29 in year of birth)</b>	<b>N</b>	<b>R2</b>
Adult height, men age 22 - 50	10.59 (10.57)	5477	.089
Adult height, women age 22 - 50	3.15 (11.16)	5772	.077

\* Statistically significant at the 10% level; \*\*5% level; \*\*\*1% level. Robust standard errors corrected for regional clustering in parentheses. Other controls: abortion legal at age 18, marital status at time of survey, Russian/non-Russian ethnicity, education level, regional dummy variables, year-of-birth dummy variables (in two-year intervals), survey year dummy variables. Controls in height regressions: Abortion legal in year of birth; Russian/non-Russian ethnicity;

large-region dummy variables; year-of-birth dummy variables (in two-year age groups); year of survey dummy variables.

## Appendix 1: Data sources

### Archival data:

Age and sex distribution of the population by RSFSR oblast, 1959: GARF F. A-374, op. 40, d. 1, 2, 3, 4.

Births (total and out-of-wedlock) by age of mother and RSFSR oblast, 1959: GARF F. A-374, op. 31, d. 4923.

Female employment and total employment by RSFSR oblast, 1959: GARF F. A-374, op. 31, d. 2944.

Suicides, homicides, and deaths from abortion by age and RSFSR oblast, 1959: RGAE F. 1562, op. 27. d. 834, 835, 836.

Wages, average monthly, by RSFSR oblast, 1959: GARF, F. A-374, op. 31, d. 2779

### Other data:

Doctors per capita: Tsentral'noye statisticheskoe upravleniye, *Narodnoye khozyaistvo RSFSR*

Education variables: Tsentral'noye statisticheskoe upravleniye, *Itogi vsesoyuznoi perepisi naseleniya 1979 goda Tom III chast' I* (Moscow 1989), 190 - 287.

Marital status by RSFSR oblast, men and women, 1959:

Net migration rate 1960: *Naselenie Rossii za 100 let*