Household Formation Rules, Fertility and Female Labour Supply: Evidence from Post-Communist Countries

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November 9, 2012

Abstract

This paper explains how household formation rules affect the fertility and labour supply of women in the Former Soviet Union and neighbouring countries. Women who bear a male first child in countries dominated by traditional, patrilocal households are shown to have substantially lower subsequent fertility from those whose first child is female. Where households are generally nuclear, male first borns do not reduce subsequent fertility. Middle-aged women in more patrilocal contexts often work less if their first child is male, despite reduced fertility and being more likely to reside with a daughter-in-law. In more nuclear contexts, they tend to work more. These findings suggest that household formation rules are strongly related both to women's demand for sons and to the direction of intergenerational transfers.

JEL codes: J100, O12, O5

Key words: household formation rules, fertility, daughter-in-law, deferred compensation, Central Asia, Russia, Soviet Union, patrilocality, intergenerational transfers.

I would like to thank Shannon Potter and Rebecca Livernois, who both provided excellent research assistance. I am very grateful to the World Bank for making the Tajikistan 1999, 2003, and 2007 LSMSes, and the 1998 Kyrgyzstan LSMS publicly available. Equal thanks to IFC Macro for making the DHS surveys for Eastern Europe and Central Asia available, and for quick responses to my numerous questions regarding these surveys. Kathryn Anderson, Reid Hamel, Miana Plesca, and Atsu Amegashie provided very helpful comments. I am indebted to Tanya Remisova for many informal discussions which lead to this project.

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1 Introduction

Sons are the key intergenerational link where women move to their husband's natal residence upon marriage. In the Caucasus and much of Asia, marriages have traditionally been arranged, and new brides move to their in-laws' residence. The wedding of a son, usually the first born, implies that his mother will have extra help in the house, and that the mother's role in home production will be reduced. This patrilocal pattern of household formation contrasts with that of developed countries today, where households generally consist of parents and children and marriages are chosen by partners. The economic implications of these different rules governing household formation have been little examined theoretically or empirically.

This paper compares the importance of first born sons to the fertility and labour supply of women across Former Soviet Union countries with different household formation rules, and with other countries in the immediate neighbourhood. For seventy years the Soviet Union explicitly attempted to modernise household formation rules in the southern republics by banning child marriage, the veil, dowry, and polygamy, permitting divorce, encouraging family planning, and making the education of girls free and compulsory. A major reason for the six year *Basmachi* rebellion before the consolidation of Soviet power in Central Asia was resistance to radical changes in the organisation of family life.[1]

Countries with predominantly nuclear families, and marriage chosen by partners, tend also be characterised by transfers between non-coresident generations, from the elderly towards the youngest.[2] This contrasts with the patrilocal context where monetary transfers tend to be greater amongst coresident family, and to flow from the young to the elderly.[3] The economic importance of monetary

[1] See, for example, Dragadze (1984), Buckley (1997), Edgar (2003), Edgar (2006), Olcott (1981), and Ritter (1985).

[2] Kuhn and Stillman (2004) document the redistribution of old-age pension income in Russia by pensioners to their non-resident adult children. Cheuk and Uhlenberg (2010) discuss both the time and monetary contributions of grandparents to children's upbringing in Russia and other countries with nuclear household norms.

[3] The importance of intergenerational transfers to economic development was first demonstrated theoretically by Samuelson (1958). Samuelson recognised that the age structure of the population suggested that intergenerational trading would be important to economic decisions of individuals. Lee (2003) describes the evolution of net flows across generations in hunter-gatherer, agricultural and industrialised societies. Consistent with these ideas, Kochar (2000) finds that only about 8% of elderly household members in rural Pakistan received monetary transfers from non-resident children, while about 85% received transfers from resident sons. Pakistani elders benefit from increased household public goods provision when their sons work more. Grogan (2007) shows that Tajik children living in three-generational, patrilocal, households obtain less education as a result.

transfers occurring around the time of patrilocal household formation, through dowry and brideprice exchanges, is well-recognised.[4]

Information on household composition and work outside of the home is contained in most household survey data, but has been little used to compare the distribution of a woman's labour over the lifecycle in patrilocal and nuclear households. When a woman's son marries in the patrilocal context, her workload is substantially lightened, because of a generational hierarchy amongst a household's women.[5] A deferred compensation system for women in patrilocal households may be enforced by intergenerational violence within gender.[6] Household formation rules may not only have large implications for the direction of monetary transfers across generations, but also for the allocation of non-market time of individuals, particularly women, across their working lives.

This paper examines the hypothesis that women's bargaining power is weaker in patrilocal families, where they are the daughter-in-law and not the wife of the household head. As a result, social norms about household formation impact the fertility and labour supply of women over their lifecycle. In the patrilocal marriage contract, but not the nuclear, women commit to producing sons. A patrilocality index including 44 developing countries is first derived. It is then shown that, in countries that are strongly patrilocal, a male first born causes women both to have fewer children and to be less likely to be employed by age 40-49. In contrast, where nuclear norms dominate, these effects are not found. The paper proceeds as follows. In the following section, the data are introduced and summary statistics presented. Section 3 introduces the patrilocality index and discusses economic differences between patrilocal and nuclear households. Section 4 estimates the causal effect of having a male first born on two outcomes for women aged 40-49: The number of children she has born, and whether or not she works outside the household. Section 5 concludes.

[4]See, for example, Goody and Tambiah (1973).

[5]For descriptions of the traditional mother-in-law and daughter-in-law relationship in patrilocal societies, see for example, Mandelbaum (1948) and Miller (1999) for India, Rahim (1988) for Bangladesh and Pakistan, Falkingham (2000) and Harris (2006) for Tajikistan, UNICEF Azerbaijan (2009) for Azerbaijan, and Wallis (1923) for Armenia.

[6]For example, using fifteen case studies from Mumbai, Fernandez (2009) shows that mother-in-laws enforce their will over daughters-in-law by both direct violence and by inciting their sons to violence. Chan, Tiwari, Fong, Leung, Brownridge, and Ho (2009) find that a major correlate of violence inflicted on pregnant women in Hong Kong is conflict with in-laws. For studies of violence directly related to marital transfers see, for example Bloch and Rao (2002) and Panda and Agarwal (2005).

2 Data and Summary Statistics

All publicly available, nationally representative household survey data from the Former Soviet Union, Albania, Turkey, and South Asian countries are employed. Aside from the Former Soviet Union samples, Turkey and South Asian countries are included because they border, respectively, the Caucasus countries and Central Asia. Long before Soviet attempts to modernise households, these countries were linked by the conquests of the Mongolian hordes, and by the Silk Road trading route. Albania, which was once part of the vast Ottoman Empire, is included as a former communist, but not Former Soviet Union country for which the necessary data is available.

The data come primarily from the Demographic and Health Surveys (2011), which always include full fertility histories of women under 50. The DHS samples include: Albania 2008, Armenia 2005, Azerbaijan 2006, Bangladesh 2007, India 2006, Kazakhstan 1999, Moldova 2005, Pakistan 2006, Turkey 2003, Ukraine 2007, and Uzbekistan 1996. As well, some World Bank household surveys, notably those from Kyrgyzstan taken in 1996, 1997, and 1998, Tajikistan from 1999, 2003 and 2007, and Russia from 1992, include the necessary fertility history. The samples are here restricted to women 40-49 who have had at least one live birth, and in the case of Pakistan to women who have ever been married.[7] In practise, this restriction eliminates about 10% of women in Russia and Azerbaijan, 6% in Armenia, and less than 5% in all other countries.[8] The DHS data have been recently employed by Filmer, Friedman, and Shady (2009) who examine the association between existing numbers of sons and subsequent fertility behaviour. Filmer et al. do not explicitly examine the link between household formation rules and women's fertility and labour supply at mid-life, and do not focus on Former Soviet Union countries.

Some women in the samples will still bear children after the survey takes place. Still, childbearing in the 40s is not related to the sex of the first born in these samples. In Data Appendix A, I demonstrate that there are no differences in the probability that a woman in any of the samples is pregnant at the time of interview by the sex of her first born child. While one might have expected

[7] In the 2006 Pakistan DHS, only women who have ever been married are administered the fertility questionnaire. Where more than one DHS survey exists for the country, the most recent is employed.

[8] It would clearly be of interest to examine the impact of bearing a male first born on all subsequent life outcomes of women. Unfortunately, fertility data is generally not collected for women older than 50, either in the DHS or World Bank surveys.

that women without sons at age 40 are relatively likely to bear more children, especially where household formation rules give old-age security, these data show otherwise.

In most cases, data from each country comes from one nationally representative data set. However, for Tajikistan and Kyrgyzstan, data from several surveys are merged. In Kyrgyzstan, the World Bank conducted household surveys (LSMS) in 1996, 1997, and 1998, and the DHS also undertook a household survey in 1997. These samples were merged to increase observations.[9] Similarly, for Tajikistan, three rounds of the World Bank's LSMS were merged. In all other cases, country-level data derives from a single survey. In the cases of Kyrgyzstan, Uzbekistan and Kazakhstan, samples have been restricted to non-Russians. Results for Russian residents of these republics are available on request from the author, but are not here presented.[10]

The sex of the first born is taken to be that of any child born, whether or not the child subsequently died. The DHS surveys advise interviewers to collect information on all live births, even if the child died very soon after birth, but to exclude stillbirths (see Demographic and Health Surveys (2000)). In the case that the first birth is multiple, the sex of the first of these children is taken.[11] It remains possible that women under-report births of children who lived only briefly. However, Hill and Choi (2006) use data from 108 DHS surveys and compare DHS birth histories to historical data. They find no evidence of significant under-reporting of neonatal deaths.

[9]The sample frame of the DHS surveys in fact differs slightly from that of the LSMS. Whereas the LSMS surveys are stratified random samples of households, the DHS surveys are stratified random samples of households containing women aged 15 to 49. To account for this difference in the merged Kyrgyzstan sample, dummies are included to distinguish the four different surveys. The publicly available 1996 Kyrgyzstan LSMS sample does not include a variable for age of marriage, although this question was posed to respondents. For the 1996 survey only, it is also not possible to construct a numerical value for the date of birth of the respondent's child.

[10]These results are similar to those for Russia, Moldova and Ukraine for non-Russians in Kyrgyzstan, the country with the largest ethnic Russian population. However, sample sizes are small, and likely to be unrepresentative due to widespread outmigration of the Russian minority, and so are not employed for inference.

[11]Note that this simplification tends, if anything, to bias observed impacts of male first borns on subsequent outcomes towards zero. If the first born is reported as a girl but a twin brother was also born soon after, the coding does not account for the fact that the woman bore a son from her first childbearing.

2.1 Summary Statistics

All of the DHS and LSMS household surveys contain information on the relationship of household members to the household head, and the size and age composition of the household. This information also permits the classification of household formation patterns in a country. Table 1 presents summary statistics on the composition of households containing women 40-49 in the samples.

Mean household sizes in the samples are smaller than 4 in only three countries: Russia, Ukraine and Moldova. In the remainder of the samples, they range from a low of 4.3 in Armenia to 8 in Pakistan, as shown in Table 1. The definition of a household may be somewhat arbitrary, despite efforts of the DHS and other surveys to standardise definitions, but these differences remain striking.[12] Women in Russia, Moldova, Ukraine, and Albania also have far fewer children under age 5 in the household than do women in either Central or South Asia.

In the Caucasus countries and Central Asia, women aged 40-49 are much more likely to reside with a daughter-in-law of the household head than in Russia, Ukraine, or Moldova. As shown in Table 1, in Tajikistan, about 22% of women aged 40-49 reside with a daughter-in-law of the household head. This compares to only 4% in Russia and 2% in Moldova. In India, 17% of women aged 40-49 reside with a daughter-in-law, as do 17% in Pakistan, 16% in Bangladesh, and 8% in Turkey. In all countries except Ukraine, Russia and Moldova women are more likely to reside with a daughter-in-law of the household head than they are with a married daughter of the head.[13]

[12]The DHS surveys generally define a household as a person or group of related or unrelated persons who live together in the same dwelling unit or in connected premises, who acknowledge one adult member as the head of the household, and who have common arrangements for cooking and eating meals. The Demographic and Health Surveys (1994) provides an in-depth discussion of issues in defining household composition, which have guided interviewer training in subsequent DHS surveys.

[13]The extent of patrilocal and matrilocal residence in the 1992 RLMS survey may appear rather low. The Soviet Union experienced chronic housing shortages (Turner, Hegedüs, and Tosics (1992)), so that multiple generations were forced to live together. In Dushanbe, Tajikistan in 1990, a rumored plan to resettle 2500 to 5000 Armenian refugees provoked a riot which killed 22 people and left 565 injured (Ray and Gvosdev (2004)). However, in the 1992 RLMS, individuals were coded in relation to all household members. Unlike the DHS surveys, it may be that the household head is not always considered to be the oldest male in the RLMS 1992. For consistency with the other surveys, however, the fraction of women living with a father-in-law household head is reported.

2.2 Patrilocality index

To assess how the household types of our samples compare to those of other developing countries, countries are ranked by the prevalence of the patrilocal residence rule amongst young married women. Specifically, the countries included in the DHS V surveys and in our samples are ranked by the fraction of married women under 30 whose household head is her father-in-law.[14] This ranking is presented in Table 2, with countries in the estimation samples highlighted by bold type.

With the exception of the Russia, Ukraine and Moldova samples, a majority of former communist countries rank relatively high on the patrilocality index. The same is true of the neighbouring countries to be included in our analysis. The extent of patrilocality in Caucasus and Central Asian countries is perhaps surprising given the recent communist history. Female labour force participation rates were relatively high during this era, and there were no official property rights.

Household formation rules are neither religion- nor culture-specific. The incidence of patrilocality is highest in Armenia (71% of married women under 30), where 98% of DHS respondents report that they are Christians. This incidence is also high in several predominantly-Muslim countries including Azerbaijan (58% of married women under 30), Pakistan (38% of women under 30) and Bangladesh (18% of married women under 30). However, patrilocality is also prevalent in India (32% of women under 30), and Nepal (37% of women under 30), where the dominant religion is Hindu. Further investigation using DHS VI data from Vietnam, where 75% of respondents report that they are non-religious, shows that 38% of married women under 30 reside in patrilocal households. Clearly, these countries represent a broad range of cultures, recent political experiences, and religions, not unlike the countries where patrilocality is a less salient phenomena.

Perhaps as important as the incidence of patrilocality is to understanding resource allocation in households is the incidence of matrilocality. In this extended family situation, the married daughter is co-resident with her parents, which should have very different implications for her bargaining power than residence in extended but patrilocal families. Residence in extended families may reflect poverty or housing shortages as well as social norms governing household formation. For this reason, in column (2) of Table 2, the fraction of extended family households that are matrilocal is also shown. Across all countries, the incidence of matrilocal residence is much lower than that of patrilocal residence.

[14] I restrict the age range to 30 to avoid conflating mortality of older males with the initial post-marital residence situation.

Both in the DHS V samples from developing countries around the world, and in the samples from Eastern Europe and the Former Soviet Union, matrilocal households are scarce.

The extent of patrilocality in a country is strongly negatively related to female labour supply. A simple regression explaining employment rates amongst women aged 15-49 (column (3)) as a function of the patrilocality index yields a patrilocality coefficient of -0.52 (P-value=0.001). This relationship is also strong amongst the 14 countries included in the estimation samples, with a patilocality coefficient of -0.35 (P-value=0.09). Married women appear more likely to reside with their in-laws when their labour market opportunities are relatively limited.

The fact that sons form the key intergenerational link in patrilocal households can be exploited to test a hypothesis that different household formation rules have different implications for women's lives. In the patrilocal context, a woman is disadvantaged because she resides with her in-laws and is responsible for producing a male heir who will provide old-age security. Providing a son increases her status in the household, since husbands prefer offspring to be male. In the nuclear context, women have greater bargaining power and sons are not key to the survival of the household. The marriage contract is unrelated to the production of sons. This suggest that male first borns will reduce both fertility and the labour supply of middle-aged women in patrilocal contexts, but not in the nuclear context. Using the patrilocality index, and the survey data, this hypothesis can now be tested.

2.3 Identification

The sex of the first born child was arguably randomly determined before the advent of sex information technology (SIT). The women in the samples are 40-49 at the time of interview, so their first births were unlikely to have been influenced by this technology. Still, there are reasons why the assumption that the sex of a first born child is exogenous may not hold.

One may be concerned that first born female children are relatively likely to be abandoned after birth in the patrilocal context. Where sons define the household formation rule, there may be greater incentives for neonatal neglect of female children. If women with certain preferences regarding total fertility and work are also more likely to abandon female children, an identification strategy assuming exogeneity of the sex of the first born will be invalid. As well, women may be more likely to commit suicide, experience violent death, or experience pregnancy-related mortality (since they are more often pregnant) if they fail to bear sons.

To address exogeneity concerns, several comparisons were undertaken to provide support for considering the sex of the first born to be random. These comparisons are presented for all countries in Tables 3a and 3b. First, the data show that the ratio of first born boys to girls is statistically indistinguishable from the 105 to 100 that is expected to be naturally occurring in human populations in 8 of the 14 countries considered. The first row of Table 3 gives the sample fraction of first borns who are male amongst babies born to women aged 40-49 in the samples, followed by a test of the equality of this fraction with the biological norm. In the South Asian countries, Ukraine, Tajikistan, and the Kyrgyz Republic, there are slightly too many male first borns.

In populations without sex selective abortion, such as the US historically, ratios of 106 to 100 live boy to girl births have also been observed (see Hamilton (2005)). Yet, even considering 106 to 100 to be the natural sex ratio does not permit the sex ratios found for these remaining countries to be considered normal. The 'excess' of male first borns ranges from 0.013 in India to 0.038 in Tajikistan.[15] Women who omit to report neonatal deaths amongst first born girls may be more likely both to report a male first born and to control their subsequent fertility. This fertility behaviour may also relate to their preferences for market work.[16]

The apparent excess neonatal mortality of female first borns in six of the samples is not reflected in differences in women's characteristics by the sex of their first born. Table 3 shows that, across women whose first borns were boys or girls, there are virtually no differences in high school completion rates, ages at marriage or first birth, or the time between marriage and first birth, which are statistically significant at the 5% level. Only in Uzbekistan in 1996, where the sex ratio equals the biological norm, are women whose first born child was female slightly older at the time of her birth than are women whose first child was male. In no countries where there is an excess of male first births is either the mean age of a woman at her first birth, nor the mean time between marriage and first

[15]These excesses are calculated as the difference between 0.512 and the actual fraction of male first borns in the samples.

[16]While one might expect that women with strong preferences for market work desire relatively few children and are more likely to select the sex of their first borns, the data do not generally support this. For example, in India, the fraction of male first borns amongst currently working women is 0.5175, so that the test of equality with the biological norm $|t|=\frac{(0.5175-0.512)}{0.005}$, and the equality with this norm is accepted at the 5% level. Since the fraction of male first borns amongst non-working women is then slightly too high, women in more traditional households are potentially both less likely to work and more likely to care about the sex of the first born.

birth different across the reported sex of the first born. If neonatal disposal of female children were strongly associated with observable characteristics, one would expect these means to be statistically different.

In a majority of countries characterised both by patrilocal and nuclear household formation rules, the sex ratio amongst first borns is statistically the same as the biological norm in human populations. Where this is not so, more caution should be used in interpreting impacts of a male first born as causal. In Data Appendix A, I present further evidence of causal effects on fertility for those countries where the sex ratio differs slightly from the biological norm.

3 Multivariate Analyses

The impact of having a male first born on the fertility and working life outcomes of women aged 40-49 is examined using simple regression. The effects of having a male first born on these outcomes are then compared across sample countries using the patrilocality index.

The outcomes of interest are: (*i.*) the total number of live births to a woman, as of the interview date, and *ii.*) the probability that a woman currently works outside of the household.

If the sex of a first born child is truly random, then the causal effect is simply the difference in observed outcomes amongst women whose first child was male versus female. In Data Appendix A, means of the three outcomes considered are presented by the sex of the first born, and compared statistically. However, these results are not discussed here in detail, in favour of the multivariate results. Since the outcomes of interest are also impacted by factors unrelated to the sex of the first born, the causal impact will be more efficiently identified with the addition of several plausibly exogenous controls (see Angrist and Pischke (2009)).

For each outcome, the equation to be estimated is:

$$OUTCOME_i = \beta_0 + \gamma * FBBOY_i + \beta_1 * AGE_i + +\beta_2 * HSCHOOL_i + \mu_c + \epsilon_i \quad (1)$$

For each woman, i, the impact of bearing a male first born ($FBBOY$) on the two outcomes above is investigated. Control variables include a linear term in the woman's age (AGE), a dummy for having completed at least highschool, $HSCHOOL$, and region and rural-urban fixed effects with

a full set of interactions. Sample weights are employed, and standard errors are robust.[17] The main term of interest, γ, is interpreted as the causal effect of bearing a male first born. Marital status is not included as a control. Marital status may be affected by the sex of the first born child, particularly in patrilocal societies. Rao (1997) finds that violence against women is associated with a failure to bear sons. Even in the US, divorce was slightly more common amongst spouses without sons in the mid-1900s (see Dahl and Moretti (2003)).

Country-specific results are individually presented and discussed in detail in Data Appendix A. This Appendix also contains robustness checks for these main country-specific findings. Nearest neighbour matching results (Herr and Imbens (2004)) are shown to be very similar to the OLS and probit results employed in what follows.

According to the hypothesis, the more patrilocal the context, the more negative should be the relationship between the sex of the first born child and both fertility and labour supply. To test this, the patrilocality index is next related to the country-specific results. I here estimate a regression explaining the probability that a male first born has a significant negative impact on each outcome (fertility, labour supply) as a function of the patrilocality index. This is done for all samples, and then for Former Soviet Union countries alone.

3.1 Fertility

In the patrilocal context, but not the nuclear, a male first born should reduce fertility. To investigate whether or not this is true in these samples, I create a variable which takes the value 1 if the measure fertility impact of a male first born is significantly negative (at the 10% level) for a country, and zero otherwise.

The more patrilocal the context, the more likely are the fertility impacts of a male first born significantly negative. Table 4 presents results of cross-country regressions relating the fertility impact to the patrilocality index. Standard errors are robust. Across all samples, the observed coefficient is large and positive (column (1)). This strong positive association is also apparent amongst only Former Soviet Union countries (column (2)), and also amongst Former Soviet Union countries excluding Russia (column (3)). This association is statistically significant at the 5% level in all three

[17] It turns out that results are unchanged with a quadratic term in age, but since the variance in ages is only 10 years, results with the linear age term are here reported.

specifications.

If parental preferences are fixed, the sex of the first born must be impacting the opportunity costs of subsequent childbearing and, potentially, the intertemporal budget constraint in the patrilocal context in a way it does not in the nuclear. This fact illustrates the link between household formation rules and *in vivo* intergenerational transfers towards the older generation. It is consistent with the Caldwell (1976) hypothesis that, early in economic development, the direction of intergenerational transfers is from young to old. The bearing of a male first child can be interpreted as resolving uncertainty about the eventual existence and timing of old age security. In contrast, neither the opportunity cost of future childbearing nor the intertemporal budget constraint of nuclear households should be impacted by the sex of the first born if boy and girl children are consumption goods of similar value. This interpretation is consistent with the parental altruism hypothesis for developed countries suggested in Becker (1974), and discussed in terms of a simple overlapping generations model in Willis (1982). Although a large literature suggests a preference for mixed sex children in developed countries, the sex of the first born hardly impacts the probability of attaining a mixed sex family.[18]

First born boys have, on average, fewer siblings than do girls in patrilocal contexts. This implies that a woman's ability to control her fertility may, paradoxically, undermine the relative status of girls in the population. Edlund (1999) discusses the potential for SIT to create an underclass of females. The findings of Table 4 suggest that girls may grow up with fewer resources per capita simply because women whose first borns were male have fewer children subsequently. These findings may also help explain why careful household expenditure studies generally find little differences in resources allocated to boys and girls (see, for example Deaton (1989)), whereas there are millions of missing women (Sen (1992), Klasen (1994)), Anderson and Ray (2010)), and these women are missed primarily from countries included in these samples. These findings for the patrilocal context concur with Filmer, Friedman, and Shady (2009), who also find that women with sons have fewer children

[18]For early evidence that US families with two children of the same sex were more likely to have a third see, for example Clare and Kiser (1951). However, Pollard and Morgan (2002) provide evidence of a recent decline in the impact of two same-sex children on the probability of a third birth in the US. In a study of demographic data from Denmark, Finland, Norway and Sweden, Andersson, Hank, Rønsen, and Vikat (2006) find consistent preferences for children of mixed sex amongst parents with two children. However, in none of these countries is the sex of the first born a predictor of the probability of a second birth.

subsequently.

3.2 Work outside the home

Home production and market labour supply may both be affected by fertility, the acquiring of a daughter-in-law, and co-residence with grandchildren. First born sons may receive different amounts of home production as children than do daughters, and have different wage earning potential as adults.

The conditional association between the patrilocality index and labour supply impacts of a first born boy is less evident in cross-country regressions. Table 5 presents results of probit regressions relating the patrilocality index to the probability of a negative impact of a first born boy on labour supply. The dependent variable takes the value 1 if the measured labour supply impact of a male first born is negative (significant at the 10% level) for a country, and zero otherwise. Using data from all 14 countries, the association is positive, but not quite statistically significant at the 10% level (column (1)). When the sample is restricted to Former Soviet Union countries (column (2)), and to Former Soviet Union countries excluding Russia (column (3)) the association between the patrilocality index and labour supply impacts becomes still weaker.

A further look at the country-specific relationships between the sex of the first born and labour supply reveals a more interesting pattern than that of Table 5. Women in the three most nuclear contexts (Russia, Moldova and Ukraine) actually tend to work slightly more if their first born was male. As discussed in Data Appendix A, this may be attributable to mothers of first born daughters becoming maternal grandmothers at relatively young ages, and exiting the labour market to help with childcare.

3.3 Evidence from census microsamples

To provide further verification of the main findings, I also employ the available microsamples of census data from Former Soviet Union countries. I show how male first borns impact the fertility to-date of mothers aged 18-28, and their labour supply, in Armenia, Belarus, and Kyrgyzstan. To summarise this investigation: Male first borns have no effects on fertility in Belarus or amongst ethnic Russians in Kyrgystan (more nuclear contexts), but important impacts in Armenia and amongst non-Russians in Kyrgystan (more patrilocal contexts). No labour supply impacts of male first borns are observed either any of these samples of young mothers. These results are explained in detail in Data Appendix A.

4 Discussion

Given communist efforts to promote nuclear families, to discourage arranged marriages, and to increase the agency of women, the observed importance of first born sons to women's midlife outcomes in Albania, Tajikistan and the Caucasus countries is particularly striking. Women's educational attainment in these countries is much closer to that prevailing in Russia, Moldova and Ukraine than to that of women in Turkey or South Asian countries, and their labour force participation rates are generally higher (see Table 2). Although there was no private property for most of these women's lives, the patrilocal method of transfering resources between generations apparently remained strong. One potential reason why household formation rules are now modern in Russia, Ukraine and Moldova, but not in the Caucasus or Central Asia, is that the latter regions never experienced the industrialisation necessary for women to earn good wages.[19]. Chung and Das Gupta (2007) show for South Korea that improvements in women's labour market prospects during industrialisation changed social norms away from son preference, despite state policies promoting traditional household norms. Lin (2009) shows that increased educational attainment of women in Taiwan since 1990, which also improved

[19]Household formation rules amongst Russian peasants left little room for love matches even by 1917, as documented by Figes (2003). Under serfdom, landowners had determined who would marry whom. After the emancipation of the serfs in 1861, marriages were arranged by fathers of the bride or by villages collectively, and women continued to marry in their teens. After emancipation, communities allocated land amongst peasants on the basis of household size. Households were generally patrilocal, and fertility rates were very high (Avdeev (2004)).

labour market prospects, was a significant factor in the reduction in son preference.

Another reason why Soviet efforts to change household formation rules may ultimately have failed is the 1991 collapse of economies and old-age pension systems, which was far more severe in the Caucasus and Central Asia than in Russia.[20] A long-running civil war in Tajikistan, and conflict between Armenia and Azerbaijan may also have contributed. Economic insecurity and decline may have increased the importance mutual insurance within households, and diminished women's own income-earning potential. With the exception of Baker and Jacobson (2006), there is little research which examines the evolution of social norms regarding household formation rules. The present study suggests that understanding the origins of these social norms might be particularly important for designing effective population policies.

5 Conclusions

This paper investigates the hypothesis that household formation rules have major implications for women's fertility and labour supply. The sex of a woman's first born child is shown to have large causal impacts on her subsequent fertility where patrilocal rules prevail. In the Former Soviet Union countries of Armenia, Azerbaijan and Tajikistan, women aged 40-49 reduce fertility by between one fifth and one third of a child if their first child is male. This fertility pattern is similar to that prevailing in Albania, Turkey, and South Asian countries, where household formation rules are also more patrilocal. The more nuclear the household formation rule, the less is the negative impact of male first borns on subsequent fertility.

Nuclear and patrilocal contexts also differ in how first born sons impact work propensities amongst 40-49 year old women. In the patrilocal context, first born males may reduce their mother's housework responsibilities earlier, by providing them a resident daughter-in-law at a younger age. However, women do not then substitute into market work. In Albania, South Asia, and the Former Soviet Union countries where patrilocal norms dominate, the impacts of first born sons on market work propensities are never positive. In contrast, these effects on the labour supply of women are never negative in countries where nuclear household norms prevail. The country-specific results are consistent with

[20] See, for example, Orlowski (1995). Indeed, as discussed in Kuhn and Stillman (2004), pensions were relatively generous in Russia in the 1990s.

women in nuclear contexts exiting the labour force to take care of a non-resident daughter's children, and women in the patrilocal context exiting due to transfers from their eldest son.

Having a male first born in a patrilocal context reduces subsequent childbearing, relieves the burden of ensuring old age security when a woman is younger, and shortens the period in which she will be the sole household female of working age. A woman's disadvantage in the patrilocal marriage contract compounds her initial disadvantage from having more siblings, on average, than do potential mates. The history of Former Soviet Union countries in the 20th century suggests both that coercive attempts to change household formation rules will not work, and that industrialisation may be one effective non-coercive means of reducing these disadvantages.

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Data Appendix A

This Data Appendix consists of country-specific summary statistics and country-specific regressions at the individual level. Table 6 shows that the fraction of sample women currently pregnant is unrelated to the sex of the first born child. Table 7 compares the mean number of children born, by the sex of the first born child. Table 8 compares the fraction of women currently working by the sex of the first born. Following these tables, the multivariate fertility and labour supply results are discussed in detail.

Fertility

There are large negative fertility impacts of bearing a male first child in a majority of morepatrilocal contexts, but none in the more nuclear. Table 9 shows these causal effects for an OLS specification in which the dependent variable is the total number of children born as of the interview.

In Albania, Armenia, Azerbaijan, and Turkey, where fractions of males amongst first borns are equal to the biological norm, the impacts are all large and statistically significant. Amongst these countries, the largest impact is found in Albania, where women aged 40-49 bear 0.38 less children on average because their first born child was male. In Bangladesh, India, Pakistan, and Albania, similarly large, negative and statistically significant impacts are found, and in Kazakhstan and Kyrgyzstan coefficients are also negative. These large effects could only be attributable to the incompleteness of fertility in the samples if male first borns reduced fertility until age 40 but increased it thereafter.

One potential reason why the effect of a male first born is not statistically significant in Kazakhstan or Kyrgyzstan is simply that these are small samples. As well, these samples were collected after a large post-Soviet outmigration and before a first national census had been undertaken. Also, women traditionally live with their last born son in these countries and in Uzbekistan.

Amongst the three countries with more nuclear household formation rules, fertility impacts of a male first born are never negative. In neither Moldova nor Ukraine is any impact found. In Russia, women with a male first born bear about 0.16 more children, an effect which is statistically significant at the 1% level. One potential explanation for the apparent preference for daughters in the Russia 1992 data is that young male conscripts had recently died at high rates in the 1979-1989 Soviet-Afghan conflict (Galeotti (1995)). Death rates of young Russian males from accidents and suicide

were also generally far higher than those of females.[21] These factors may have reduced the value of male children relative to female.

Where there are large measured impacts of the sex of the first born on subsequent fertility, they are not caused by the sometimes 'too high' observed fractions of boys amongst first borns. In India, Bangladesh, Pakistan and Tajikistan, there were slightly too many first born boys reported, and the measured effects of male first borns on subsequent fertility were very large. Earlier DHS samples and subsamples where the fraction of male first borns were biologically normal show that the measured effects are not attributable to selection bias. Amongst women aged 40-49 in the India 1999 DHS, the fraction of boys amongst first borns is normal for backwards castes who were not scheduled castes or scheduled tribes (0.525 with a standard error of 0.08). The coefficient on the same fertility regression run here is -0.314 for this group in 1999, with statistical significance at the 1% level. In the Bangladesh 2000 DHS, the fraction of male first borns amongst women 40-49 was 0.515 which, with a standard error of 0.01 is normal. Still, coefficients on the same regression as previously yield a coefficient for the a male first-born of -0.22, statistically significant at the 5% level. In Pakistan in 2006, amongst non-Urdu and non-Punjabi native speakers, the sex ratio is normal at 0.523 with standard error 0.03, but the coefficient on the fertility regression is -0.45 and statistically significant at the 1% level. In the Tajikistan 1999 sample, the sex ratio is also normal, but the coefficient on the same regression is -0.22. Although it is not statisticall significant at the 10% level, it is of the expected sign.[22]

India is the only country in our samples containing a significant Hindu population, and this population behaves similarly with respect to fertility to both non-Hindus within India, and to Christians and Muslims in other patrilocal contexts. In the 1999 DHS survey, the ratio of boys to girls amongst first borns is statistically 'too high' amongst both Hindus and non-Hindus, but actually higher for non-Hindus (0.5485 for non-Hindus with standard error of 0.008 versus 0.524 for Hindus with stan-

[21] In 1992, the mortality rate of females 15-19 was 71.8 per 100 000 versus 180 per 100 000 for males (Transmonee Database (2011)). About 80% of suicides in Russia between 1965 and 1999 were of males (Nemtsov (2003)).

[22] Similarly, in the Ukraine, the lack of observed fertility effects cannot be attributed to a too high fraction of boys amongst first borns. Amongst the 85% of the population that is Christian Orthodox, the sex ratio normal is at 0.53 with standard error 0.012. However, for this subsample there is no observed effect of the sex of the first born on subsequent fertility. The fertility regression yields a coefficient of -0.017 which is not statistically significant at the 5% level).

dard error of 0.004). Religion is not a key correlate of the observed surplus of male first borns in the 1999 DHS. In the 1999 data the association between the sex of the first born and subsequent fertility is strongly negative and statistically significant at the 10% level for both Hindus and non-Hindus. The ratio of boys to girls is normal for non-Hindus in the Indian 2006 data (0.5177 with a standard error of 0.007 in 2006), but a large negative statistically significant impact of the a first born male on subsequent fertility is still found. In 2006, non-Hindu Indian women aged 40-49 had 0.28 fewer children because their first born was male. Differences in attitudes towards neonatal sex selection between Hindus and other religious groups in India are not obvious in the DHS fertility data.

The finding that first born males are so important to subsequent fertility in Albania, Azerbaijan and Armenia is consistent with Hvistendahl (2011), who documents the contemporary practise of sex-selective abortion these countries and the current imbalance in under-5 sex ratios. While the fraction of male first borns in our samples is biologically normal for these three countries, this does not likely reflect a lack of latent son preference at the time of these women's first births. These women were, on average, aged 23, when they first gave birth. The youngest member of our most recently-collected sample is a 40 year old Albanian woman. Ultrasound was not available to pregnant women in communist Albania or the Soviet Union. On average, her first birth would have occurred in 1991, just as the Soviet Union and Albanian communism was collapsing. While she may have employed sex-selective abortion to control future fertility, access to contraceptives, sterilisation, and non-SIT means of fertility control can also account for her having fewer subsequent children if her first born was male. Indeed, when the Tajikistan sample is restricted to that taken at the end of the long and brutal Tajik Civil War, in 1999, the negative association between having a male first born and fertility is also apparent.[23] It seems most unlikely that any of these Tajik women would have had access to ultrasound before the end of the war. Even before the advent of SIT, household composition may have been endogenous to the demand for sons. The results of Filmer, Friedman, and Shady (2009) also suggest this to be true.

[23]The mean number of children born to women with male first borns is 6.08, versus 6.43 amongst women whose first born was female. Note, however, that the p-value of a t-test of equality of these means is P=0.17 for these 475 observations, so these differences are not statistically significant at the 5% level.

Female Labour Supply

The bearing of sons is part of the marriage contract in patrilocal but not in nuclear households. Table 10 examines the causal effect of having a male first born on the probability of a woman working outside the household. In Russia and Ukraine these effects are positive and of similar magnitudes, and in Moldova they are positive although not statistically significant at the 10% level. In these three countries, where there is a Soviet legacy of high female labour force participation, these middle-aged women are 2-3% more likely to work outside the home because their first born child was male.

Women become maternal grandmothers earlier when their first born is female, and so may give up work to help care for their daughter's children when they are younger. The time use survey collected concurrently with the Russia 1992 data shows that 14% of women 40-49 with female first borns spent at least one hour caring for other family members in the week prior to the survey, versus 9% of women with male first borns. This difference is statistically significant at the 5% level, and is consistent with both case studies of the role of maternal grandmothers in Russia in childcare and evidence from nationally-representative household surveys. Utrata (2008) and Clarke (2002) document the key importance of maternal grandmothers to the children of single women in Russia. Lokshin, Harris, and Popkin (2000) find that the fraction of single mothers living with their parents increased during the 1990s, with nationally-representative household survey data. Using a case-study approach, Callister, Getmanenko, Garvrish, Eugenevna, Vladimirova, Lassetter, and Turkina (2007) find that young women in Russia expect that their mothers will provide childcare while they work. Perelli-Harris (2007) (p. 1171) discusses the importance of grandparents for childcare in Ukraine, and the intergenerational flow of transfers from elderly parents to young adult children. It is also possible that the female labour supply responses are related to impacts of male first borns on men's wages and labour supply. For example, Rose and Lundberg (2002) show for the US that fatherhood increases men's wages and male first borns increase men's labour supply.

In the patrilocal context, the impact of a male first born on the probability of working outside the home is generally negative, although not always statistically significant. In Albania a woman aged 40-49 is about 5% less likely to work outside the home because her first born was male. Significant negative associations are also found in India (2%), Pakistan (8%), and Tajikistan (6%).

The nearest neighbour matching results of Table 11 show very similar signs and levels of signifi-

cance to both the OLS results of Table 9, and the probit results of Table 10.

Evidence from Integrated Public Use Microdata Series

Census samples from the Integrated Public Use Microdata Series (IPUMS) of the Minnesota Population Center (2010) provide further support for the main findings. These data do not contain full birth histories for women, but information on the composition of their households and total live births is known. For mothers aged 18-28 in Belarus, Kyrgyzstan, and Armenia, the impact of a male first born on two outcomes is investigated: Children born to date, and employment status. The results, presented in Table 12, show that Belarusians and ethnic Russians in Kyrgyzstan, both of whom tend to live in nuclear households, do not have fewer children at a given age if their first born was male. However, non-Russians in Kyrgyzstan and women in Armenia have 0.05-0.08 fewer children at a given age because their first born was male.[24] Labour supply impacts of male first borns are not statistically significant for any of the samples. If the previous findings for women 40-49 were primarily the result of intergenerational transfers amongst adult children, one would not expect to find effects when children are under 10.

[24]The sex of the first born is considered to be the oldest child under age 10 in the household. In the case that this child is not, in fact, a child of the woman or her oldest child, the coefficient γ will be biased towards zero. The accuracy of this proxy is checked by comparing the number of children under 10 in the household to the number of live births reported by the woman. This proxy is more accurate in the nuclear context, as shown in Panel C of Table 12. Thus γ should be more biased towards 0 in the patrilocal context than in the nuclear.

Table 1: Household Characteristics

	Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
Household Size	4.3065	4.2691	4.4452	5.7325	5.5912	4.7550	6.2456
	(0.032)	(0.035)	(0.035)	(0.061)	(0.020)	(0.082)	(0.053)
No. Kids Under Age 5	0.0830	0.1714	0.1222	0.4099	0.3674	0.2229	0.4180
	(0.007)	(0.011)	(0.009)	(0.014)	(0.005)	(0.021)	(0.017)
Daughter-in-Law of Hhld Head in House	0.0349	0.1058	0.0799	0.1622	0.1658	0.0422	0.1666
	(0.004)	(0.007)	(0.006)	(0.008)	(0.003)	(0.008)	(0.009)
Married Daughter of Hhld Head in House	0.0244	0.0155	0.0145	0.1588	0.0947	0.0175	0.0297
	(0.003)	(0.003)	(0.003)	(0.008)	(0.002)	(0.005)	(0.004)
No. of Observations	2211	1892	2088	2224	21062	407	1885

	Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
Household Size	3.6534	8.3179	3.3022	6.9170	4.9565	3.2727	6.2625
	(0.030)	(0.084)	(0.038)	(0.048)	(0.047)	(0.030)	(0.098)
No. Kids Under Age 5	0.1148	0.7574	0.0681	0.4700	0.2144	0.1032	0.4361
	(0.009)	(0.024)	(0.009)	(0.014)	(0.013)	(0.008)	(0.030)
Daughter-in-Law of Hhld Head in House	0.0205	0.1651	0.0234	0.2216	0.0831	0.0168	0.2064
	(0.003)	(0.008)	(0.005)	(0.008)	(0.006)	(0.003)	(0.015)
Married Daughter of Hhld Head in House	0.0539	0.0455	0.0385	0.0150	0.0166	0.0379	0.0120
	(0.005)	(0.004)	(0.006)	(0.002)	(0.003)	(0.004)	(0.004)
No. of Observations	1886	2420	910	3001	2263	1930	657

Notes: Standard errors in parentheses. Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan samples. Sample weights employed.

Table 2: Patrilocality Index Ranking

	Fraction married women,15-30, daughters-in-law of hhld head	Fraction of married women,15-30, who live with their father	Employment Rate of women, 15-49
Armenia, 2005	0.705	0.055	0.133
Tajikistan, 2003	0.672	0.026	0.467
Albania, 2008-09	0.635	0.026	0.211
Azerbaijan, 2006	0.577	0.040	0.114
Uzbekistan, 1996	0.530	0.015	0.443
Kyrgyzstan, 1997	0.457	0.088	0.434
Pakistan, 2006-07	0.379	0.062	0.247
Nepal, 2006	0.369	0.074	0.690
Swaziland, 2006-07	0.335	0.049	0.396
India, 2005-06	0.322	0.103	0.294
Kazakhstan , 1999	0.265	0.087	0.412
Turkey, 2003	0.245	0.030	0.270
Ukraine, 2007	0.191	0.237	0.640
Egypt, 2008	0.187	0.049	0.123
Bangladesh, 2007	0.176	0.126	0.265
Moldova, 2005	0.164	0.165	0.421
Niger, 2006	0.132	0.028	0.390
Zimbabwe, 2005-06	0.129	0.052	0.354
Russia, 1992	0.121	0.149	0.539
Philippines, 2008	0.120	0.144	0.393
Indonesia, 2007	0.108	0.212	0.452
Guinea, 2005	0.091	0.058	0.853
Kenya, 2008-09	0.082	0.019	0.601
Honduras, 2005	0.073	0.073	0.333
Jordan, 2007	0.070	0.050	0.115
Cambodia, 2005	0.069	0.198	0.592
Peru, 2004-08	0.066	0.138	0.598
Sierra Leone, 2008	0.064	0.085	0.765
Liberia, 2007	0.061	0.084	0.641
Benin, 2006	0.056	0.037	0.265
Colombia, 2005	0.051	0.096	0.438
Haiti, 2005-05	0.049	0.146	0.498
Madagascar, 2008-09	0.049	0.035	0.913
Congo (Brazzaville), 2005	0.046	0.045	0.664
Bolivia, 2008	0.043	0.066	0.607
Dominican Republic, 2007	0.041	0.117	0.352
Congo (Democratic Republic), 2007	0.041	0.055	0.732
Uganda, 2006	0.037	0.020	0.877
Namibia, 2006-07	0.036	0.049	0.445
Ethiopia, 2005	0.028	0.019	0.232
Nigeria, 2008	0.027	0.027	0.653
Ghana, 2008	0.025	0.061	0.870
Mali, 2006	0.023	0.029	0.626
Zambia, 2007	0.016	0.044	0.500
Rwanda, 2005	0.003	0.007	0.717

Sample weights employed where available. Bold font indicates that country belongs to estimation samples.

Table 3: (a) Respondent Characteristics

		Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
	First Born Boy	0.5080	0.5073	0.5200	0.5333	0.5248	0.4846	0.5422
		(0.011)	(0.011)	(0.011)	(0.011)	(0.003)	(0.025)	(0.011)
	P-value, |t|-test	0.705	0.681	0.465	0.044	0.000	0.269	0.009
High School Completed	First Born Boy	0.4187	0.5871	0.6163	0.0517	0.0680	0.8720	0.8787
		(0.015)	(0.016)	(0.015)	(0.007)	(0.002)	(0.025)	(0.010)
	First Born Girl	0.4138	0.5682	0.6338	0.0627	0.0715	0.8723	0.9038
		(0.015)	(0.016)	(0.015)	(0.007)	(0.003)	(0.022)	(0.010)
	P-value, |t|-test	0.851	0.522	0.512	0.277	0.395	0.994	0.081
Age Married	First Born Boy	21.998	21.146	21.897	14.427	17.128	21.311	20.101
		(0.108)	(0.125)	(0.125)	(0.072)	(0.036)	(0.256)	(2.650)
	First Born Girl	21.761	21.254	21.868	14.546	17.175	21.745	20.349
		(0.109)	(0.135)	(0.116)	(0.076)	(0.037)	(0.268)	(2.970)
	P-value, |t|-test	0.189	0.670	0.894	0.306	0.462	0.274	0.085
Age at First Birth	First Born Boy	23.872	22.959	23.950	18.154	20.202	23.419	20.925
		(0.106)	(0.133)	(0.132)	(0.106)	(0.038)	(0.304)	(0.239)
	First Born Girl	23.776	23.300	23.856	18.448	20.216	23.620	21.601
		(0.107)	(0.143)	(0.120)	(0.104)	(0.039)	(0.295)	(0.256)
	P-value, |t|-test	0.590	0.213	0.680	0.084	0.837	0.668	0.054
Time between Marriage, First Birth	First Born Boy	1.8734	1.8119	2.0363	3.7265	3.0739	1.9473	0.7596
		(0.060)	(0.060)	(0.060)	(0.087)	(0.026)	(0.148)	(0.226)
	First Born Girl	2.0152	1.9914	1.9846	3.9021	3.0415	1.6915	1.2235
		(0.058)	(0.067)	(0.050)	(0.089)	(0.026)	(0.117)	(0.236)
	P-value, |t|-test	0.149	0.134	0.604	0.222	0.504	0.180	0.156

Notes: Standard errors in parentheses. Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan samples. Sample weights employed.

(b) Respondent Characteristics

		Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
	First Born Boy	0.5281	0.5403	0.4868	0.5495	0.5187	0.5416	0.5349
		(0.011)	(0.010)	(0.017)	(0.009)	(0.011)	(0.011)	(0.019)
	P-value, |t|-test	0.163	0.005	0.129	0.000	0.521	0.009	0.240
High School Completed	First Born Boy	0.5369	0.0708	0.7607	0.8124	0.1384	0.6914	0.8320
		(0.016)	(0.007)	(0.020)	(0.010)	(0.010)	(0.014)	(0.020)
	First Born Girl	0.5243	0.0957	0.7281	0.8081	0.1367	0.6939	0.8448
		(0.017)	(0.009)	(0.021)	(0.011)	(0.010)	(0.015)	(0.021)
	P-value, |t|-test	0.613	0.069	0.259	0.792	0.924	0.916	0.700
Age Married	First Born Boy	20.788	18.622	22.211	19.633	19.247	20.885	19.702
		(0.109)	(0.115)	(0.200)	(0.057)	(0.119)	(0.105)	(0.160)
	First Born Girl	20.758	18.563	22.412	19.526	19.051	20.772	20.056
		(0.111)	(0.126)	(0.187)	(0.061)	(0.120)	(0.112)	(0.183)
	P-value, |t|-test	0.855	0.769	0.461	0.231	0.318	0.523	0.180
Age at First Birth	First Born Boy	22.659	21.786	23.316	22.211	21.559	22.941	21.730
		(0.115)	(0.124)	(0.197)	(0.090)	(0.128)	(0.115)	(0.167)
	First Born Girl	22.555	21.795	23.674	22.116	21.359	22.752	22.375
		(0.113)	(0.136)	(0.186)	(0.098)	(0.127)	(0.120)	(0.205)
	P-value, |t|-test	0.543	0.966	0.186	0.511	0.334	0.328	0.025
Time between Marriage, First Birth	First Born Boy	1.8642	3.1639	1.1628	2.5660	2.3118	2.0278	2.0279
		(0.081)	(0.073)	(0.131)	(0.082)	(0.061)	(0.079)	(0.094)
	First Born Girl	1.7744	3.2319	1.2212	2.5735	2.3074	1.9228	2.3194
		(0.078)	(0.086)	(0.122)	(0.089)	(0.062)	(0.077)	(0.144)
	P-value, |t|-test	0.450	0.592	0.744	0.957	0.964	0.428	0.122

Notes: Standard errors in parentheses. Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan samples. Sample weights employed.

Table 4: The Patrilocality Index and Fertility Impacts of Male First Borns

Dependent variable = 1 if negative fertility impact, 0 otherwise. Ordinary Least Squares (OLS) Regression			
	All samples	FSU countries	FSU no Russia
	(1)	(2)	(3)
Patrilocality Index	1.1010**	1.7586**	1.9353 **
	(0.499)	(0.355)	(0.360)
R^2	0.19	0.64	0.64
No. obs.	14	9	8

Notes: The dependent variable takes the value 1 if the country level regression indicates a negative impact, statistically significant at the 10% level, of a male first born on the total number of children born to a woman 40-49. In the case of no negative and statistically significant impact it takes the value 0. Robust standard errors in parentheses. ** significant at 5% level, * significant at 10% level.

Table 5: The Patrilocality Index and Labour Supply Impacts of Male First Borns

Dependent variable = 1 if negative labour supply impact, 0 otherwise. Ordinary Least Squares (OLS) Regression			
	All samples	FSU countries	FSU no Russia
	(1)	(2)	(3)
Patrilocality Index	.8284	.6364	.7100
	(0.560)	(0.591)	(0.670)
R^2	0.13	0.19	0.18
No. obs.	14	9	8

Notes: The dependent variable takes the value 1 if the country level regression indicates a negative impact, statistically significant at the 10% level, of a male first born on the labour supply of a woman 40-49. In the case of no negative and statistically significant impact it takes the value 0. Robust standard errors in parentheses. ** significant at 5% level, * significant at 10% level.

Data Appendix A

Table 6: Fraction Pregnant at the Time of Interview

	Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
First Born Boy	0.0002	0.0000	0.0007	0.0021	0.0017	0.0000	0.0000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
First Born Girl	0.0008	0.0027	0.0001	0.0056	0.0025	0.0000	0.0000
	(0.001)	(0.002)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
P-value, |t|-test	0.386	0.162	0.409	0.246	0.382		0.355

	Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
First Born Boy	0.0012	0.0106	0.0023	0.0081	0.0033	0.0014	0.0065
	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.004)
First Born Girl	0.0000	0.0145	0.0021	0.0082	0.0000	0.0000	0.0000
	(0.000)	(0.004)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
P-value, |t|-test		0.391	0.970	0.990		0.171	0.220

Notes: Standard errors in parentheses. Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan samples. Sample weights employed.

Table 7: Summary Statistics: Total Number of Kids

	Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
First Born Boy	2.7269	2.5990	2.8796	4.6234	3.9823	4.0148	4.7916
	(0.035)	(0.032)	(0.040)	(0.062)	(0.020)	(0.140)	(0.069)
First Born Girl	3.1100	2.8107	3.1107	4.7785	4.3033	4.2395	4.8111
	(0.039)	(0.036)	(0.041)	(0.063)	(0.021)	(0.144)	(0.075)
P-value, |t|-test	0.000	0.000	0.000	0.080	0.000	0.265	0.848

	Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
First Born Boy	2.3964	6.1742	2.0181	5.1734	3.6167	1.8051	4.9261
	(0.034)	(0.074)	(0.039)	(0.058)	(0.062)	(0.027)	(0.115)
First Born Girl	2.4664	6.4046	1.8522	5.4432	3.8419	1.7792	4.8961
	(0.037)	(0.080)	(0.038)	(0.064)	(0.070)	(0.027)	(0.125)
P-value, |t|-test	0.165	0.035	0.002	0.002	0.016	0.500	0.860

Notes: Standard errors in parentheses. Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan samples. Sample weights employed.

Table 8: Summary Statistics: Currently Working

	Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
First Born Boy	0.3890	0.3897	0.3431	0.3381	0.4283	0.5448	0.5998
	(0.015)	(0.016)	(0.014)	(0.014)	(0.005)	(0.030)	(0.015)
First Born Girl	0.4360	0.4131	0.3096	0.3577	0.4408	0.5177	0.6234
	(0.015)	(0.016)	(0.015)	(0.015)	(0.005)	(0.027)	(0.017)
P-value, |t|-test	0.025	0.299	0.103	0.333	0.067	0.504	0.295

	Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
First Born Boy	0.7209	0.2603	0.9278	0.4978	0.2654	0.8562	0.6142
	(0.014)	(0.012)	(0.012)	(0.012)	(0.013)	(0.011)	(0.025)
First Born Girl	0.6946	0.3407	0.8908	0.5627	0.2936	0.8257	0.6633
	(0.015)	(0.014)	(0.014)	(0.013)	(0.014)	(0.013)	(0.025)
P-value, |t|-test	0.210	0.000	0.053	0.000	0.135	0.067	0.167

Notes: Standard errors in parentheses. Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan samples. Sample weights employed.

Table 9: The effect of a male first born on live births by interview date (OLS)

Dependent variable: Live births to date

	Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
First Born Boy	-0.3735 ***	-0.2085 ***	-0.2504 ***	-0.1822 *	-0.3368 ***	-0.2684	-0.0793
	(0.058)	(0.060)	(0.064)	(0.096)	(0.034)	(0.208)	(0.094)
Age	0.0566 ***	0.0147	0.0708 ***	0.1070 ***	0.0466 ***	0.1315 ***	0.0795 ***
	(0.010)	(0.010)	(0.012)	(0.016)	(0.006)	(0.037)	(0.017)
R^2	0.2159	0.1001	0.1770	0.1226	0.2664	0.2607	0.1657
No. of Observations	2211	1892	2088	2224	21062	407	1885

	Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
First Born Boy	-0.0508	-0.3173 ***	0.1641 ***	-0.2250 ***	-0.2406 ***	0.0171	0.1139
	(0.051)	(0.122)	(0.053)	(0.087)	(0.082)	(0.040)	(0.170)
Age	0.0149 *	0.1141 ***	-0.0059	0.1179 ***	0.0599 ***	0.0290 ***	0.0634 **
	(0.009)	(0.021)	(0.010)	(0.016)	(0.015)	(0.007)	(0.030)
R^2	0.1292	0.1129	0.1249	0.2451	0.3116	0.1004	0.2162
No. of Observations	1886	2420	910	3001	2263	1930	657

Notes: Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan statistics. * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors in parentheses. Sample weights employed.

Table 10: The effect of a male first born on working outside the home

Dependent variable: works outside the home currently

	Albania 2008	Armenia 2005	Azerbaijan 2006	Bangladesh 2007	India 2006	Kazakhstan 1999	Kyrgyzstan Republic 1996,1997,1998
First Born Boy	-0.0474 *	-0.0153	0.0345	-0.0240	-0.0186 **	-0.0130	-0.0095
	(0.027)	(0.031)	(0.026)	(0.024)	(0.009)	(0.057)	(0.023)
Age	-0.0003	0.0021	0.0092 *	-0.0040	-0.0092 ***	0.0030	-0.0037
	(0.005)	(0.006)	(0.005)	(0.004)	(0.002)	(0.010)	(0.004)
Pseudo-R^2	0.0835	0.0868	0.0480	0.0401	0.0785	0.0510	0.0257
Actual P-value	0.4121	0.4013	0.3270	0.3473	0.4342	0.4695	0.6106
No. of Observations	2211	1892	2088	2224	21062	407	1885

	Moldova 2005	Pakistan 2006	Russia 1992	Tajikistan 1999,2003,2007	Turkey 2003	Ukraine 2007	Uzbekistan 1996
First Born Boy	0.0219	-0.0800 ***	0.0316 *	-0.0647 ***	-0.0307	0.0339 **	-0.0509
	(0.023)	(0.022)	(0.019)	(0.020)	(0.023)	(0.017)	(0.044)
Age	0.0017	-0.0019	0.0049	-0.0055	-0.0081	-0.0036	-0.0263 ***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.008)
Pseudo-R^2	0.0203	0.0516	0.0625	0.0166	0.0669	0.1020	0.0754
Actual P-value	0.7085	0.2973	0.9022	0.5270	0.2790	0.8422	0.6160
No. of Observations	1886	2420	849	3001	2263	1930	657

Notes: Ethnic Russians excluded from Kyrgyzstan Republic, Kazakhstan, and Uzbekistan statistics. Observations dropped due to no variation in outcomes within region: 61 for Russia. * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level. Robust standard errors in parentheses. Sample weights employed.

Table 11: Sensitivity Analysis. Nearest neighbour matching estimates of the impacts of male first borns, women 40-49

	Panel A: Dep. var is number of live births						
	Albania 2008	**Armenia 2005**	**Azerbaijan 2006**	**Bangladesh 2007**	**India 2006**	**Kazakhstan 1999**	**Kyrgyzstan 1996 1997, 1998**
ATT	-0.3510 **	-0.2015 **	-0.1992 **	-0.1966 **	-0.3371 **	-0.2570 **	-0.0814
	(0.054)	(0.063)	(0.064)	(0.094)	(0.034)	(0.162)	(0.107)
	Moldova 2005	**Pakistan 2006**	**Russia 1992**	**Tajikistan 1999 2003, 2007**	**Turkey 2003**	**Ukraine 2007**	**Uzbekistan 1996**
ATT	-0.0933	-0.3850 **	0.1548 **	-0.2642 **	-0.2164 **	0.0457	0.0219
	(0.063)	(0.118)	(0.062)	(0.084)	(0.081)	(0.040)	(0.154)
	Panel B: Dep. var is works outside of household						
	Albania 2008	**Armenia 2005**	**Azerbaijan 2006**	**Bangladesh 2007**	**India 2006**	Kazakhstan **1999**	**Kyrgyzstan 1996 1997, 1998**
ATT	-0.0410 *	-0.0148	0.0325	-0.0291	-0.0130 *	0.0145	0.0003
	(0.023)	(0.027)	(0.024)	(0.024)	(0.008)	(0.047)	(0.024)
	Moldova 2005	**Pakistan 2006**	**Russia 1992**	**Tajikistan 1999 2003, 2007**	**Turkey 2003**	**Ukraine 2007**	**Uzbekistan 1996**
ATT	0.0123	-0.0807 **	0.0258	-0.0614 **	-0.0325	0.0257	-0.0608 *
	(0.023)	(0.021)	(0.023)	(0.020)	(0.021)	(0.017)	(0.035)

Notes: Data are identical to those employed in Tables 2, 3, and 4. Nearest neighbour matching with 3 neighbours, and robust standard errors with 3 draws. The average effect of treatment on the treated (ATT) is calculated, with standard errors in parenthesis.

Table 12: Evidence from census data microsamples from the Former Soviet Union, mothers aged 18-28

Census:	Armenia	Kyrgyzstan		Belarus
Year:	2001	1999		1999
		Non-Russian	Ethnic Russian	
Panel A: OLS: Dep. var is number of live births				
First born boy	-0.0780**	-0.0571**	0.0021	-0.0018
	(0.013)	(0.011)	(0.021)	(0.005)
age	0.1177**	0.1605**	0.0566**	0.0509**
	(0.003)	(0.002)	(0.004)	(0.001)
completed highschool	-0.2901**	-0.1160**	-0.1453**	-0.0762**
	(0.025)	(0.018)	(0.036)	(0.007)
R^2	0.21	0.22	0.09	0.13
F-stat	86.63	296.56	15.04	257.17
No. obs.	9988	18509	2299	31201
Panel B: Probit (MFX at X): Dep. var is works outside of household				
first born boy	-0.0086	-0.0067	0.0169	0.0001
	(0.008)	(0.006)	(0.020)	(0.005)
age	0.0226**	0.0182**	0.0370**	0.0491**
	(0.002)	(0.001)	(0.004)	(0.001)
completed highschool	0.0394**	0.0605**	-0.0148	0.0105
	(0.013)	(0.010)	(0.028)	(0.006)
pseudo-R^2	0.22	0.22	0.05	0.06
F-stat	92.90	340.42	9.08	149.97
No. obs.	9988	18509	2299	31201
Panel C: Household composition means				
Mean hhld size	5.484	5.852	4.164	3.812
	(0.014)	(0.020)	(0.032)	(0.007)
Pr. spouse of head or head	0.2649	0.5210	0.5546	0.6712
	(0.004)	(0.004)	(0.010)	(0.003)
Pr. children born matches children <10 in hhld	0.9000	0.7296	0.9108	0.9613
	(0.003)	(0.003)	(0.006)	(0.001)
Pr. first born boy	0.5165	0.5165	.5337	0.5140
	(0.005)	(0.004)	(0.010)	(0.003)
P=0.512	0.37	0.23	0.04	0.50

Notes: Sample includes women aged 18-28 who have had a live birth. Robust standard errors in parentheses. Region, urban-rural dummies, and a full set of interaction terms are included in all specifications. Estimation employs IPUMS data samples, with sample weights. These data were collected by the National Statistical Service of the Republic of Armenia, Ministry of Statistics and Analysis of the Republic of Belarus, and the National Statistical Committee of the Kyrgyz Republic, respectively. All samples constitute 10% of census-enumerated households.