Post-Soviet Economic Crisis and Fertility Decline: Parity-Specific Trends in Tajikistan

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Abstract

The post-Soviet republics of Central Asia have been neglected in the fertility literature. Least of all is known about fertility change in Tajikistan, which experienced the most acute economic downturn in the post-socialist world. Here, given the inadequate nature of official registration data, survey birth history data are used to establish the temporal pattern in total fertility since independence in 1991. The paper finds evidence for a significant decline in fertility. Until the mid-1990s, total fertility decline was effected through a decline in higher order births. The scale and timing of this decline strongly indicates that, as in other ex-Soviet countries, the economic crisis discouraged childbearing in the early post-independence years. After the mid-1990s, fertility decline in Tajikistan was mostly effected through a reduction in the first birth rate. This may reflect a reduction in marriage rates stemming from large-scale male labour migration, itself a response to the economic crisis.

Keywords: post-Soviet, Central Asia, Tajikistan, fertility, food crisis, civil war

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Introduction

The collapse of socialism in Eastern Europe and the former Soviet Union offers 'potentially rich material for an examination of the effects of dramatic sociopolitical and economic change on marital and fertility behaviour' (Agadjanian 1999:426). There are a number of studies examining recent marital and fertility changes in Central and Eastern Europe (for example, Conrad et al. 1996; Kučera et al. 2000; United Nations Economic Commission for Europe 2000; Kohler and Kohler 2002; Sobotka 2002; Philipov and Dorbritz 2003; Sobotka 2004; Perelli-Harris 2005). However, the post-Soviet republics of Central Asia have been neglected in the demographic literature (Gentile 2005). This paper seeks to address this research need by analysing marriage and fertility change in post-Soviet Tajikistan.

Tajikistan, after Uzbekistan and Kazakhstan the third most populous state in Central Asia, had a total *de jure* permanent population of 6.1 million according to the 2000 census, 74% living in rural areas (Rowland 2005). In terms of the study of post-Soviet fertility change, Tajikistan is of particular interest. First, traditionally it had the highest fertility of the Soviet republics. Census data show that Tajikistan had the highest average annual rates of population growth in the Soviet Union in each of the periods 1959-1970, 1970-79 and 1979-1989 (Anderson and Silver 1989). Studies in Eastern Europe have documented the effect of post-socialist and post-Soviet change, and the effect of dramatic social and economic crisis, in a context where fertility was already at or approaching replacement level. The effect on 'pre-transitional' populations like Tajikistan (Anichkin and Vishnevskii 1992:61) is less well documented. Second, of all the ex-socialist and ex-Soviet states, Tajikistan has experienced the most acute social and economic problems since independence. In particular, Tajikistan's population has been subject to three specific shocks: a civil war between 1992 and 1997; a food crisis in 1995; and a drought in 2000-01, which also led to severe food shortages. Tajikistan's

experience therefore offers an opportunity to contribute to the literature on the demography of conflict and of food crises.

Post-socialist fertility decline in Europe and Central Asia

Post-socialist fertility decline in Europe has been substantial. Ex-communist Europe is now the lowest fertility region in the world after the dramatic decline in period fertility during the 1990s, with total fertility ranging between 1.1 and 1.4 in 2002 (Sobotka 2002). Declines in countries of Central Europe, which experienced a relatively successful post-socialist economic transition, have been attributed more to new opportunities, ideational change and the 'Westernisation' of fertility behaviour. Here, the decline in fertility has been characterised by the postponement of first births.

In contrast, declines in southeastern Europe and ex-Soviet European states, which have experienced the most difficult post-socialist transition, have been attributed more to the depth of social and economic crisis in these countries (United Nations Economic Commission for Europe 2000; Philipov and Dorbritz 2003; Sobotka 2004). Shrinkage in national economies, together with the removal of the three pillars of the former socialist system – guaranteed employment, subsidised and stable pricing, and social benefits and services (Standing 1996:230) – combined to bring dramatic declines in living standards. In Belarus, for example, 'the slowing of the economy, skyrocketing inflation, destabilisation of the production sphere, increasing unemployment... impoverishment of the population' and associated uncertainties generated by the crisis 'undoubtedly' affected fertility (Shakhotska 2000:36). Unlike in Central Europe, in the first half of the 1990s first order birth rates in ex-Soviet and southeastern Europe were robust, and total fertility decline was driven by

reductions in second and higher birth orders (see, for example, Steshenko (2000), Perelli-Harris (2005) for Ukraine; Bulgaru et al (2000) for Moldova; Kohler and Kohler (2002) for Russia; Stankuniene (2000) for Lithuania; Katus et al. (2000) for Estonia; Aassve et al. (2006) for Albania), though increases in the mean age at first birth in these countries since the mid-1990s are indicative of a decline in period first order rates (see TransMONEE 2006).

Central Asia is culturally, historically and demographically very different from post-Soviet Europe. Nevertheless, both regions have emerged from what Sobotka (2002:42) has termed the 'socialist greenhouse' – an environment which had served to encourage childbearing, or at least undermine reasons to reduce it. Further, during this transition countries in both regions have faced severe economic crises. But while a number of academic studies have documented fertility change in post-socialist and post-Soviet Europe, there is not a comparable literature on fertility change in post-Soviet Central Asia. The available evidence, however, suggests that fertility trends in post-Soviet Central Asia show certain parallels with those in post-Soviet Europe. First, there are indications of substantial declines in period fertility. Vital registration data collated by UNICEF (TransMONEE 2006) suggest larger absolute declines than in post-Soviet Europe, and comparable relative declines: between 1989 and 2003, total fertility fell from 4.3 to 2.6 in Turkmenistan, from 3.8 to 2.5 in Kyrgyzstan, and from 2.8 to 2.0 in Kazakhstan; between 1990 and 2003, from 4.1 to 2.4 in Uzbekistan; and between 1989 and 2000, from 5.1 to 3.7 in Tajikistan. Second, there are indications that, as in post-Soviet Europe, fertility reached a peak in 1987 and then declined thereafter (Becker and Hemley 1998; Agadjanian 1999). Third, in the first half of the 1990s fertility decline specifically involved the reduction of higher order births. Thus Agadjanian and Makarova (2003:471), in one of the few detailed studies on fertility change in post-Soviet Central Asia, argue that post-independence economic hardship in Uzbekistan in the early 1990s acted to discourage births 'beyond the minimally acceptable one child'. Indeed, the share of first

births in total fertility increased in Kazakhstan during this period (Becker and Hemley 1998). However, there is no information on order-specific change in Tajikistan, and none at all on order-specific change in the region since the mid-1990s. Changes in nuptiality, and their contribution to fertility change, have also not been addressed.

Fertility during food crises and civil war

There is strong evidence that food crises reduce fertility in the short-term. Galloway (1988), examining the response of vital rates to annual fluctuations in grain prices in nine pre-industrial European countries, finds a decrease in fertility most evident one year after the price shock, and a fertility rebound in the second year. There was also a very close correspondence between the rise in food prices and a decline in conceptions during the South Asian famines of the nineteenth and twentieth centuries (Dyson 1991a; Dyson 1991b) . Similarly, Lindstrom and Bernahu (1999) find evidence for a decrease in conception probabilities during years of drought and famine in Ethiopia in the 1970s and 1980s, often followed by a rebound in the following year.

Direct evidence to assess the relative importance of biological factors, such as an increase in amenorrhoea and spontaneous abortion because of malnutrition, and behavioural factors, such as a decrease in marriage rates, an increase in migration and spousal separation, or an increase in conscious fertility control, are often lacking in studies of this kind. However, Bengtsonn and Dribe (2006), for a pretransitional population in Sweden, argue that the strong fertility response in the first six months after a grain price shock point to the importance of deliberate fertility control, and the ability to anticipate years of economic difficulty. Dyson (1991a) finds evidence for a similar almost 'anticipatory' fertility response which, in contrast with the

more delayed mortality effects, tends to favour behavioural explanations over biological ones. Indeed, Bongaarts (1980) and Menken et al. (1981) conclude that while periods of severe famine and starvation can significantly reduce fecundity, chronic malnutrition has only a minor biological effect on fertility levels. Thus Lindstrom and Bernahu (1999) attribute declines in marital fertility to a combination of the unintentional influence of increases in spousal separation through temporary migration and the intentional decision to temporarily postpone births in crisis periods. Since we know that nuptiality tends to decrease during years of grain price shocks (Galloway 1988), decreases in the marriage rate can also be an important contributor to decreases in overall fertility levels.

These behavioural factors are also likely to play an important role during periods of military conflict. Lindstrom and Bernahu's (1999) study showed that, as well as fluctuating during periods of famine, conception probabilities decreased during peak years of military unrest. Agadjanian and Prata (2002) similarly find evidence for a drop in fertility during wartime in Angola, followed by a subsequent post-war rebound. On the other hand, Khlat et al. (1997) find no evidence for a significant decline in fertility in Beirut, Lebanon, during the civil war – though these results should be treated with a certain caution given the assumptions made in the indirect estimation of fertility levels (National Research Council 2004). Differing responses to war reflect Sillanpää's (2002) argument that the demographic impact varies according to the length and severity of the conflict, together with the ability of the population to adapt and the extent of spousal separation.

Post-Soviet Tajikistan: economic decline, civil war and food crises

Tajikistan has experienced acute social and economic problems since independence. The extent of the crisis is difficult to overstate. Tajikistan had been dependent on subsidies from Moscow during the Soviet era – making up 47% of total government revenues, the highest proportion in the USSR; it also had the highest inter-republic trade deficit (Foroughi 2002). The withdrawal of subsidies and the disruption of trading relationships, together with the transition to a free-market economy, led to dramatic economic declines (Falkingham 2005). By 1996, GDP was just 39% of 1989 levels (TransMONEE 2006), the biggest decline in Central Asia, while its GDP per capita of $1,041 (purchasing power parity) in 1998 made it one of the poorest countries in the world (United Nations Development Programme 2000). Annual average inflation was 4% in 1990, then increased to 112% in 1991, the year of independence, before soaring to 1,157% in 1992 and 2,195% in 1993 (Economist Intelligence Unit 1997b). It did not decline to double figures until 1997. Real wages in 1994 were estimated to be 6% of 1989 levels, which represents the most dramatic decline in any post-socialist or post-Soviet country (TransMONEE 2006). Unemployment increased (Falkingham 2000) while the system of social welfare collapsed (United Nations Development Programme 2000; De Soto et al. 2001). Vast swathes of the population were plunged into poverty. By the end of the millennium, 95% of the population were classed as living below the official minimum subsistence level (Falkingham 2003). The ability of the population to adapt through subsistence agriculture has been hampered not only by the difficult mountainous terrain, but also by the inherited Soviet system of collectivised land geared towards the production of cotton (see Duncan 2000).

In sum, Tajikistan - which was the poorest of the Soviet republics, with average income in 1988 around 50% of that in the Russian Federation (Atkinson and Micklewright 1992:134) - has also experienced the most severe social and economic problems since independence, with a population among the least able to adapt to the changes thrust upon it. No sphere of Tajik life has been left unaffected. Education has been in decline, with enrolment, attendance and attainment all impacted (Falkingham 2000; United Nations Development Programme 2000). The health care system has deteriorated (Falkingham 2003) while outbreaks of infectious disease have increased. Life expectancy declined for both men and women (United Nations Children's Fund 2001:7).

In particular, over and above dramatic economic decline and social change, Tajikistan's population has been subject to three specific shocks: a protracted civil war, lasting until 1997 but with peak fighting in the latter half of 1992, which represented the most bloody civil unrest in the post-Soviet republics; a food crisis in 1995, stemming from an acute shortage of grain; and a drought in 2000-01, which also led to severe food shortages.

Civil War

Figures for the number of casualties in the war are hard to establish; the International Crisis Group (2001) estimate that 60,000 to 100,000 people were killed between 1992 and 1997, from a total population of 5.1 million (at the time of the 1989 census). Many more were displaced by the conflict: 500,000-600,000 people were internally displaced, mainly people in and around Kurgan-Tyube fleeing to the capital Dushanbe (and some to the GBAO region); an estimated 70,000-100,000 fled to Afghanistan (Foroughi 2002; Lynch 2002), the majority of whom had returned to their permanent place of residence by the end of 1993. The key feature of the conflict was its concentration in space and time. The most severe fighting took

place in the last six months of 1992 and was concentrated in Kurgan-Tyube and Kulyab (both in what is now the region of Khatlon), Dushanbe, and the Regions of Republican Subordination (RRS). By the beginning of 1993, the outcome of the civil war had been effectively decided when Communist forces took control of Dushanbe (Atkin 1997).

Food crisis in 1995

By the mid-1990s, the economic crisis had already affected household food consumption. Falkingham et al. (1997) cite unpublished World Bank data, based on Family Budget Surveys, to illustrate the decline in per capita food consumption in Tajikistan: from 1990 to 1993, there was a decrease of 50% in meat consumption, with declines of 40% for milk, 19% for vegetables and 20% for bread. This is reflective of a change in diet composition, in which expenditures on bakery products and vegetables were more stable than those on protein (Babu and Reidhead 2000), which Howell (1996) interprets as a 'reductive' response to the economic crisis. The population became more dependent on the traditional staple of bread, the cheapest source of calories.

Throughout the Soviet era, Tajikistan was dependent on the import of grain from other republics; in the early post-Soviet years, with food security no longer the responsibility of Soviet central planning, trading links and payment mechanisms took time to be fully established. As the World Food Programme (1996) report, stocks of grain were drawn down to very low levels and the government was unable to establish any strategic reserves, while imports were severely restricted:

> 'Tajikistan has a very limited ability to mobilise adequate cereal supplies through commercial imports. The accumulated debt exceeds GDP, and nether the Government

> nor the central bank have significant foreign currency reserves. Production of the main barter commodities – cotton and aluminium – have fallen sharply and is inadequate to cover essential imports… Trading partners are not willing to provide cereals on credit terms. The capacity to import has been further reduced by high world market cereal prices and poor harvests in the Russian Federation and Kazakhstan, the traditional suppliers. With Tajikistan land-locked, the sources of cereals are limited.' (World Food Programme 1996:24)

The poor cotton crops in 1994 and 1995 contributed to the crisis. Around 420,000 tonnes of cotton seed had been delivered by the end of October 1994, around half the Soviet-era level (Economist Intelligence Unit 1994), with a similarly low crop in 1995 (Economist Intelligence Unit 1996b). This further limited the ability of government to fund grain imports. Imports in 1994-1995, nearly half of which was aid, were just half of the 1993-1994 level (World Food Programme 1996; Table 1). Shortages of flour and basic foodstuffs, leading to social unrest in Dushanbe and other major cities, were reported in late 1994. Russian troops were drafted in to guard the flour and bread factories in Dushanbe (Economist Intelligence Unit 1994).

[Table 1]

The acute shortage of grain at this time prompted dramatic increases in bread prices. During the Soviet period, subsidised food prices had helped to maintain food security. Following independence, the first government of Tajikistan lifted controls on 80% of goods in January 1992 (Kaser 1997), but bread prices continued to be partly state-controlled. However, rationed state bread only provided for a fraction of people's needs. The price of open market bread, meanwhile, increased sixfold in the first six months of 1995 (Grand et al. 2001). In

May 1995, at the same time as a new currency was introduced, the government announced a 150% increase in the price of state bread and flour products; in August, it announced the complete lifting of these price controls, with the Tajik prime minister arguing the move was unavoidable given that bread products were 'four or five' times higher in neighbouring Uzbekistan (Economist Intelligence Unit 1995b:40). The impact of these price rises was accentuated by a severe shortage of cash in the republic. Many state employees had not been paid since January 1994, while others have only been paid in kind (Economist Intelligence Unit 1995a). Meanwhile, the devaluation of the new national currency from May 1995 contributed to the bankruptcy of most of the collective (*kolkhoz*) and state (sovkhoz) farms, which were the main source of livelihood for rural households. Until 1995, the *kolkhoz* had still been able to pay their workers a small salary, despite the decrease in decrease in production and the disruption caused by the civil war (Grand et al. 2001).

The food crisis was widespread and acute. The preceding years of economic crisis had left the population even more reliant on bread, and therefore particularly to vulnerable to changes in its availability and price. The scarcity of flour, rationing of bread and increase in prices in 1995 was therefore a major problem: 'families found themselves compelled to sell their last livestock and any other valuables they still possessed in order to purchase a few sacks of flour to feed their families for a couple of months' (Harris 1998:665). Harris (2004:29) argues that 'many people suffered significant hunger over a period of many months', and that it was only the aid from international relief agencies that prevented famine.

The shortage of grain persisted into early 1996, with further significant increases in bread prices (Economist Intelligence Unit 1996a). However, the food supply crisis in 1995 prompted the government to increase the production of wheat on *kolkhoz* farms and to allocate 50,000 hectares of farmland for household use (Grand et al. 2001). It also prompted

households to change their behaviour. Harris (1998:665-6) notes that, after 1995, villagers decided to devote more of their private household plots to growing wheat, rather than vegetables. The increase in the price of wheat also served to stimulate production. Therefore, domestic grain output rose to a record 548,000 tonnes in 1996, up from 249,000 in 1995 (Economist Intelligence Unit 2001b). Consistent with this increased local availability, 'wheat prices have risen by less than inflation, and there has been no evidence of severe shortages since May 1996' (Economist Intelligence Unit 1997a:30). Indeed, at the time of a later report (Economist Intelligence Unit 1998a), bread had been in general widely available, and prices had stabilised, since mid-1996.

Drought in 2000-01

Domestic grain production remained high in 1997 and, although heavy rains damaged part of the crop in 1998 and 1999, production levels were still much higher than before the agricultural changes prompted by the food crisis in 1995. But while land reform had increased the area of land devoted to wheat, yields were falling owing to a lack of credit for purchasing agronomic inputs (Economist Intelligence Unit 2000). Tajikistan remained far from grain self-sufficiency, with an estimated 300,000-500,000 tonnes of wheat flour imports required annually for minimum consumption needs (Economist Intelligence Unit 1998b). International aid provided 100,000 tonnes per year. In 1997 and 1998 Tajikistan liberalised its previously restrictive trade regime (McHugh and Gürgen 1999), which helped to facilitate commercial imports and kept a ceiling on bread prices (Economist Intelligence Unit 1998b). But food security remained a big issue. Flour prices remained high in comparison to household income. In rural areas, in the absence of income from the *kolkhoz*, many came to rely heavily on their own wheat production from household plots. More generally, the suite

of social and economic shocks in the post-Soviet era had undermined any capacity to cope with further shocks such as a poor harvest.

In 2000 and 2001, Tajikistan suffered a severe drought, estimated to be the worst for 70 years. Annual rainfall was below the long term average across the country. Most significantly, rainfall in March and April in both years – the key months for the wheat crop cycle - were low, averaging less than half of the long term average (FAO/WFP 2001). This led to an almost total failure of the rainfed wheat crop and, with low river levels stemming from reduced glacial snow reservoirs combined to poorly maintained irrigation systems, significant drops in the irrigated wheat yield (FAO/WFP 2000). Overall, wheat production dramatically declined from 475,000 tonnes in 1999 to 255,000 thousand tonnes in 2000 (EIU 2001, April: 40) and 300,000 tonnes in 2001 (World Food Programme 2003). This had a serious effect on food security. There was a 63.6% increase in price of foodstuffs in 2000 (Economist Intelligence Unit 2001b). Especially vulnerable were those in rural areas whose household crop had failed. The situation was particularly acute in the second year of drought in 2001, as people had exhausted whatever coping strategies remained. As many as one million people faced malnutrition and potential starvation (Economist Intelligence Unit 2001a) and were dependent on international aid. Following the drought conditions in the 1999/2000 and 2000/2001 cropping season, rain during the 2001/02 cropping season was in line with the long term average, and production in 2002 recovered to 1999 levels.

Tajikistan's fertility in historical perspective

Traditionally in Tajikistan, as elsewhere in Central Asia, demand for children has been high (Tabyshalieva 1997). But in Pre-Soviet times, and into the Soviet era until after World War II, realised family size was limited by high levels of infant and child mortality associated with epidemics of measles and other diseases (Harris 2004). It was not until the 1960s that living standards and medical facilities were sufficient to reduce mortality and effect rapid population growth (Harris 2002). Fertility rates also increased (Anichkin and Vishnevskii 1994), with vital registration data showing increases of 50% by the mid-1970s (Lutz and Scherbov 1994) (Figure 1). This probably reflects a real increase in fertility - owing to a reduction in breastfeeding, improvements in nutrition and a reduction in the spousal age difference - but also increasingly complete birth reporting as the Soviet registration system developed (Jones and Grupp 1987).

[Figure 1]

Patriarchal and patrilocal social relations have been important in underpinning a high demand for children. Men's status is dependent on the number of their (male) children, while a wife's standing in a family also improves with childbearing. It is therefore perhaps the 'social traditions that have grown up round Islam, rather than the religion itself' (Harris 2002:225), that have encouraged large family sizes. Further, in rural areas, children provide a much needed source of labour. Soviet era influences have also played an important role: as Harris (p.218) summarises, 'benefits paid to mothers of large families, cheap housing, free education and health care, free plots of land for members of communal and state farms, and the low costs of essential food stuffs all made it possible for most families to afford the economic costs of many children without too much hardship'. In many ways, the system represented an

artificial 'greenhouse' environment, in which state population policy was important in shaping family decisions and, even amongst the urban population, reproduction was not impacted by career choices (Sobotka 2002). Indeed, the pronatalist Soviet regime, concerned about the low fertility of its European population, made no attempt to take account of the very different demographic trends in its Central Asian populations (Barbieri et al. 1996). Ironically, it was perhaps in Central Asia that its pronatalist policies had most influence.

It was not until the mid-1970s that family planning programmes began to be introduced following concern about high population growth rates in the region. In Tajikistan, the intrauterine device (IUD) was introduced around 1980 – but while demand was high among women, they often met resistance from their husbands or mothers-in-law and, in any case, supplies were limited (Harris 2002). Nevertheless, according to vital registration data, fertility peaked in 1976 at 6.3 children per woman and had declined to a low of 5.45 in 1984. Pre-independence declines in fertility were largely restricted to those aged 35 and over and probably largely reflected trends in the urban population, where access to modern contraceptives was easier (Harris 2002:219). Thereafter, as elsewhere in the Soviet Union, fertility increased slightly following the introduction of family policy measures (United Nations Economic Commission for Europe 2000:182), reaching a peak in 1987. Fertility subsequently started to decline, mirroring wider Soviet trends, and had reached a figure of 5.04 by the time of independence in 1991 (TransMONEE (2006). Despite this decline, by the end of the Soviet era, Tajikistan was still regarded as 'pre-transitional' (Anichkin and Vishnevskii 1992:61). Central Asia had the highest fertility rates in the Soviet Union, with Tajikistan showing the highest rates of all (Turner 1993) and the ideology of large families 'well established' among the local population (Harris 2002:219).

Data and Method

Under-registration of births has traditionally been a problem in Central Asian vital registration figures (Anderson and Silver 1989), and the quality of registration data has declined further since independence. Aleshina and Redmond (2003) report that, even in a context of ex-Soviet countries, under-registration in Tajikistan is particularly acute. The births of four in ten children aged between 6 months and 1 year, and more than one in ten children aged between 4 and 5, were not registered in 2000. In total, only 75% of children under 6 in 2000 had been registered (United Nations Children's Fund 2001). Overall, the 'reliability and relevance' of vital registration data have become 'a cause of concern for both the Government and the international community' (United Nations Population Fund 2004:2). Owing to an increase in the under-registration of births, in the post-independence period 'total fertility rates in Tajikistan are probably much higher than most [vital registration] statistics would suggest' (Gentile 2005:8). However, some attempt to correct for under-registration is made. Indeed, many children who are unregistered at the time of birth are registered at a later date, often at the age of seven when children start attending school, since non-registered children cannot be enrolled. Annual estimates of fertility are corrected to reflect these late registrations; at the end of 2007, the estimate for 2000 was in the process of being corrected. The vital registration figures are much improved by this adjustment, but should still be used with an element of caution.

This paper therefore uses birth and marriage histories from three nationally representative sample surveys, in preference to vital registration data, to reconstruct marital and fertility trends since independence: the 2003 Tajikistan Living Standards Survey (TLSS), and the Multiple Indicator Cluster Surveys (MICS) of 2000 and 2005. Each survey included a female questionnaire, for women aged 15-49 at the time of the survey, with a section on the fertility

history of respondents. The numbers of women interviewed in the three surveys were 6,196, 6,206 and 10,626 respectively. The TLSS contains a complete birth history, while in the MICS surveys only the dates of a woman's first and most recent births were recorded. Only the MICS 2005 survey recorded the month and year of a woman's marriage, making it the most suitable for analysing changes in nuptiality and first births within marriage.

Use of survey data is not without its drawbacks. First, since the surveys collected birth history information for women aged 15-49 at the time of the survey, data are truncated in periods before the survey, with fertility rates based on a progressively younger sample of women as we go back in time (see Ní Bhrolcháin 1993). To ensure comparability across time for periods before the survey, rates are calculated based on the births and exposure of women aged 15-34, for periods where the age distribution of women is complete up to age 35 (1990 onwards). This is likely to yield a conservative estimate of fertility decline, since it excludes any reductions in fertility among the over-34s. Second, reported birth history data are vulnerable to the omission or displacement of births (Potter 1977) - though this is perhaps less of an issue in Tajikistan, with the Soviet legacy of very high literacy levels, than elsewhere in the developing world. Women's date of birth is not provided in the 2003 TLSS. Only the woman's age *x*, in completed years, is provided. For the purposes of the analysis, the woman is assumed to be exactly *x* and a half years old at the time of the survey.

The starting point in the analysis is the calculation of annual total fertility estimates for 15-34 year olds (hereafter $TFR_{15\text{-}34}$) using the 2003 TLSS. Importantly, fertility estimates from surveys are subject to sampling variability (Dyson and Murphy 1985). It is therefore important to assess the statistical significance of differences between adjacent annual estimates. Following Handwerker (1988) and Ren (2004), standard errors for each of the annual rates, and the covariance between adjacent rates, are calculated using Tukey's

jackknife, with replicates based on the survey primary sampling units. In turn, these are used to calculate confidence intervals for the difference in total fertility between two adjacent years of interest.

Interest also lies in unpacking changes in overall fertility into trends in the component rates: first marriages to never-married women, first births to married women, second births to those who have had a first birth, etc. Calculating rates specific to those who are at *risk* of experiencing them - i.e. those that have not experienced them before - controls more effectively for past history than when including all women in the denominator. For example, a sudden decrease in first marriages would increase the number of never-married women in the following year. Therefore, if the rates are calculated for all women, a subsequent increase in first marriage might reflect a true increase in the propensity of never-married women to marry – or simply reflect the higher numbers of never-married women.

To calculate rates specific to the women 'at risk', the first step is to calculate relevant exposures using Kaplan-Meier estimation, in which each woman is removed from the exposure at the time at which she has experiences the event of interest. Summing exposures over all women gives the number of woman years of exposure in a given annual period. This exposure is then used as an offset term in Poisson regression, which models the effect of given explanatory variables on rates (see Schoumaker (2004) for more details). Here, year is the single explanatory variable. When modelling fertility, dates of birth are shifted back by nine months to reflect the date of conception. Jackknife methods are used to calculate standard errors, allowing for the clustered nature of the survey data. The significance of annual changes in the rate of second births to women of parity one, for example, can then be assessed by examining the significance of rate ratios.

Poisson regression assumes that the variance of the dependent variable is equal to the mean. For each dependent variable in the different models used here (number of first marriages, number of first births, etc.) the mean and variance were almost equal – and in each case, the variance was slightly less than the mean. This accords with previous research which has shown that fertility data are more likely to be under- than over-dispersed (Covas and Santos Silva 1994; Winkelmann and Zimmermann 1994). Since under-dispersion results in *over*-estimation of the standard errors of regression coefficients, if anything this would result in conservative conclusions regarding the significance of annual effects.

Results and Discussion

[Figure 2]

Figure 2 presents variations in fertility levels in Tajikistan since 1989 according to three different sources: vital registration (TFR_{15-49}), TLSS survey (TFR_{15-34}) and census (child-woman ratio$_{15-44}$[1]). Trends in each of the sources – especially the census and survey data – show considerable agreement. All three sources show a decline in fertility since independence in 1991. The survey and census data suggest that fertility had also been declining in the years immediately before independence, consistent with 1987 being a peak fertility year across the Soviet Union (Becker and Hemley 1998; Agadjanian 1999). Most

[1]The census in Tajikistan took place in January 2000, time *t*. Here the child-woman ratio in 1999 is calculated as the number of children aged 0 at *t* per 1,000 women aged 15-44 at *t*. In the same way, the child-woman ratio for 1998 is the number of children aged 1 at *t* per 1.000 women aged 16-45 at *t*. Whipple's index provided no evidence for strong age heaping in the census data.

interestingly, all three sources show that the post-Soviet trend has been far from a consistent, year-on-year decline. Indeed, the pattern has been highly volatile – a volatility which is unusual in comparison to the Soviet era (Figure 1). In particular, the timing of the sharp declines in fertility from 1995 to 1996, and from 2000 to 2001, suggest that these represent reactions to the food crisis and drought respectively.

Vital registration data show a very sharp fall in TFR_{15-49} from 1991 to 1992, compared to the more gradual decline apparent in survey and census data. This probably reflects the breakdown in the registration system during the most intense period of fighting in the civil war in the latter half of 1992 – a conclusion which is supported by regional registration data showing that this decline was particular to Khatlon, RRS and Dushanbe, the three regions most affected by the war. The survey and census data show a decline in fertility from 1992 to 1993, but at a similar rate to the decline in preceding years, suggesting that the intense fighting had little impact on aggregate fertility levels. However, when the survey TFR_{15-34} is split into its order-specific components (Figure 3), distinguishing first births from all higher orders, there is a clear decline in higher-order fertility between 1992 and 1993 (difference in order-specific TFR_{15-34} 0.50; 95% CI, 0.07-0.93; p=0.023) which seems sharper than earlier declines.

[Figure 3]

[Figure 4]

If the fighting in the latter half of 1992 is the reason for this sharper decline, we would expect the declines to be greatest in Khatlon, RRS and Dushanbe. Limits placed on disaggregation by sampling variability preclude survey estimates specific by annual period and region. However, the 'child-woman ratio' census estimates by region in Figure 4 do indeed show the

greatest decline in these three regions – and only in these regions is there a significant rebound in fertility in 1994. This is evidence, in line with the findings of Lindstrom and Bernahu (1999) and Agadjanian and Prata (2002), for a decline in conceptions during periods in intense military conflict, followed by a post-conflict rebound. That, in contrast to higher orders, first births rose during through the economic crisis and civil unrest in the early 1990s (Figure 3) suggests that in some instances 'people do not change all components of their demographic behaviour equally and uniformly' (Agadjanian 1999:426) and that changes in nuptiality may not necessarily mirror wider changes in reproductive behaviour. Indeed, first marriage rates remained high until the mid-1990s (Figure 5).

[Figure 5]

[Figure 6]

There is a sharp decrease in fertility between 1995 and 1996 (survey difference in TFR_{15-34} 0.77; 95% CI, 0.38-1.15; $p<0.001$). Unlike the drop from 1992 to 1993, this reflects declines in not only higher-order (difference in order-specific TFR_{15-34} 0.43; 95% confidence interval, 0.08-0.76; $p=0.013$) but also first-order fertility (0.33; 95% CI 0.13-0.54; $p=0.001$) (Figure 3). Figure 5 provides further insight into the contributions to decline. From 1994 to 1995 there were declines in first marriages to unmarried women (rate ratio 0.69; 95% CI 0.54-0.88; $p=0.003$) and in conceptions leading to first births to childless women within marriage (rate ratio 0.79; 95% CI 0.62-1.01; $p=0.059$). The cumulative effect of the decreases in marriage and in conceptions within marriage is illustrated in Figure 6. In each of the three surveys, there were sharp decreases in conceptions leading to first births for childless women between 1994 and 1995. While there is no evidence for a decrease in conceptions leading to a second birth for women who already have one child (rate ratio 0.92; 95% CI 0.72-1.18; $p=0.53$), there is stronger evidence for a decrease in conceptions leading to a subsequent birth for women of parity two (rate ratio 0.80; 95% CI 0.60-1.07; $p=0.133$) and for women of parity

three (rate ratio 0.61; 95% CI 0.45-0.83; p=0.002) (Figure 7). Overall, there is a suite of converging evidence - including distinctive decreases in overall fertility apparent in vital registration, census and TLSS survey data, and distinctive decreases in first birth levels in three independent sample surveys – which is consistent with a reduction in fertility because of the 1995 food crisis. As we might expect, since the population as a whole had been reliant on imports for its grain supply (including in rural areas, where cotton dominated agricultural production), census data suggest that the effect of the grain shortage in 1995 was spatially pervasive (Figure 4).

[Figure 7]

Since the vital registration figures for 2000 onwards are yet to be adjusted for under-registration, and the census took place in 2000, only survey data are available to investigate the most recent fertility trends (Figure 2). Nevertheless, the distinctiveness of the estimated decrease in total fertility from 2000 to 2001 (survey difference in TFR_{15-34} 0.65; confidence interval, 0.27-1.03; p<0.001) suggests that it reflects a response to the drought. As with the 1995 crisis, there is evidence for a decrease in higher order fertility (difference in order-specific TFR_{15-34} 0.39; 95% confidence interval, 0.06-0.72; p=0.020) and in first-order fertility (0.27; 95% CI 0.09-0.44; p=0.003). The same TLSS 2003 survey data show a significant decline in conceptions leading to first births for childless women between 1999 and 2000 (rate ratio: 0.63; 95% CI 0.51-0.78; p<0.001), and a persistent low level in 2001 (Figure 6). The corresponding MICS 2005 survey data show a decrease between 1999 and 2001, the second year of the drought (rate ratio: 0.79; 95% CI 0.62-1.00; p=0.046), though with a less sharp decline in conceptions between 1999 and 2000. The MICS 2005 survey provides no evidence for any decline in first marriages to unmarried women in the first year of the drought, but strong evidence for a drop from 2000 to 2001 (rate ratio: 0.69; 95% CI

0.54-0.89; p=0.005) (Figure 5). It also provides evidence, though weak, for a reduced first birth propensity within marriage: in both drought years, there is a lower rate of conceptions compared to 1999 (and an identical rate ratio of 0.85; 95% CI 0.67-1.08; p=0.192).

The strong fertility responses to the crisis in 1995 and the drought in 2000-01 in Tajikistan provide further support, following from Galloway (1988), Lindstrom and Bernahu (1999) and Bengtsson and Dribe (2006), to suggest that periods of acute food shortage and high prices can have a significant demographic impact. Further, just as Bengtsson and Dribe (2006) and Dyson (1991a; 1991b) document an immediate, almost 'anticipatory' fertility response to food shortage, so the response is also immediate here. The 1995 crisis developed over the winter of 1994-5, when imports were only half of the 1993-94 level Table 1). Fertility declined in 1996, indicative of a reduction conceptions in 1995 (Figures 2, 6). The swift nature of the response to the crisis points towards behavioural, rather than biological, factors in the fertility decline. This is also consistent with the judgements of Bongaarts (1980) and Menken et al. (1981) that chronic malnutrition, as opposed to starvation, has only a minor biological effect on fertility levels (while there are no reliable statistics on death rates during these periods, it is probable that international aid prevented widespread excess mortality).

During both the 1995 and 2000-01 crises, an acute drop in the marriage rate was a key contributor to the fertility decline – especially so given that in Tajikistan births outside of marriage are rare. However, there is also evidence for a decrease in the conception rate to childless women within marriage, and a decrease in higher-order births. Contraceptive prevalence in Tajikistan is low: in 1991, among sexually active individuals, current use of modern methods was estimated at 3% (Turner 1993). By 1999 this had increased to an estimated 30% (Falkingham 2000), with use confined to women at higher ages and parities. However, prevalence in 1995 was almost certainly lower than this, and contraceptive use at

older ages would not explain the decrease in the rate of first births within marriage. If the reduction in conceptions represented the deliberate postponement of childbearing, this must largely reflect the use of traditional methods. Bengtsson and Dribe (2006) judge that, in a population in pre-industrial Sweden without modern methods, deliberate control was the main mechanism through which fertility was related to economic fluctuations.

The decline in conceptions during the crises may reflect a decrease in coital frequency, through a loss of libido or temporary spousal separation because of migration. Hionidou (2002) argues that contraception was not a major factor in the decrease in conceptions during famine on the Greek island of Syros, but that the decrease instead largely resulted from a loss of libido stemming from the psychological effect of the crisis. Saito (2002), meanwhile, cites literary evidence for an increase in the 'floating' male population, in search for food and work, during famines in Japan, with the separation of men and women a major factor in fertility declines in these periods. Indeed, Menken et al. (1981) advocate more vigorous searches for data which are able to provide evidence for the temporary separation of spouses during food crises. Reports at the time suggest that the drought in Tajikistan prompted many men to leave the country to find work (OCHA 2000; World Food Programme 2001). Work in progress by the author examines the 2003 TLSS data, containing information on migration histories of household members since 1998, to examine further the links between male temporary migration and fertility over the drought period.

While there is evidence for a rebound in higher order fertility following periods of crisis, first order fertility remains depressed (Figure 3). This reflects, in contrast to the recovery in the rate of conceptions within marriage, a longer lasting impact on marriage levels (Figure 5). Indeed, the 1995 case in particular not only involved food shortage but a number of more lasting economic changes. Food shortages eased from mid-1996 but bread, following the end

of subsidies, was now much more expensive than before. Further, the bankruptcy of most of the collective (*kolkhoz*) and state (sovkhoz) farms, following the rapid inflation in 1995, led to persistent under- or non-payment of workers in the following years (Grand et al. 2001). These changes, particularly in the Tajik context when the ceremony itself is traditionally very expensive and a focus for conspicuous demonstrations of wealth (Tett 1996), would have undermined people's ability to finance the costs of a wedding and family formation. Galloway (1988) also notes that the effects of economic crisis on marriage can be prolonged, while Palloni et al. (1996:107) argue that 'when the economic effects of the crisis are long-lasting, a more permanent disequilibrium in the marriage markets sets in, and the making up of postponed marriages ceases to be a feasible option. The consequence is an increase in the proportion of members who never marry'. This describes the Tajik situation well; sustained low marriage rates since the mid-1990s will inevitability translate to an increase in the never-married. Large scale labour migration, as well as influencing fertility within marriage, is likely also to be a key factor in the prolonged marriage decline, given qualitative accounts for a sharp imbalance in the sex ratio (for example, Harris 1998).

Conclusions

In Central and Eastern Europe, fertility declined significantly during the 1990s following the collapse of socialism. Studies have focused on explaining the extent to which the decline reflected a response to economic crisis, and the extent to which it reflected ideational change and the 'Westernisation' in fertility behaviour (Conrad et al. 1996; United Nations Economic Commission for Europe 2000; Sobotka 2004). In Tajikistan, the volatile pattern of fertility change is, in itself, powerful evidence that the country's post-Soviet demography has been shaped by crisis. In particular, the drops in fertility following periods of food shortages in 1995 and 2000-01 are sharp and distinctive from Soviet-era trends. They serve to further illustrate, following Galloway (1988), Lindstrom and Bernahu (1999), and Bengtsonn and Dribe (2006), the short-term effects of food crises on demographic behaviour.

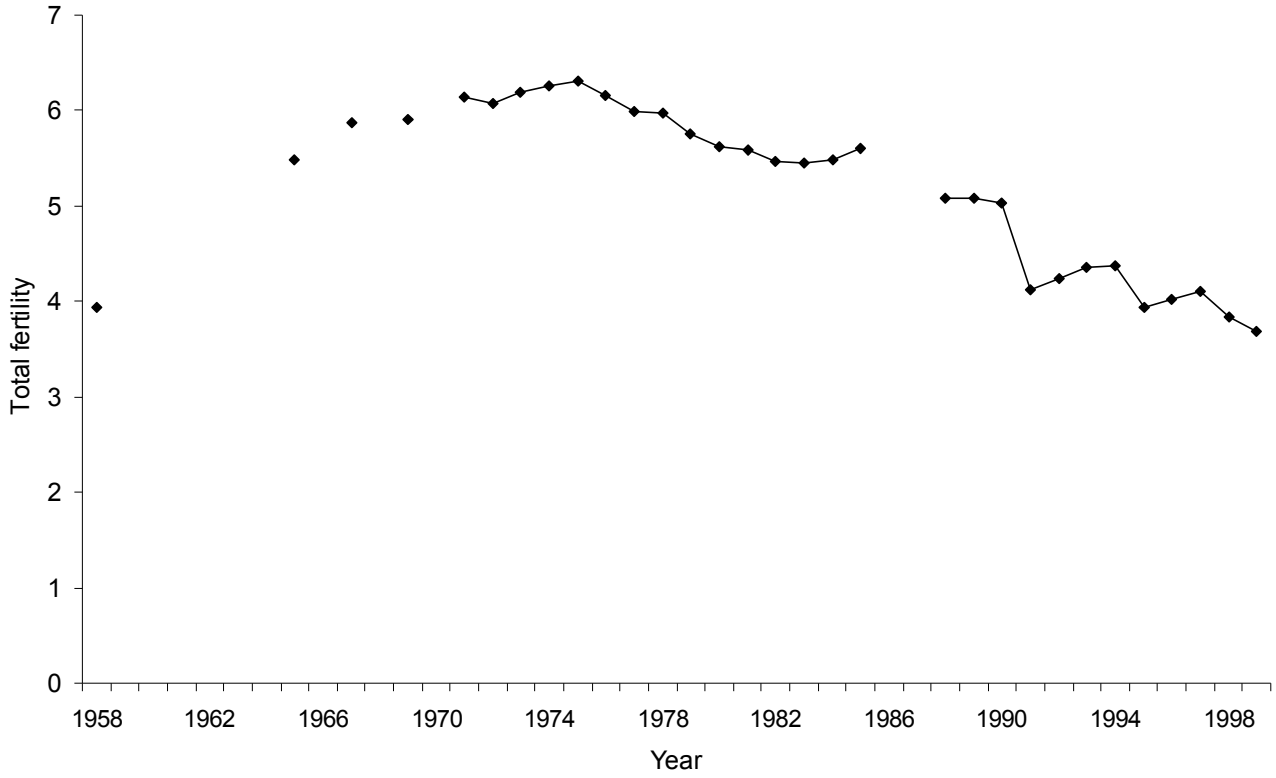
Tajikistan's experience also illustrates the importance of context in understanding the demographic effects of post-socialist economic crisis. During the Soviet era, with agriculture focused on the production of cotton, Tajikistan was a net importer of grain. This lack of self-sufficiency left the population particularly vulnerable to the collapse of Soviet central planning, which had assured minimum consumption levels and food security. When, by the mid 1990s, the government could no longer afford to import sufficient grain, a food crisis was inevitable. In contrast, countries like Kazakhstan were net exporters of grain during the Soviet period, and did not experience comparable food crises in the post-Soviet period. Its post-Soviet demographic experience is likely to be very different to that of Tajikistan. Further research on the particularities of marital and fertility change in other Central Asian republics, therefore, would be valuable. Indeed, the demography of post-Soviet Central Asia remains an under-researched field (Gentile 2005).

Table 1 Average cereal availability and utilisation in Tajikistan 1990-95 (thousand tons)

	Average 1990-92	**1993/4**	**1994/95**
Domestic availability	620	335	265
Opening stocks	*350*	*80*	*26*
Production	*270*	*255*	*239*
Imports	1100	800	409
Utilisation	1720	1135	674
Food use	*870*	*660*	*498*
Feed use	*400*	*309*	*60*
Other uses	*200*	*140*	*110*
Closing stocks	*250*	*26*	*6*
(Per capita consumption, kg/pa)	(160)	(120)	(90)

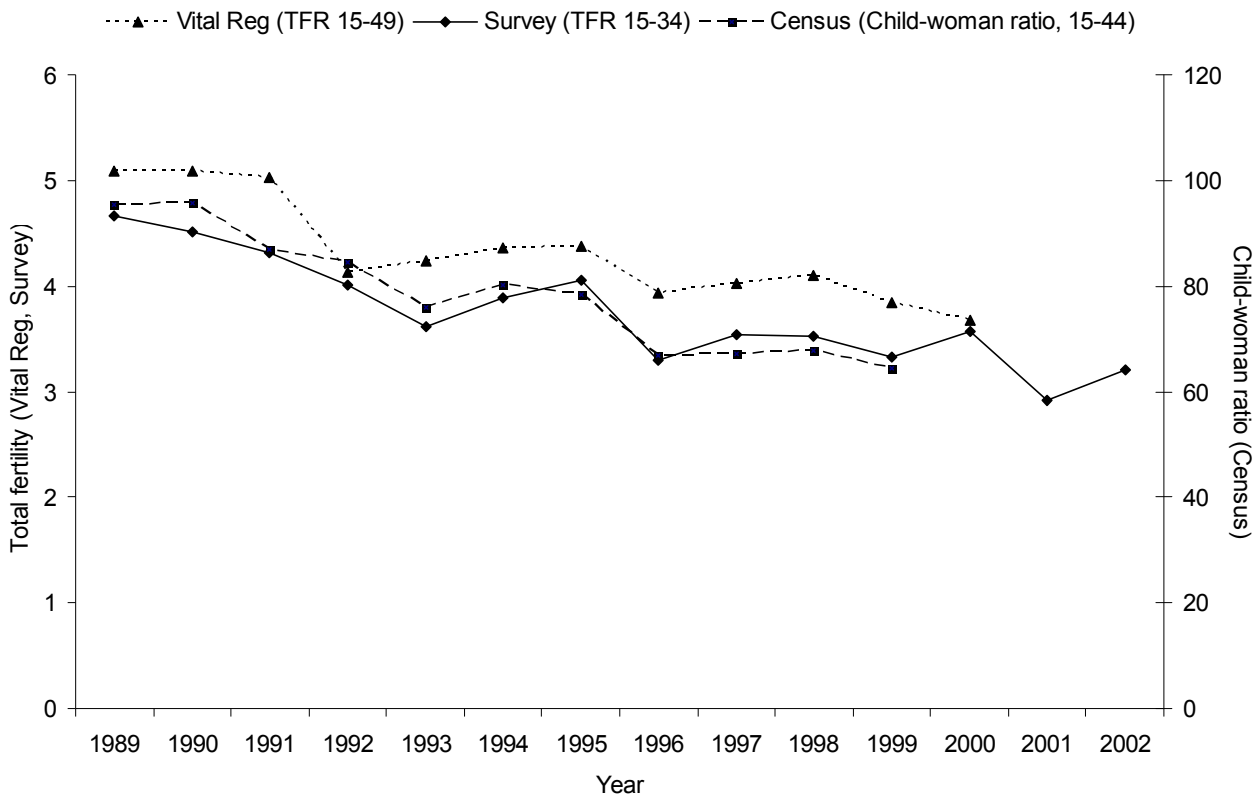
Source: FAO Global Information and Early Warning System, in World Food Programme (1996)

Figure 1 Total fertility in Tajikistan based on vital registration data, 1959-1995



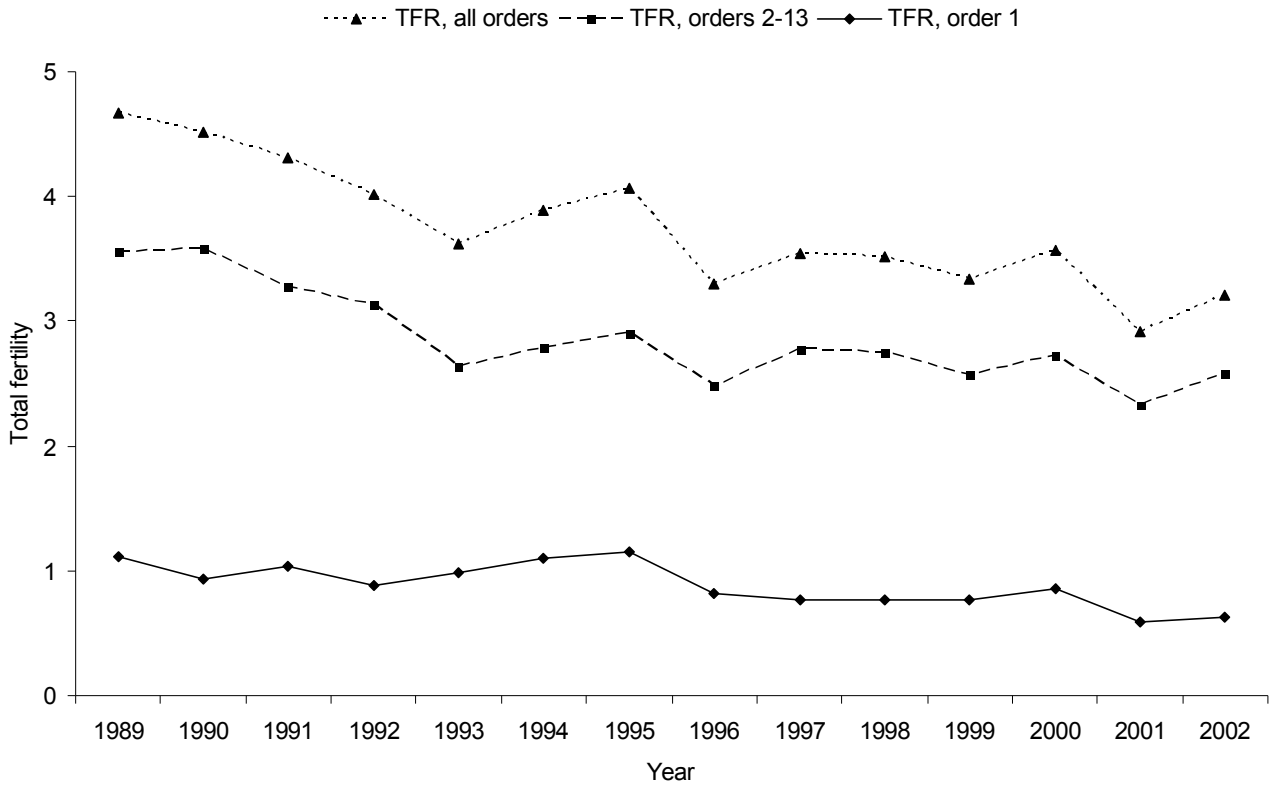
Sources: Jones and Grupp (1987) for 1959-1974; *Vestnik Statistiki* (Goskomstat multiple years) for 1975-1987; UNICEF TransMONEE (2006) for 1989-2000.
Note: Rates pre-1989: plotted rate in 1975 refers to 1974-5; 1976 refers to 1975-6, etc.
*[As yet no data found for 1987 and 1988]

Figure 2 Fertility trends in Tajikistan, 1989-2002, based on three different sources



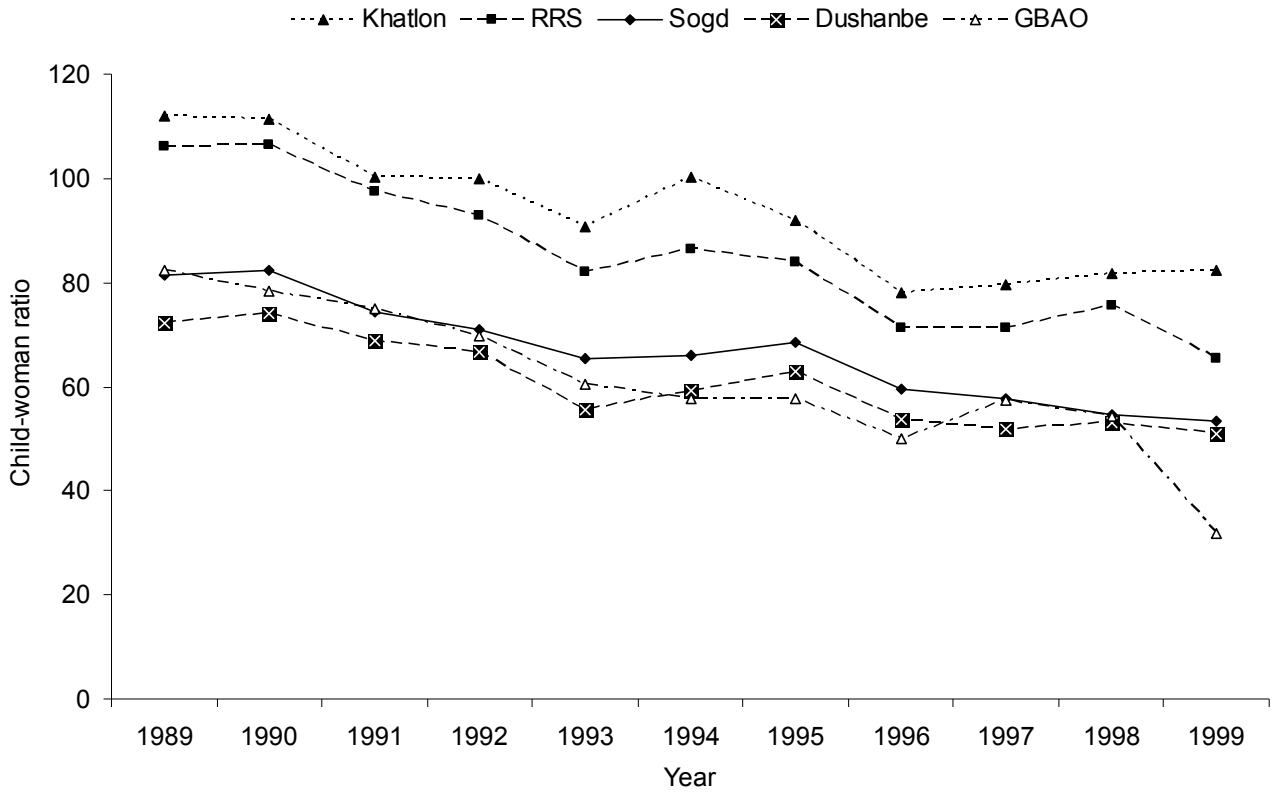
Note: for explanation of child-women ratio, see text.
Sources: vital registration: TransMONEE (2006); survey: author's analysis of TLSS (2003) data; census: author's calculations using data published in Tajikistan State Committee on Statistics (2001).

Figure 3 Total fertility (TFR_{15-34}) trends by birth order in Tajikistan, 1989-2002



Source: author's analysis of TLSS (2003) data.

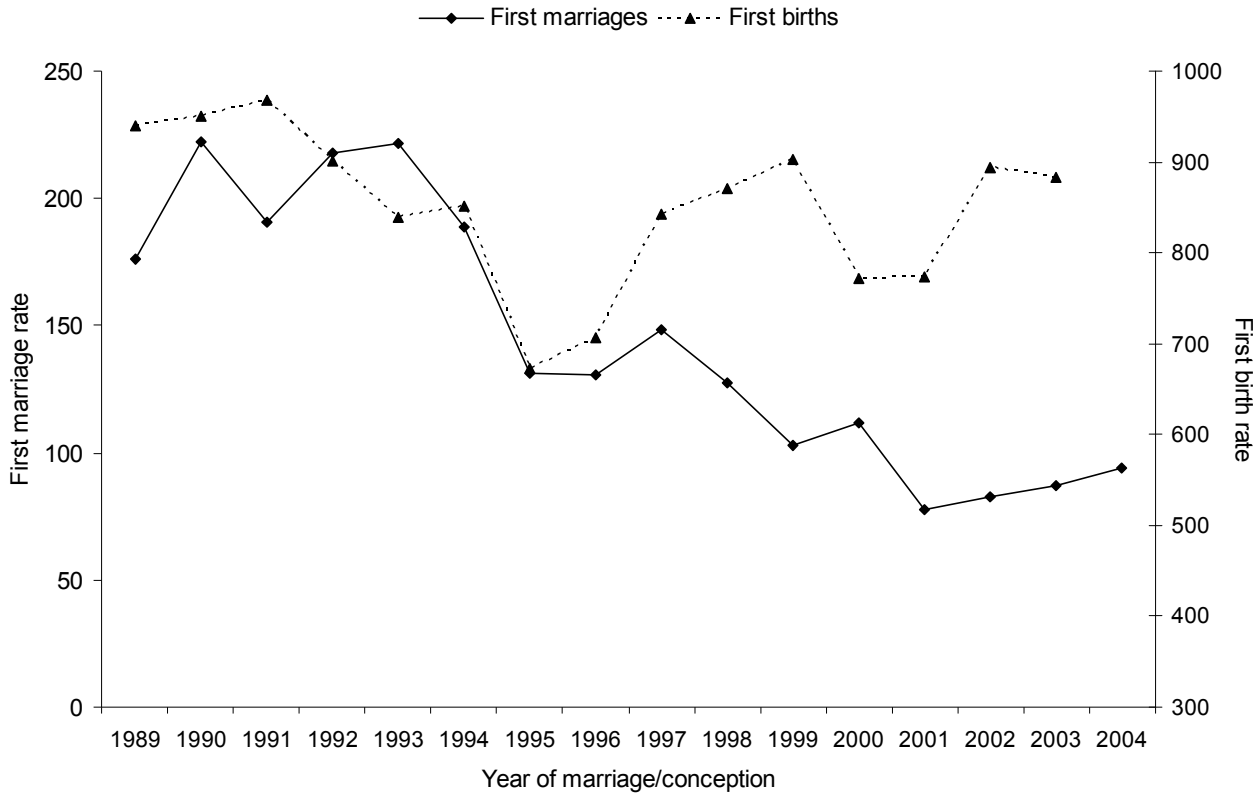
Figure 4 Regional fertility trends in Tajikistan, 1989-1999: estimates using the 2000 census



Note: for explanation of child-women ratio, see text.
Source: author's calculations using data published in Tajikistan State Committee on Statistics (2001).

Figure 5 First marriages to never-married women, and first births to childless married women, Tajikistan 1989-2004

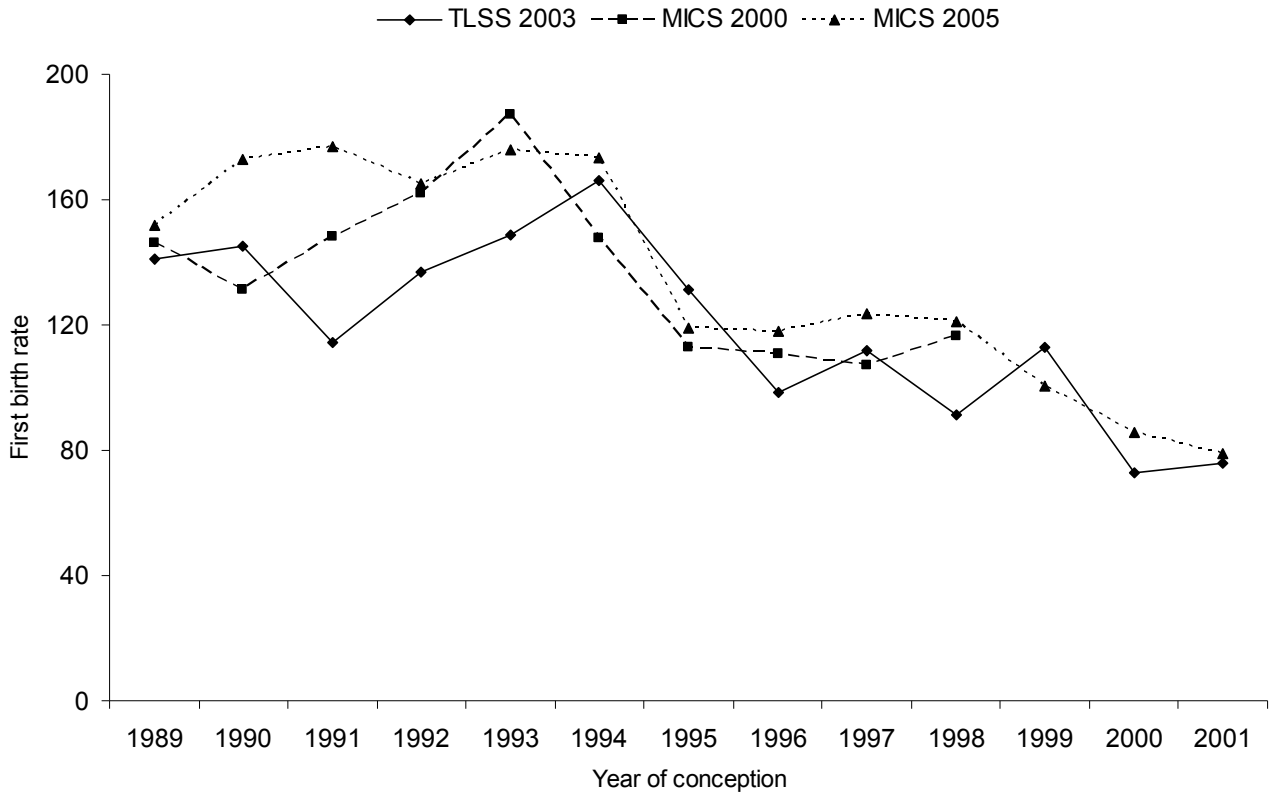
[Date of birth shifted back nine months to reflect date of conception]



Note: Rates per 1,000 woman years of exposure, for women aged 15-29 inclusive.
Source: author's analysis of MICS (2005) data.

Figure 6 First births to childless women, Tajikistan 1989-2001: estimates of rates from three different surveys

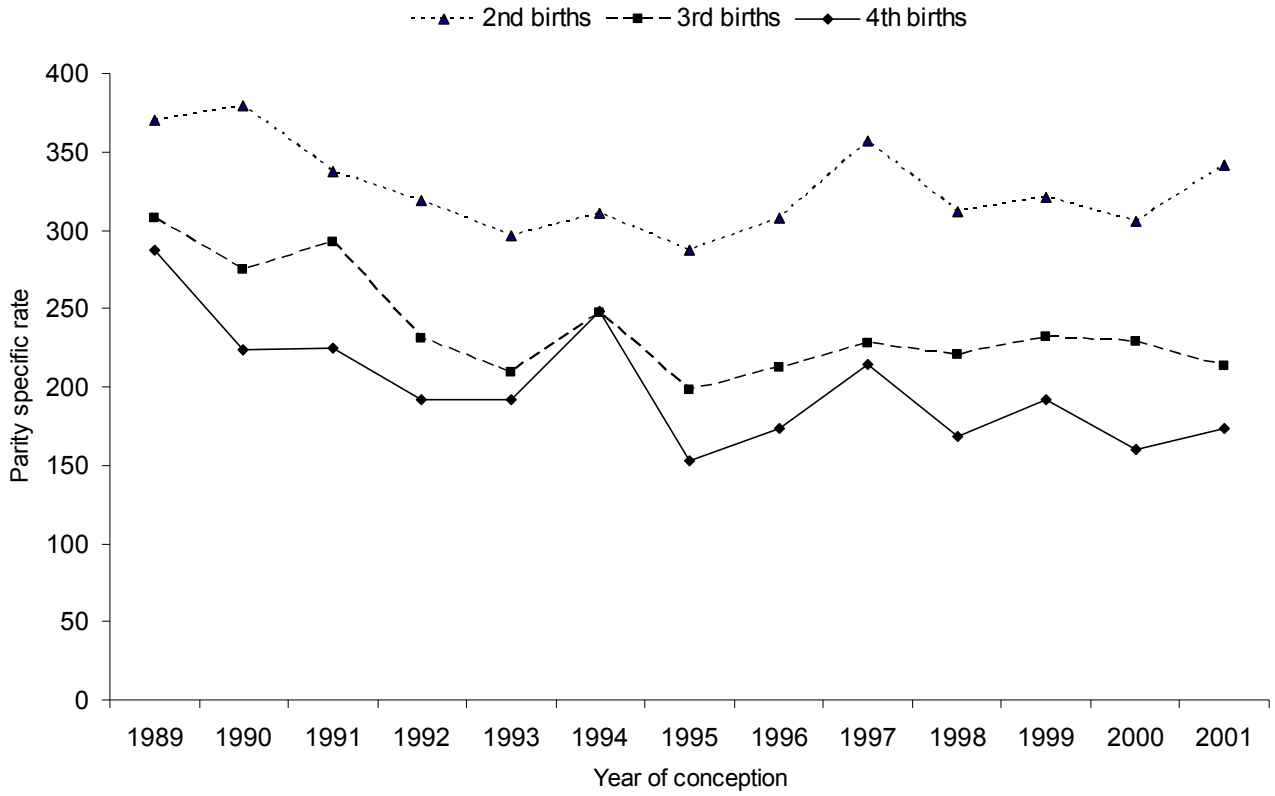
[Date of birth shifted back nine months to reflect date of conception]



Note: Rates per 1,000 woman years of exposure, for women aged 15-34 inclusive.
Source: author's analysis of data from the three surveys.

Figure 7 Parity specific fertility rates, Tajikistan 1989-2001

[Date of birth shifted back nine months to reflect date of conception]



Note: Rates per 1,000 woman years of exposure, for women aged 15-34 inclusive.
Source: author's analysis of TLSS (2003).

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