Birth Spacing in the Presence of Son Preference and Sex-Selective Abortions: India's Experience over Four Decades

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Abstract

Strong son preference is typically associated with shorter birth spacing in the absence of sons, but access to sex selection has the potential to reverse this pattern because each abortion extends spacing by six to twelve months. I introduce an empirical method that simultaneously accounts for how sex selection increases both birth spacing and the likelihood of a son. Using the four rounds of India's National Family and Health Surveys, I show that birth intervals increased substantially over the last four decades, with the most significant increase among women most likely to use sex selection. Specifically, well-educated women with no boys now have significantly longer birth intervals, and more male-biased sex ratios, than similar women with boys. Women with no education still follow the standard pattern of short average spacing when they have girls and little evidence of sex selection, with medium-educated women showing mixed results. Furthermore, the traditional pattern of longer average spacing with sons appears to arise not from fewer very short birth intervals, but rather from the upper end of the distribution. Finally, northern and western India are responsible for most of the spacing pattern reversal, although even the south experienced substantially increased intervals from sex selection.

JEL: J1, O12, I1 Keywords: India, prenatal sex determination, censoring, competing risk, non-proportional hazard

1 Introduction

Birth spacing has long served as a measure of son preference, with strong son preference typically associated with shorter birth intervals the fewer sons a family has (Ben-Porath and Welch, 1976; Leung, 1988). However, the introduction of prenatal sex determination has the potential to change the relationship between son preference and birth spacing. The stronger the son preference, the more likely couples are to resort to sex-selective abortions, and each abortion automatically increases the interval between births by six months to a year.[1] Longer birth intervals in the absence of sons, which previously would be taken to indicate a lower son preference, now may arise precisely because a sufficiently strong son preference makes couples use sex selection.

In this paper, I examine how birth spacing in India has changed over time and across groups with the introduction of sex selection. I introduce and apply an empirical method that directly incorporates the effects of sex-selective abortions on the duration between births *and* the likelihood of a son. The method can be used to analyze both situations with and without prenatal sex selection. I apply the method to birth histories of Hindu women, using data from the four India's National Family and Health Surveys (NFHS), covering the period 1972 to 2016.

India is a particularly compelling case since it has a long history of male preference, especially in the northern states (Kishor, 1993; Murthi, Guio and Dreze, 1995; Arnold, Choe and Roy, 1998). A significant proportion of Indian families exhibit differential stopping behavior, where, for a given number of children, they are more likely to have an additional child if they have not yet reached their preferred number of sons (Repetto, 1972; Das, 1987; Arnold, 1997; Arnold et al., 1998; Clark, 2000; Basu and De Jong, 2010; Barcellos, Carvalho

[1] The increase consists of three parts. First, starting from the time of the abortion, the uterus needs at least two menstrual cycles to recover; otherwise, the likelihood of spontaneous abortion increases substantially (Zhou, Olsen, Nielsen and Sabroe, 2000). The second part is the waiting time to conception, which is between one and six months (Wang, Chen, Wang, Chen, Guang and French, 2003). Finally, sex determination tests are reliable only from three months of gestation onwards.

and Lleras-Muney, 2014).[2] Moreover, mortality risk is higher for females than males for most ages groups, and there has been an almost continuous increase in India's overall ratio of males to females over the last century (Dyson, 2001; Navaneetham and Dharmalingam, 2011; Bongaarts and Guilmoto, 2015).

Over the last three decades, India has seen dramatic increases in the males-to-females ratio at birth as access to prenatal sex determination expanded (Das Gupta and Bhat, 1997; Sudha and Rajan, 1999; Arnold, Kishor and Roy, 2002; Retherford and Roy, 2003; Jha, Kumar, Vasa, Dhingra, Thiruchelvam and Moineddin, 2006; Guilmoto, 2012; Pörtner, 2015). Simultaneously, fertility has declined substantially, to the point where it is now at, or even below, replacement in some areas (Guilmoto and Rajan, 2013; Dharmalingam, Rajan and Morgan, 2014; International Institute for Population Sciences (IIPS) and ICF, 2017). This decline in fertility, combined with a continued strong preference for sons, has intensified the pressure to use sex selection (Das Gupta and Bhat, 1997; Guilmoto, 2009; Bongaarts, 2013; Jayachandran, 2017).[3] The strongest predictor of the use of sex selection is the sex composition of previous children; for families without a son, the higher the parity, the higher is the probability of having a son as the next birth (Retherford and Roy, 2003; Jha et al., 2006; Abrevaya, 2009; Pörtner, 2015). The use of sex selection also increases with socioeconomic status, especially education, and is more prevalent in cities than in rural areas, both possibly because of lower desired fertility (Retherford and Roy, 2003; Jha et al., 2006; Pörtner, 2015).

There are four main reasons for examining birth spacing and how it changes with access to sex selection. First, researchers have made extensive use of birth spacing as a measure of son preference, and it is critical to understand to what extent spacing is still useful as a measure of son preference. In India, the sex of the last-born child has in the past significantly affected the duration to next birth, with the expected birth interval about three

[2] Other countries show a similar pattern (see, for example, Larsen, Chung and Das Gupta, 1998; Filmer, Friedman and Schady, 2009; Altindag, 2016).

[3] In some instances, however, the fertility decline appears to have created a stronger aversion to daughters rather than a stronger preference for son (Diamond-Smith, Luke and McGarvey, 2008).

percent longer if the last-born was a son than if it was a daughter (Bhalotra and van Soest, 2008; Kumar, 2016). Ethnic Indians in South Africa also show a longer duration after the birth of a son than after a daughter (Gangadharan and Maitra, 2003).[4] In both Bangladesh and Vietnam, the more boys a family has the longer is the expected duration to the next birth (Haughton and Haughton, 1995, 1996; Rahman and DaVanzo, 1993; van Soest and Saha, 2018). Outside Asia, the evidence is more mixed. North Africa shows shorter spacing in the absence of sons, while a similar pattern does not exist in Sub-Saharan Africa (Rossi and Rouanet, 2015).[5]

Second, birth spacing can have a substantial impact on children's outcomes. Most of the research finds a negative impact of short spacing on child health—especially for very short intervals of 18 months or less—although identifying the causal mechanisms have proven more difficult (Conde-Agudelo, Rosas-Bermúdez and Kafury-Goeta, 2006; Conde-Agudelo, Rosas-Bermudez, Castaño and Norton, 2012). There are three pathways through which birth intervals can affect health. First, there is maternal depletion, where the mother does not have sufficient time to recover after her last pregnancy before she becomes pregnant again.[6] Second, disease transmission either from mother to child or between children. Third, sibling competition, where siblings close in age compete for scarce resources and parental care. Which mechanism dominates is of particular interest when son preference drives spacing decisions. Both the maternal depletion and the transmission of disease explanations predominately affect the subsequent child and the mother. Only sibling competition has the potential to affect the older child negatively.

In India, there is evidence that both the prior and the subsequent child have worse health outcomes and a higher likelihood of dying the shorter the interval between them, although the effects are not symmetrical (Whitworth and Stephenson, 2002; Bhargava, 2003;

[4]Ethnic Indians in Malaysia do, however, show little evidence of son preference, although the sample sizes are small (Pong, 1994).

[5]A possible exception is Senegal, where women with a higher risk of widowhood show shorter birth spacing until they have secured a son (Lambert and Rossi, 2016).

[6]This depletion can take the form of nutrition, folate, or cervical insufficiencies.

Rutstein, 2005; Maitra and Pal, 2008; Makepeace and Pal, 2008; Ghosh and Kochar, 2018).[7] The increased mortality risk for prior children may come from shorter breastfeeding of girls to ensure that the mother can conceive again sooner, and with poor water quality this shorter breastfeeding may result both in higher risk of dying and shorter stature if the child survives (Jayachandran and Kuziemko, 2011; Jayachandran and Pande, 2017). In other countries, focus has been mostly on the subsequent birth, but there is evidence in countries as diverse as Bangladesh, Brazil, El Salvadore, and Pakistan that short intervals between births have adverse health effects (Cleland and Sathar, 1984; Curtis, Diamond and McDonald, 1993; Davanzo, Hale, Razzaque and Rahman, 2008; Gribble, Murray and Menotti, 2009; Saha and van Soest, 2013).

The potential effects of spacing are not restricted to early outcomes, although there is less evidence on longer-term effects and most comes from Western countries. In the US, for example, a longer interval between births increases the older sibling's test scores on the Peabody Individual Achievement Test, although there is no statistically significant effect on the younger sibling (Buckles and Munnich, 2012). In line with this, close spacing appears to increase the risk of dropping out of high school and lower the probability of attending a post-secondary school in both the US and Sweden (Powell and Steelman, 1993; Pettersson-Lidbom and Thoursie, 2009). These results are, however, not uniformly supported, with recent results from Sweden showing no relationship between birth spacing, even if very short, and outcomes such as years of education completed, earnings, and unemployment (Barclay and Kolk, 2017).

Third, the mother may also be affected by the length of the birth intervals. The effect of spacing on mothers have received less attention than the effect on children, and reviews of the literature show mixed results on mother's anthropometric status (Dewey and Cohen, 2007; Conde-Agudelo et al., 2012). For India, there is, however, evidence that women with first-born girls are both more likely to have short birth spacing and more likely to

[7] Bhalotra and van Soest (2008), however, find that birth spacing only explains a limited amount of neonatal mortality.

have anemia, possibly as the result of the short spacing resulting in maternal depletion (Milazzo, 2018). In Western countries, having a longer interval between births appear to have positive effects on long-term labor market outcomes, such as participation and income (Gough, 2017; Karimi, 2014).

Finally, we know less about what determines spacing behavior in developing countries than in developed countries, and with declining fertility and increasing numbers of women entering the labor force in developing countries, understanding how couples make timing decisions will be necessary for the design of suitable policies (Pörtner, 2018).[8] For example, the evidence on the effects of education and socio-economic status on birth intervals is mixed, with some research showing either a positive association, no association, or one that is changing over time (Tulasidhar, 1993; Whitworth and Stephenson, 2002; Bhalotra and van Soest, 2008; Kim, 2010; van Soest and Saha, 2018).

Even the effects of access to contraceptive and declining fertility on spacing are unclear. On the one hand, access to contraceptives allows women to avoid too short spacing between birth, which would increase birth spacing. On the other hand, increased reliability of access and effectiveness of contraceptives can lead to shorter intervals between births (Keyfitz, 1971; Heckman and Willis, 1976). With less reliable contraception parents choose a higher level of contraception, which results in longer spacing, to avoid having too many children by accident. However, as contraception becomes more effective parents can more easily avoid future births, allowing them to reduce the spacing between births without having to worry about overshooting their preferred number of children. These two counteracting effects may explain why better-educated women have shorter spacing than less educated women in some instances but not in others and why finding statistically significant effects of contraception use on birth spacing is difficult (Yeakey, Muntifering, Ramachandran, Myint, Creanga and Tsui, 2009).[9]

[8] It is clear that birth spacing does respond to policies in both developed and developing countries (Pettersson-Lidbom and Thoursie, 2009; Todd, Winters and Stecklov, 2012; Meckel, 2015; Ghosh and Kochar, 2018).

[9] There is evidence in Matlab that the effect of son preference on birth spacing is stronger in areas with

Despite the increasing use of sex selection, the critical impacts of spacing on outcomes for both mother and children, and the extensive use of spacing to measure son preference in the literature, there has so far been no examination of what effect access to sex selection has had on spacing. The overall hypothesis is that spacing patterns significantly changed as prenatal sex determination became available. Specifically, I address three questions.

First, how did average birth intervals change over time for different groups and how are those changes related to the likely use of sex selection? The underlying hypothesis is that in the absence of sex selection son preference leads to shorter spacing the fewer boys a family has for a given parity, whereas son preference increases the spacing the fewer boys a family has when prenatal sex selection is available. I still expect parents to *try* to conceive earlier after the birth of a girl than after a boy, but the abortions will increase the duration between births, and may even lead to longer average spacing after the birth of girls than after boys. Families with son preference who—for one reason or another—do not use prenatal sex selection may continue to have shorter birth spacing. Based on the prior literature on sex selection, I focus on how birth intervals have changed for different education levels, urban or rural, and the sex composition of prior children.

Second, have the shapes of the survival curves changed? Very short birth intervals are, as mentioned, associated with worse health outcomes and increased mortality risk (Conde-Agudelo et al., 2012). Hence, understanding how the distribution of birth intervals changes can help us understand to what extent we can expect improvements in health outcomes. We should, for example, expect different impacts on the distribution of birth intervals depending on whether parents change their spacing behavior based on an increasing concern for child health or from a strong son preference leading to continued pregnancies until they conceive a son.

Finally, how are the changes in birth intervals with increasing access to sex selection

better access to family planning (Rahman and DaVanzo, 1993). Other evidence, however, points to families ability to time birth, even in the absence of modern contraceptives (Jayachandran and Kuziemko, 2011; Alam and Pörtner, 2018).

distributed geographically? Given the size and cultural differences within India, it is unlikely that the increasing access to sex selection will have had the same effects throughout (Retherford and Roy, 2003). I, therefore, examine how birth intervals have changed across four regions.

Direct information on the use of sex selection is not available, but it is possible to compare different periods as a proxy since there have been substantial changes in access and legality of prenatal sex determination in India. Abortion has been legal in India since 1971 and still is. The first reports of sex determination appeared around 1982–83 (Sudha and Rajan, 1999; Bhat, 2006; Grover and Vijayvergiya, 2006). The number of clinics quickly increased, and knowledge about sex selection became widespread after a senior government official's wife aborted a fetus that turned out to be male (Sudha and Rajan, 1999, p. 598). In 1994, the Central Government passed the Prenatal Diagnostic Techniques (PNDT) Act, making determining and communicating the sex of a fetus illegal.[10]

Based on these developments, I split the four decades into four periods. The first period covers until prenatal sex determination became widely available, 1972–1984. The second period saw (mostly) unrestricted access to sex selection, 1985–1994. Although, as reviewed above, there is evidence that there has been a substantial increase in the use of sex selection, some researchers argue that we might be close to or have already passed a turning-point in the use of sex selection (Das Gupta, Chung and Shuzhuo, 2009; Diamond-Smith and Bishai, 2015). I, therefore, split the period from the implementation of the PNDT Act until the last survey into two, 1995–2004, and 2005–2016.

There are four main results. First, there has been a general increase in the intervals between births for all education groups over the four decades covered by the data. These increases are larger the higher the parity and the higher the education level. Second, those women who are most likely to use sex selection, well-educated women with no sons, have

[10]Details about the act are at http://pndt.gov.in/. The number of convictions has been low. It took until January 2008 for the first state, Haryana, to reach five convictions. Hence, private clinics operate with little risk of legal action (Sudha and Rajan, 1999). Furthermore, there is little evidence that bans like this significantly affect sex ratios (Das Gupta, 2016).

seen the largest increases in birth intervals. As a result, we now have a complete reversal of the traditional spacing pattern for well-educated women, and instead, observe the longest birth intervals for women with no sons. Third, women who are least likely to use sex selection, those with no education in rural areas, still follow the standard pattern of short spacing when they have girls and little evidence of the use of sex selection. In other words, these women adhere to a strategy where they achieve a son through higher fertility rather than the use of sex selection. Fourth, the traditional pattern of longer average spacing when women have one or more sons appear to arise from more very long intervals, rather than from fewer very short birth intervals; across education groups there appear to be little difference in the likelihood of having a very short birth interval across sex compositions, especially for lower parities.

2 Estimation Strategy

The standard approach in the birth spacing literature is to use proportional hazard models with a single exit, the birth of a child. There are two problems with the standard approach in this setting. First, and most importantly, the introduction of sex selection means that the sex of the next child is no longer necessarily random and that parents' choices will impact the spacing to the birth of a girl or a boy differently. I, therefore, use a competing risk set-up, which can capture both the non-randomness of the birth outcome and the differential spacing to the birth of a girl or a boy. To my knowledge, this is the first application of competing risk models to birth spacing.[11]

Second, it is unlikely—even in the absence of prenatal sex determination—that characteristics, such as the sex composition of previous births, have the same effects throughout the entire spell as is assumed by the proportional hazard model. Assuming that the effect of sex composition is the same throughout a spell is especially problematic for higher-

[11] Merli and Raftery (2000) used a discrete hazard model to examine whether there were under-reporting of births in rural China, although they estimated separate waiting time regressions for boys and girls.

order spells where different sex composition of previous births can lead to substantial differences both in the likelihood of progressing to the next birth and how soon couples want their next child if they are going to have one. The introduction of prenatal sex determination exacerbates any bias from the proportionality assumption since sex-selective abortion use varies across groups, which affects birth spacing, and because a household's use of sex selection may vary within a spell, which means that the effects of covariates vary within the spell as well. I, therefore, use a non-proportional hazard specification, which allows the shape of the hazard functions to vary across groups. The use of a non-proportional specification also mitigates any potential effects of unobserved heterogeneity when used in conjunction with a flexible baseline hazard (Dolton and von der Klaauw, 1995).

The model is a discrete time, non-proportional, competing risk hazard model with two exit states: either a boy or a girl is born. The unit of analysis is a spell, the period from nine months after one birth to the next. For each woman, $i = 1, \dots, n$, the starting point for a spell is time $t = 1$, and the spell continues until time t_i, when either a birth occurs or the spell is censored.[12] There are two exit states: the birth of a boy, $j = 1$, or the birth of a girl, $j = 2$, and J_i is a random variable indicating which event took place. The discrete time hazard rate h_{ijt} is

$$h_{ijt} = \frac{\exp(D_j(t) + \alpha'_{jt}\mathbf{Z}_{it} + \beta'_j\mathbf{X}_i)}{1 + \sum_{l=1}^{2} \exp(D_j(t) + \alpha'_{lt}\mathbf{Z}_{it} + \beta'_l\mathbf{X}_i)} \quad j = 1, 2 \tag{1}$$

where the explanatory variable vectors, $\mathbf{Z}_{it}$ and $\mathbf{X}_i$, capture individual, household, and community characteristics discussed below, and $D_j(t)$ is the piece-wise linear baseline hazard for outcome j, captured by dummies and the associated coefficients,

$$D_j(t) = \gamma_{j1}D_1 + \gamma_{j2}D_2 + \dots + \gamma_{jT}D_T, \tag{2}$$

with $D_m = 1$ if $t = m$ and zero otherwise. This approach to modeling the baseline hazard

[12] The time of censoring is assumed independent of the hazard rate, as is standard in the literature.

is flexible and does not place overly strong restrictions on the baseline hazard.

The explanatory variables in $\mathbf{Z}$, and the interactions between them, constitute the non-proportional part of the model, which means that they are interacted with the baseline hazard:

$$\mathbf{Z}_{it} = D_j(t) \times (\mathbf{Z}_1 + Z_2 + \mathbf{Z}_1 \times Z_2), \tag{3}$$

where $D_j(t)$ is the piece-wise linear baseline hazard, $\mathbf{Z}_1$ captures sex composition of previous children, if any, and Z_2 captures area of residence. The remaining explanatory variables, $\mathbf{X}$, enter proportionally, but to further minimize any potential bias from assuming proportionality, estimations are done separately for different levels of mothers' education and different periods.[13]

Equation (1) is equivalent to the logistic hazard model and has the same likelihood function as the multinomial logit model (Allison, 1982; Jenkins, 1995). Hence, transforming the data, so each observation is an interval—here equal to three months—the model can be estimated using a standard multinomial logit model.[14] In the reorganized data the outcome variable is 0 if the woman does not have a child in a given interval (the base outcome), 1 if she gives birth to a son in that interval, and 2 if she gives birth to a daughter in that interval.

The distribution of spacing is captured by the survival curve, which shows the probability of not having had a birth yet by spell duration, for a given set of explanatory variables. The survival curve at time t is

$$S_t = \prod_{d=1}^{t} \left(\frac{1}{1 + \sum_{l=2}^{2} \exp(D_j(t) + \alpha'_{ld}\mathbf{Z}_{kd} + \beta'_l \mathbf{X}_k)} \right). \tag{4}$$

[13] I discuss the choice of which variables to use for non-proportionality in more detail in the "Explanatory Variables" section.

[14] The multinomial model assumes that alternative exit states are stochastically independent (Independence of Irrelevant Alternatives or IIA), which rules out any individual-specific unmeasured or unobservable factors that affect both the hazard of having a girl and the hazard of having a boy. I, therefore, include a proxy for fecundity discussed in Section 3. Also, the multivariate probit model can be used as an alternative because the IIA is not imposed (Han and Hausman, 1990). The results are substantially identical between these two models and available upon request.

Because the probability of ever having a next birth varies across groups, a direct comparison of standard survival curves tells us little about how the spread of sex selection affects birth spacing across groups. I, therefore, condition on the predicted likelihood of parity progression when examining birth spacing measures, such as the average duration to a birth. The reliability of this approach depends on whether the spell length covered is sufficiently long that few women are likely to give birth after the spell cut-off. I discuss the choice of spell length below.[15] In addition, I present graphs of survival curves conditional on parity progression, which therefore begin at 100% and end at 0%.

Interpretation of the model coefficients is challenging (Thomas, 1996). It is, however, possible to calculate the predicted probabilities of having a boy, b, and of having a girl, g, in period t, conditional on a set of explanatory variables and not having had a child before that period, as

$$P(b_t|\mathbf{X}_k, \mathbf{Z}_{kt}, t) = \frac{\exp(D_j(t) + \alpha'_{1t}\mathbf{Z}_{kt} + \beta'_1\mathbf{X}_k)}{1 + \sum_{l=1}^{2} \exp(D_j(t) + \alpha'_{lt}\mathbf{Z}_{kt} + \beta'_l\mathbf{X}_k)} \tag{5}$$

$$P(g_t|\mathbf{X}_k, \mathbf{Z}_{kt}, t) = \frac{\exp(D_j(t) + \alpha'_{2t}\mathbf{Z}_{kt} + \beta'_2\mathbf{X}_k)}{1 + \sum_{l=2}^{2} \exp(D_j(t) + \alpha'_{lt}\mathbf{Z}_{kt} + \beta'_l\mathbf{X}_k)} \tag{6}$$

It is then straightforward to calculate the estimated percentage of children born that are boys, $\hat{Y}$, at each t:

$$\hat{Y}_t = \frac{P(b_t|\mathbf{X}_k, \mathbf{Z}_{kt}, t)}{P(b_t|\mathbf{X}_k, \mathbf{Z}_{kt}, t) + P(g_t|\mathbf{X}_k, \mathbf{Z}_{kt}, t)} \times 100. \tag{7}$$

Combining the percentage boys and the likelihood of exiting the spell across all t gives the predicted percent boys born over the entire spell.

[15] It is important to note that the approach is not the same as merely calculating the birth spacing measures for women who already have a given parity child in the survey because that number does not take into account the censoring of spells that will eventually lead to a birth.

3 Data

The data come from the four rounds of the National Family Health Survey (NFHS-1, NFHS-2, NFHS-3, and NFHS-4), collected in 1992–1993, 1998–1999, 2005–2006, and 2015–2016.[16] The surveys are large: NFHS-1 covered 89,777 ever-married women aged 13–49 from 88,562 households; NFHS-2 covered 90,303 ever-married women aged 15–49 from 92,486 households; NFHS-3 covered 124,385 never-married and ever-married women aged 15–49 from 109,041 households; and NFHS-4 covered 699,686 never-married and ever-married women aged 15–49 from 601,509 households surveyed.

I exclude visitors to the household, as well as women who have been married more than once, divorced, or who are not living with their husband, women with inconsistent age at marriage, and those with missing information on education. Women interviewed in NFHS-3 or NFHS-4 who were never married or where Gauna had not yet been performed were also dropped. The same goes for women who had at least one multiple births, reported having a birth before age 12, had a birth before marriage, or an interval between births of less than nine months.

Finally, I restrict the sample to Hindus, who constitute about 80% of India's population. If the use of sex selection differ between Hindu and other religions, such as Sikhs, assuming that the baseline hazard is the same would lead to bias. The other groups are each so small relative to Hindus that it is not possible to estimate different baseline hazards for each group. Furthermore, the other groups are so different in background and son preference that combining them into one group would not make sense.

There are four advantages to using the NFHS. First, surveys enumerators pay careful attention to spacing between births and probe for "missed" births. Second, no other surveys cover as extended a period in the same amount of detail. The four NFHS rounds allow me to show how spacing and sex ratio changed from before sex-selective abortions were available until 2016. Third, NFHS has birth histories for a large number of women.

[16] A delay in the survey for Tripura means that NFHS-2 has some observation collected in 2000.

Finally, even if probing for missing births does not eliminate recall error, the overlap in cohorts covered and the large sample size makes it possible to establish where recall error remains a problem.

Recall error arises mainly from child mortality when respondents are reluctant to discuss deceased children. Systematic recall error, where the likelihood of reporting a deceased child depends on the sex of the child, is especially problematic because it biases both spacing and sex ratios. Probing catches many missed births, but systematic recall error is still a potentially substantial problem.

Three factors contribute to the problem here. First, girls have a significantly higher mortality risk than boys. Second, son preference may increase the probability that parents recall boys more readily than girls. Finally, in NFHS-1 and NFHS-2 enumerators probed only for a missed birth if the initially reported birth interval was four calendar years or more, but, given short durations between births, especially after the birth of a girl, that procedure is unlikely to pick up all missed children.

Recall error is heavily dependent on how long ago a woman was married.[17] I, therefore, drop women married 22 years or more. The final sample consists of 395,695 women, with 815,360 parity one through four births.

3.1 Spell Definition

I focus here on the second through fourth spells, that is, on the intervals from the first birth until at most the fourth birth.[18] The spells all begin nine months after the previous birth because that is the earliest we should expect to observe a new birth, which also means that they capture the interpregnancy interval for pregnancies carried to term. A spell continues

[17]See the discussion in the online Appendix.

[18]I exclude the first spell from marriage to the first spell because of data issues. In NFHS-1 and NFHS-2 the only information on marriage timing is the age at marriage, and all spell durations are therefore imputed. In NFHS-3 about a third of respondent did not provide complete information on the timing of marriage and therefore had the length of their first spell imputed using only the age at marriage. The result of the imputation is that large numbers of women end up with very short, i.e., less than nine months, or negative spells and that comparison of spell duration over time is subject to an excessive amount of noise.

until either a child is born or censoring occurs. Censoring can happen for three reasons: the survey takes place; sterilization of the woman or her husband; or too few births are observed for the method to work. For all spells censoring is set at 96 months (eight years) after a birth can occur. With these cut-offs, less than one percent of observed births occur after the spell cut-off.[19]

I group spells into four periods based on the year of the previous birth: 1972–1984, 1985–1994, 1995–2004, and 2005–2016. The periods follow the main changes in the availability and legality of prenatal sex determination discussed in the Introduction. The allocation into periods is determined by when conception and therefore decisions on sex selection can begin, even if we do not observe any births until nine months later.

The allocation into periods means that some spells cover two periods. A couple may, for example, have their first child in 1984, but not have their second child until 1986. That couple's second spell will be in the 1972–1984 period, even though most of the interval falls in the 1985–1994 period. Hence, prenatal sex determination was likely available when some children from spells that began in the 1972–1984 period were conceived, which could result in evidence of sex-selective abortions even for this period. Similarly, a spell that started in the 1985–1994 period may have been partly or mostly under the PDNT act. The effect is a downward bias in the differences between the periods.

3.2 Explanatory Variables

I divide the explanatory variables into two groups. The first group consists of variables expected to affect the shape of the hazard function (the **Z** variables): mother's education, sex composition of previous children, and area of residence. I chose these variables because

[19] The cut-offs are determined not by the total number of births, but by how many that occur in each three months period. If there are too few births, the multinomial logit estimations will not converge. For spell 2, 0.84%, or 2,240 births, of a total of 266,104 births are observed after 105 months from the first birth, with the highest observed duration 235 months. For spell 3, 0.64%, or 884 births, of a total of 138,615 births are observed after 105 months from the second birth, with the highest observed duration 200 months. For spell 4, 0.41%, or 262 births, of a total of 63,431 births are observed after 105 months from the third birth, with the highest observed duration 184 months.

the prior literature shows that they affect spacing choices and the likelihood of using sex selection.[20]

The first variable that is likely to affect the hazard rate in a non-proportional manner is education. First, there is evidence, even in the absence of sex selection, that women with different education levels have different hazard profiles, although the size and direction of the effect vary across areas and time (Tulasidhar, 1993; Whitworth and Stephenson, 2002; Bhalotra and van Soest, 2008; Kim, 2010; van Soest and Saha, 2018). Second, as discussed above, the use of sex selection increases with socioeconomic status, especially education, and the use of sex selection is unlikely to be the same throughout a spell, which means that education cannot enter proportionally (Retherford and Roy, 2003; Jha et al., 2006; Pörtner, 2015). One potential reason for the correlation between education and sex selection is that increasing education of mothers correlates closely with lower fertility (Schultz, 1997). This lower fertility leads, in turn, to a higher likelihood of using sex selection (Das Gupta and Bhat, 1997; Guilmoto, 2009; Bongaarts, 2013; Jayachandran, 2017).[21] Another reason is that having more education is closely associated with higher income and wealth, which makes it easier to access illegal services such as prenatal sex determination. It is not possible to separate these two effects here.

I divide women into three groups based on education attainment: no education, one to seven years of education, and eight and more years of education. The models are estimated separately for each education level to reduce the potential problem of including other variables as proportional.[22]

As discussed, the sex composition of previous children affects both the timing of births

[20] Increasing the number of variables interacted with the baseline hazard would further lower the risk of bias but at the cost of requiring more data to precisely estimate.

[21] In principle, it is possible that part of the higher likelihood is driven by a stronger son preference, independently of desired fertility. There is, however, evidence that higher education women have shown a decline in son preference (Bhat and Zavier, 2003; Pande and Astone, 2007).

[22] Fathers' education has two opposite predicted effects: the associated higher income should increase fertility and therefore lower the pressure to use sex selection, but the higher income also makes the use of sex selection cheaper. In practice, fathers' education had little effect on the hazards and the use of sex-selective abortions, and I, therefore, do not include it.

and the use of sex-selective abortions (Retherford and Roy, 2003; Jha et al., 2006; Bhalotra and van Soest, 2008; Abrevaya, 2009; Pörtner, 2015; Kumar, 2016; van Soest and Saha, 2018). I capture sex composition with dummy variables for the possible combinations for the specific spell, ignoring the ordering of births. As an example, for the third spell, three groups are used: Two boys, one girl and one boy, and two girls. It is, in principle, possible to estimate the model taking into account the ordering of children, but this would further lower the power of the test, by adding one additional group for the third spell and four additional groups for the fourth spell.

Whether a woman lives in an urban or rural area affect both her fertility level and her access to sex selection (Retherford and Roy, 2003; Jha et al., 2006; Pörtner, 2015). Area of residence is a dummy variable for the household living in an urban area. The cost of children is higher in urban areas than in rural areas, and there is easier access to prenatal sex determination in urban areas. Both factors are likely to lead to higher use of sex-selective abortions in urban than in rural areas.

The second group of variables consists of those expected to have an approximately proportional effect on the hazard. These include the age of the mother at the beginning of the spell, whether the household owns any land, and whether the household belongs to a scheduled tribe or caste.

3.3 Descriptive Statistics

Appendix Table B.1 presents descriptive statistics for the spells by education level and period they began. There is a substantial number of censored observations. As an example, for highly educated women who had their first child in the 2005–2016 period, more than 40% did not have their second child by the time of the survey. Censoring becomes even more important for the third and fourth spells, with around 70% of the observations censored. The level of censoring also increases with parity and time, which reflects a combination of factors: timing of the surveys relative to the periods of interest, later beginning of childbearing, falling fertility, and the increase in spell lengths from sex-selective abortions.

The share of urban women in the sample has fallen slightly over the periods, even though India's population has become progressively more urbanized. The most likely explanation is that the age of marriage has increased faster in urban areas than in rural areas. Hence, there are relatively more urban women, but fewer show up in the sample because they are not yet married.

The population has become substantially better educated over time. Women with no education constituted almost 60% in the first period, but less than twenty percent in the last period. Correspondingly, in the first period just over twenty percent had eight or more years of education, whereas in the last period more than 60% did. These changes are an underestimate of the increase in female education overall because many of the younger women with more education have not yet married than therefore are not in the sample.[23]

4 Results

Figures 1, 2, and 3 show predicted average birth intervals, sex ratios, and probabilities of having a birth by decade, spell, and sex composition for the three education levels separated by the area of residence.[24] For each subsample, I first estimate the model described in Section 2 and then use the estimated coefficients to predict average birth spacing, sex ratio, and the probability of having a birth in that spell.

I calculate the expected average duration as follows. For each woman in a sample, I calculate her probability of giving birth for each period in the spell and use these probabil-

[23]Women with eight or more years of education accounted for 65.9% of unmarried women in NFHS-3 and 82.8% of unmarried women in NFHS-4. See International Institute for Population Sciences (IIPS) and Macro International (2007, p 56) and International Institute for Population Sciences (IIPS) and ICF (2017, p 61) for more information.

[24]For legibility, none of the graphs show standard errors. Instead, the standard errors, together with the graphed values, are shown in Appendix Tables C.1, C.2, and C.3. The standard errors are based on bootstrapping for all three measures, where the model is repeatedly estimated using resampling with replacement.

ities as weights to calculated her expected duration for that spell. I then take the average of these expected durations using her probability of having a birth by the end of the spell as weights.

The predicted sex ratio is the weighted average over the women in the sample's individual predicted sex ratios, using the individual probabilities of having given birth by the end of the spell as weights. Each woman's predicted sex ratio is the weighted average of the predicted percentage of boys over each period in the spell calculated using equation (7) and the probability of giving birth in each period as weights.[25] The predicted sex ratio captures the percent boys that will have been born to women in the sample when childbearing for that spell is over.

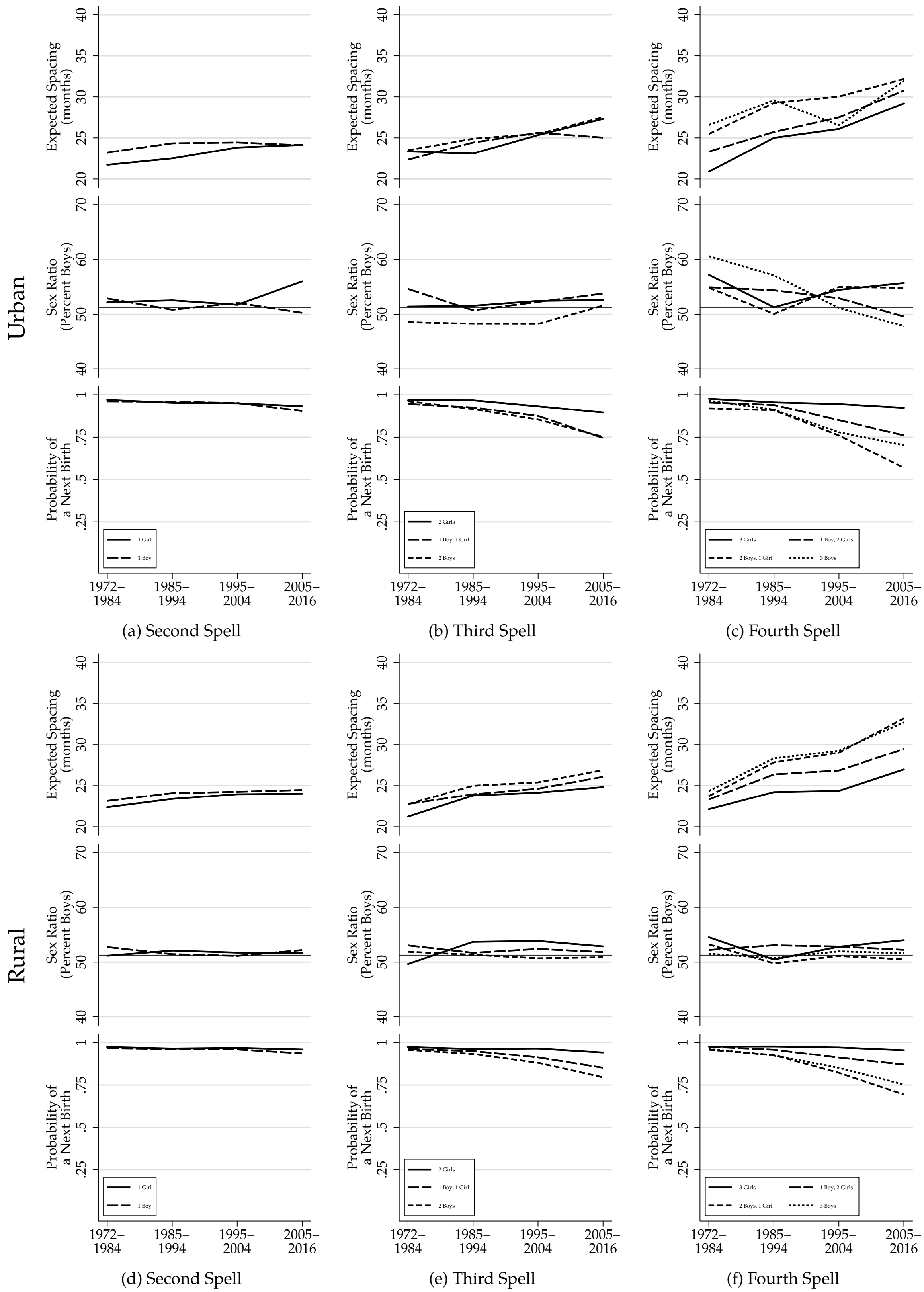
4.1 No Education Women

The previous literature finds that women with no education are the least likely to use sex selection, which suggests that they would instead follow a traditional strategy to son preference with higher fertility and shorter birth intervals the fewer sons they have. This pattern is supported by Figure 1, but with significant differences across spells. Most of the women without education live in rural areas, and I, therefore, focus on rural women.[26]

The initial high fertility of women with no education shows clearly in the results. In the 1972–1984 period almost all women had at least four children, irrespectively of the sex composition of the children. Over time, however, the likelihood of having a third or fourth child decreased for women with at least one son, and more so the more sons they had. Hence, fertility has begun to fall even among women with no education, as long as they have at least one son. Two additional fertility trends stand out. First, virtually all

[25]Imagine a spell has two periods and that the estimated percentages of boys for a woman are 54% and 66% and that the likelihood of having a birth is 20% and 40%. The likelihood of having a birth is the change in the survival curve; in other words, there is a 40% chance that she will not have given birth by the end of this spell. This woman's percentage of boys is then $\frac{54*0.2+66*0.4}{0.2+0.4} = 62$.

[26]Only between ten and twenty percent of the surveyed women without education live in urban areas, and this proportion has been decreasing over time.



(a) Second Spell (b) Third Spell (c) Fourth Spell

(d) Second Spell (e) Third Spell (f) Fourth Spell

Figure 1: Estimated average spell length, sex ratio, and probability of a next birth for women with no education

women still have a second birth, whether the first child was a boy or a girl. Second, for women with only girls, there is almost no reduction in the probability of having a birth across time and spells.

Birth intervals have increased in length over time, although the increases are not uniform over spells and sex compositions of prior children. The smallest increases have been for the second spell, with most increases between one and two months. Interestingly, son preference appears to have little effect on spacing for the second spell, with very small, albeit statistically significant, differences in birth intervals depending on the sex of the first child. This small difference is in line with the high likelihood of having a second child. The second spell also shows convergence in birth intervals, especially in the urban areas where the predicted average duration is now the same whether the first child was a boy or a girl.

Son preference in birth intervals shows most clearly for the fourth spell. Despite the increase in spacing even for those with three girls, the increases in spacing have been substantially stronger for families with at least one son. As for fertility, the more sons a family has, the more significant are the differences.

Despite the prior literature finding that women with higher education are the primary user of sex selection, the predicted sex ratios for those with only girls are statistically significantly higher than the natural ratio for the third and fourth spell. Hence, it is possible that at least part of the increased birth intervals for those with only girls comes from the use of sex selection and that the differences in birth spacing across sex compositions would be even more substantial in the absence of sex selection.

4.2 Low to Medium Education Women

Figure 2 shows that women with one to seven years of education follow a fertility pattern broadly similar to those with no education. As expected, fertility is lower than for women with no education, but there is still a strong son preference in the parity progression be-

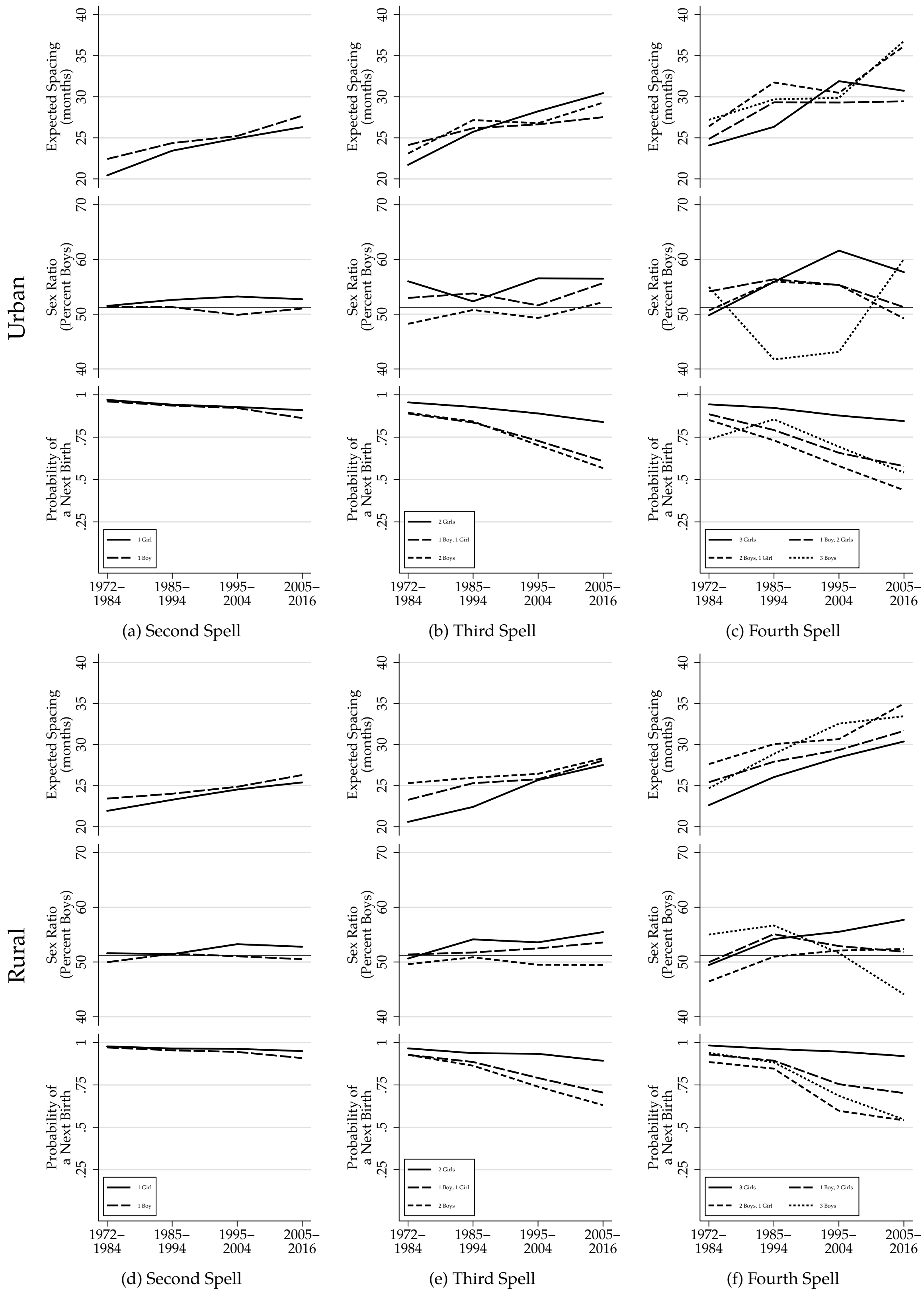
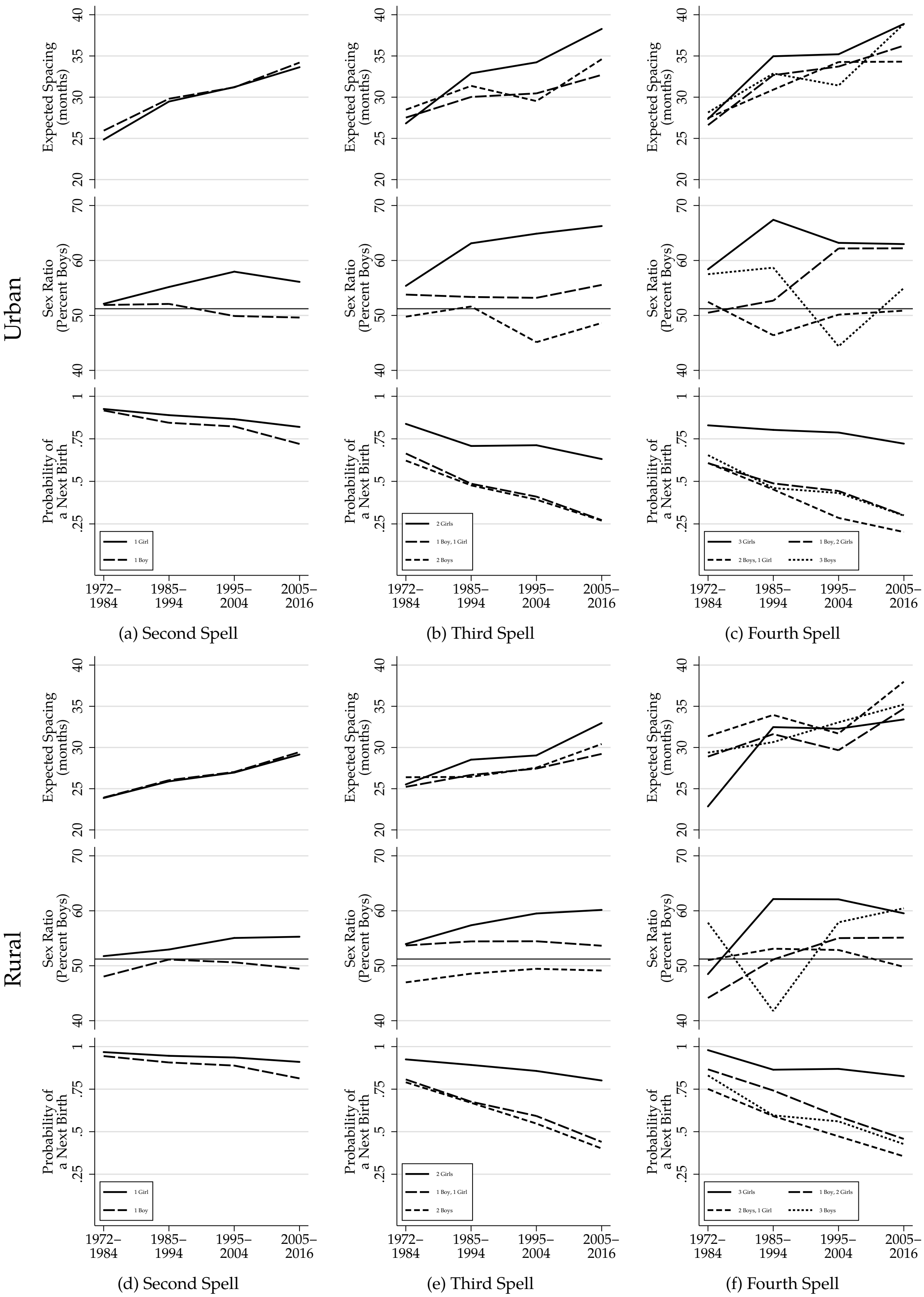


Figure 2: Estimated average spell length, sex ratio, and probability of a next birth for women with one to seven years of education

havior. Except for the second spell, the likelihood of having a birth by the end of the spell is substantially lower if there has been at least one male birth than if there are only girls. Despite this, the probability of a birth in the third and fourth spells has also been falling for those with only girls. Having a second birth is still close to universal, although in urban areas it is down to just over 85 percent for those with a son as their first child.

The spacing between births has increased over the four decades, and the increases are larger than for women without any education across all spells. Contrary to women without education, however, there has not been an increased divergence in birth intervals lengths across sex compositions for the third and fourth spells. On the contrary, for the third spell, the most substantial increases in birth intervals are for women with two daughters and no sons, with an increase of about seven months across the four decades. The result is that for urban women the standard spacing pattern reversed, so the longest predicted spacing is now for those with only girls, while for rural women the predicted average birth intervals are now almost identical across sex compositions of prior children. For the fourth spell, the increases in spacing for women with only girls have kept pace with the other sex compositions in rural areas.[27]

The substantial increases in spacing for women with only girls is not evidence of lower son preference as the changes in the predicted sex ratios show. For both the third and fourth spell the predicted sex ratio in both urban and rural areas is statistically significantly above the natural sex ratio at between 55.5 and 57.7 percent boys. The elevated sex ratios strongly suggest that sex selection is driving the increases in birth intervals for women with only girls and that without sex selection we would instead have observed a diverging pattern in birth intervals across sex composition as for women without education.



(a) Second Spell (b) Third Spell (c) Fourth Spell

(d) Second Spell (e) Third Spell (f) Fourth Spell

Figure 3: Estimated average spell length, sex ratio, and probability of a next birth for women with eight or more years of education

4.3 High Education Women

Women with eight or more years of education are those expected to have the lowest fertility and the highest use of sex selection based on the prior literature. Figure 3 shows that this group not only have lower fertility than the two previous groups; fertility is also falling rapidly over time. Of women with one birth, the probability of having a second birth when the first-born is a son is only around 70 percent for urban women and around 80 percent for rural women, and for those with a first-born daughter, it is around 80 percent for urban women and 90 percent for rural women.

The rapid decline in fertility for the most educated women is even more clear for the third and fourth spells when the woman has given birth to at least one son. At the beginning of the sample, urban women with at least one boy had a close to 75 percent likelihood of having a birth, but that has fallen to only around 25 percent. Son preference still shows clearly in the parity progression probabilities for women without a son, with the declines for the third and fourth spells substantially slower for both urban and rural women without a son than for those with at least one son. The falling fertility means that relatively few women make it to the fourth spell, which, therefore, has more noise than the other spells.

Average birth spacing for the second spell is almost identically across sex compositions for both urban and rural women and increased by around five months for rural women and by almost ten months for urban women over the four decades. These similarities hide, however, what would have been a standard son preference spacing pattern with significantly shorter spacing after a first-born girl than after a first-born boy if there had not been a substantial amount of sex selection. For both of the last two periods, the predicted sex ratio for women with a daughter as their first-born child is above 55 percent for both urban and rural areas.

The tremendous impact that sex selection can have on birth spacing is illustrated particularly vividly by the changes over time for the third spell, which led to a complete reversal

[27] Because of the low number of observations, the pattern for the fourth spell is noisier for urban women.

of the standard spacing pattern. In the 1972-1984 period, the predicted average birth intervals for the three possible sex compositions were less than two months apart. For the later periods, however, the highest predicted average spacing was for women *with only daughters*, with most of the differences to the other sex compositions statistically significant. In urban areas, the predicted average birth interval for a woman with only daughters increased by almost a full year from 26.8 to 38.3 months. What is more, this increase is likely an underestimate. The sex ratios for the 1972-84 period are substantially higher than the natural sex ratio despite sex selection not being widely available until around 1985. If this early, elevated sex ratio is because of recall error, it means that the actual birth intervals would have been substantially shorter than the ones predicted here and the increase over time larger.

The reversal pattern also shows for the fourth spell for urban women, although not for rural women. An important caveat is that because of the falling fertility relatively few women make it to the fourth spell, and even if they do, we often do not observe a birth by the time of the survey. Of the 11,886 women across urban and rural areas observed for the fourth spell for the 2005-2016 period more than 70 percent did not have a birth at the time of the survey. Even though the censoring is less prevalent for the earlier periods, this is countered by those samples being substantially smaller. Despite this, the pattern for the fourth spell is similar to that of the third spell.

The predicted sex ratios at the end of the spells show that this reversal in spacing patterns is not the result of a declining son preference but instead corresponds to a substantially more male-biased sex ratio as the use of sex selection spread. For urban women, the predicted sex ratio with only girls is consistently above 60% boys for the third and fourth spells. For rural women, the predicted sex ratios are lower than for urban women but still substantial and statistically significant at close to 60%.

When trying to understand the strength of son preference, it is interesting that the sex ratio is also statistically significantly different from the natural rate in the case where women already have one son for the third and fourth spells. Again, the sex ratio in the presence of one son for the third and fourth spells are higher in urban areas than rural areas, although the difference is less than for women with only girls. Hence, it is possible that women are still willing to use sex selection even after giving birth to one, although this behavior may also be in response to either experienced or expected mortality of the first son born. This result is different from prior studies using NFHS data. The NFHS-4 sample is substantially larger than the three prior surveys. Hence, it is possible that the effect has been there all along, but we did not have the power to detect it.

4.4 Distribution of Birth Spacing Within Spells

The results above show consistent increases in average spacing across the board. Average spacing is a convenient way to understand the overall changes in behavior but may hide important differences in the distribution of spacing. Specifically, whether these increases in average spacing come from fewer births after very short intervals, because of even longer spacing from births with already long spacing, or a general increase in spacing have important implications for what effects the increases in average spacing are likely to have and how to interpret the motivation for the changes. On one hand, if there still are many births that occur after very short intervals, the increase in average spacing is unlikely to have a substantial impact on health outcomes since the literature on birth spacing and child health suggests that an interpregnancy interval of fewer than 18 months is associated with a higher risk of adverse health outcomes and mortality (Conde-Agudelo et al., 2012). On the other hand, we may see a reduction in early observed births and more long spells if families with fewer sons are both more likely to have a very early pregnancy and to continue through pregnancies and sex-selective abortions until they conceive a son.[28]

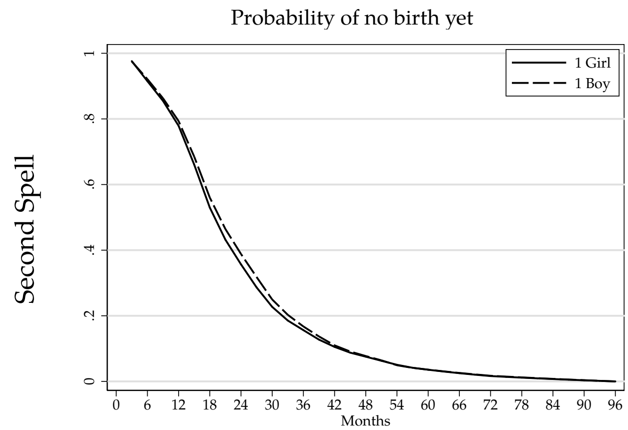
[28]It is unclear what the optimal response in the timing of pregnancies to the availability of sex selection should be. The expected birth intervals become longer with the use of sex selection, which may be costly for parents leading them to try to conceive even earlier than previously. Conversely, if parents know that short birth intervals are detrimental to the next child's health, and that, with sex selection, the next child is likely a boy, it might make sense to wait longer before conceiving.

This section, therefore, provides more detail on how spacing is distributed within a spell and across sex compositions using a graphical approach. I show survival curves conditional on predicted parity progression rather than standard survival curves. The advantage of this approach is that it is possible to directly compare the distribution of spacing to next birth across groups, independently of differences in how likely the next birth is. Because the conditional survival curves are independent of the likelihood of parity progression, they all begin at 100% and end at 0%.

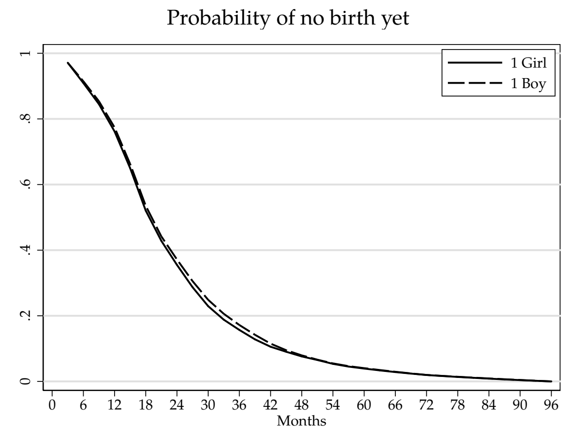
Instead of averaging across the entire sample, I calculate the conditional survival curves for an average woman using the method detailed in Section 2. For each combination of education and spell, I use values based on the average age at the start of the spell. Furthermore, I use the majority categories for the categorical explanatory variables, which means no ownership of land and not in a scheduled caste or tribe. The characteristics used do not change across the four decades to ensure that composition effects do not drive any changes. To complement this approach, Appendix Tables C.4, C.5, and C.6 show 25th, 50th, and 75th percentiles durations with bootstrapped standard errors based on averages across all women in each subsample as for the results above.

In the interest of brevity, I discuss only two subsamples. Figures 4 and 5 show spacing across sex compositions for the second, third, and fourth spells for the first period, 1972–1984, and the last period, 2005–2016, for rural women with no education and urban women with eight or more years of education. The Appendix shows conditional survival curves for all groups and decades.

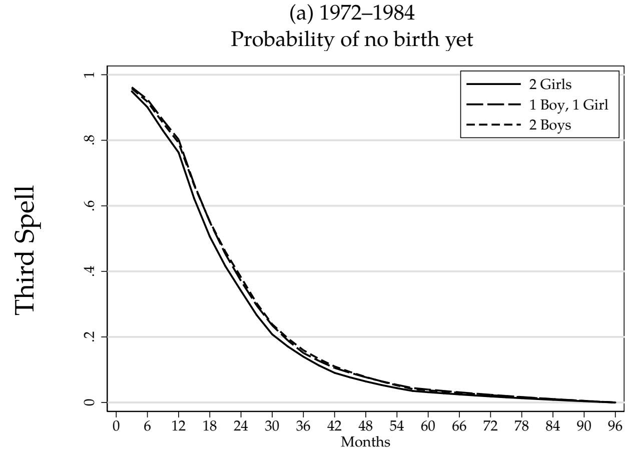
Figure 4 shows the distribution of birth within a spell for women with no education. For the second spell, what is most interesting is that there is almost no difference between those with a first-born boy and those with a first-born girl. For the 1972–1984 period the two conditional survival curves only begin to diverge at around 18 months (corresponding to 27 months after the first birth took place), and at that point close to 50 percent of the women have already had their second child. With a nine-month pregnancy, this means



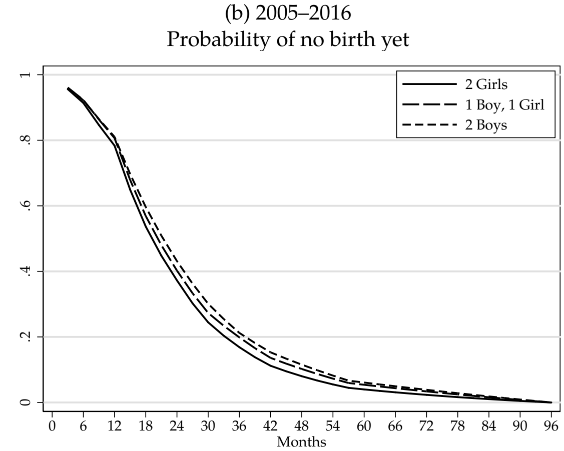
(a) 1972–1984



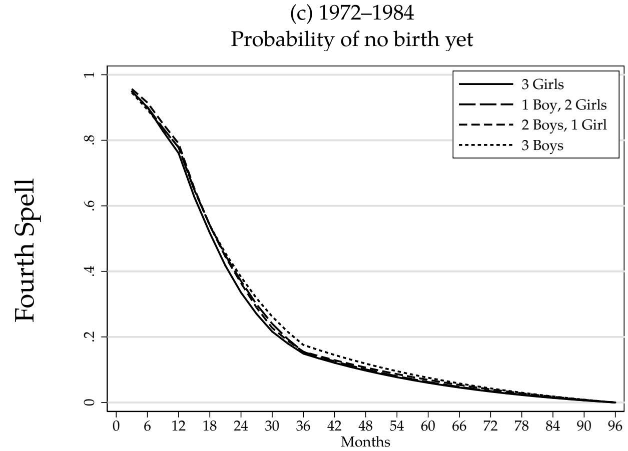
(b) 2005–2016



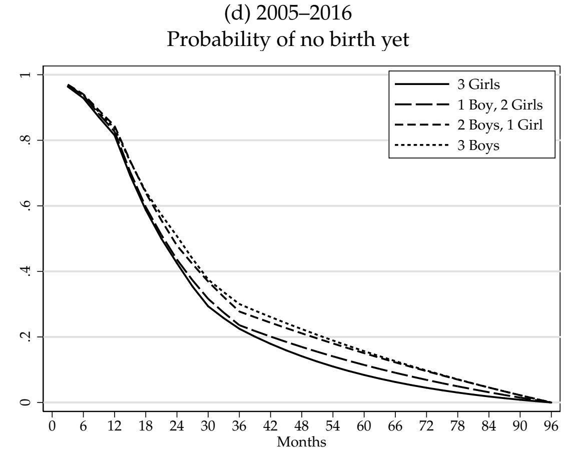
(c) 1972–1984



(d) 2005–2016



(e) 1972–1984



(f) 2005–2016

Figure 4: Survival curves conditional on progression to next birth for rural women without education; start point for each spell is nine months after prior birth

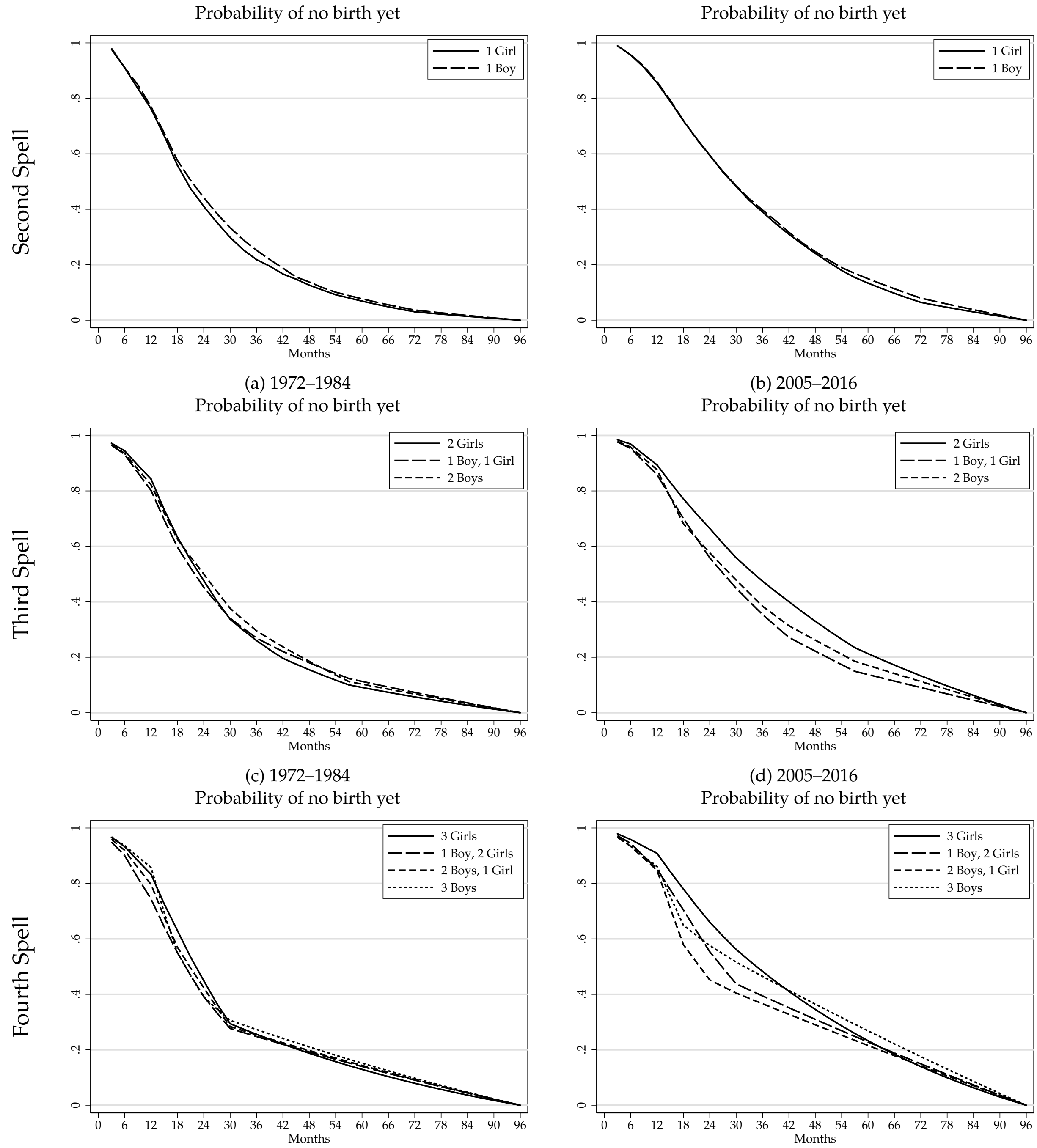
that almost 50 percent of the children born are born within the interpregnancy interval associated with a higher risk of adverse health outcomes and mortality, and, somewhat surprisingly, that there do not appear to be any particular disadvantage for the child born after a girl than after a boy.[29] The difference in spacing after a first-born girl and a first-born boy remains almost the same across the four decades. Furthermore, the proportion with very short spacing remains almost the same.

For the third spell, the son preference driven short spacing is evident throughout the distribution and becomes more pronounced over the four decades. Families with two girls are especially likely to have a birth early with 25 percent having a child within 12 months of the beginning of the spell (21 months after the second birth). That number is only slightly smaller four decades later. The fourth spell shows changes in the distribution that appear to be more pronounced than for the third spell, although these results are based on fewer observed births. For families with three girls, 75 percent have had their fourth child within 36 months after the beginning of the spell, but this occurs more than a year later for families with two or more boys.

The distribution of spacing for the second spell is almost indistinguishable between urban women with eight or more years of education and rural women with no education for the 1972–1984 period, as shown in Figure 5. The small differences point to these two very different groups of women behaving similarly in response to son preference in a situation where there was little access to prenatal sex determination or little incentive to use it early even for those who might have had access. However, whereas the no education group shows almost no change across the four decades for the second spell, the high education women show an upward shift and a relatively even distribution of births within the spell for both women with a first-born son and women with a first-born girl. The result is that the spacing patterns are close to identical after first-born girls and after first-born boys until after approximately 80 percent have had their second child, although as mentioned above, this is driven in large part by the significant use of sex selection among women with a first-born girl.

For the third spell, the 1972–1984 period shows a close to standard pattern throughout,

[29] Note that this does not imply that the first-born girl is not in a more adverse position than a first-born boy when the second child arrives, just that this is not directly related to a short birth interval.



(a) 1972–1984 (b) 2005–2016

(c) 1972–1984 (d) 2005–2016

(e) 1972–1984 (f) 2005–2016

Figure 5: Survival curves conditional on progression to next birth for urban women with eight or more years of education; start point is nine months after prior birth

although, as mentioned above, the sex ratios for women without girls was substantially higher than the natural sex ratio either because of recall error or early use of sex selection. The correlation between the increased use of sex selection and the reversal of the standard spacing pattern show up clearly in the 2005–2016 period for the third spell with spacing to the third child consistently longer with two girls than with either two boys or one boy and one girl throughout the entire spell. This pattern is most consistent with early and continued use of sex selection, rather than a general reduction in the likelihood of very short birth intervals. It also means that the previously born girls can expect more time without a younger sibling, which may reduce the sibling competition for resources.

There is an even more pronounced rightward and upward shift for spacing after only girls in the fourth spell for the first years of the spell.[30] Furthermore, the differences are substantial across most of the distribution. Twelve months after the beginning of the spell there is a more than ten percentage points difference in the conditional survival curves for only girls and only boys. Both of the spells, therefore, show changes in the distribution of births that is in line with extensive use of sex selection among families with no or one son.

4.5 Regional Differences

To understand how regional differences in son preference, fertility, and use of sex selection affect birth spacing, I divide India into four broad regions based on the degree of son preference and initial fertility levels. The focus is on the most educated women since they are the primary users of sex selection. The four regions are based on Retherford and Roy (2003), although expanded to include all states in the surveys. Table 1 shows the four regions and the states that they contain.[31] The state names are those in existence at the time of the NFHS-1 data collection. States formed later are allocated as close as possible to the original state. The "West" contains states with a high degree of son preference and use of sex selection. The "North" consists of states that also have a strong son preference, but initially had higher fertility and, therefore, lower likelihood of using sex selection. The

[30]The caveat is that there are few births to base the results on, especially for women with two or more sons.

[31]The geographical names do not entirely reflect the geography of India, and mainly serves as mnemonic short-hands.

"East" states generally have only a moderate level of son preference. Finally, the "South" contains states with traditionally low son preference and lower fertility than the rest of India.

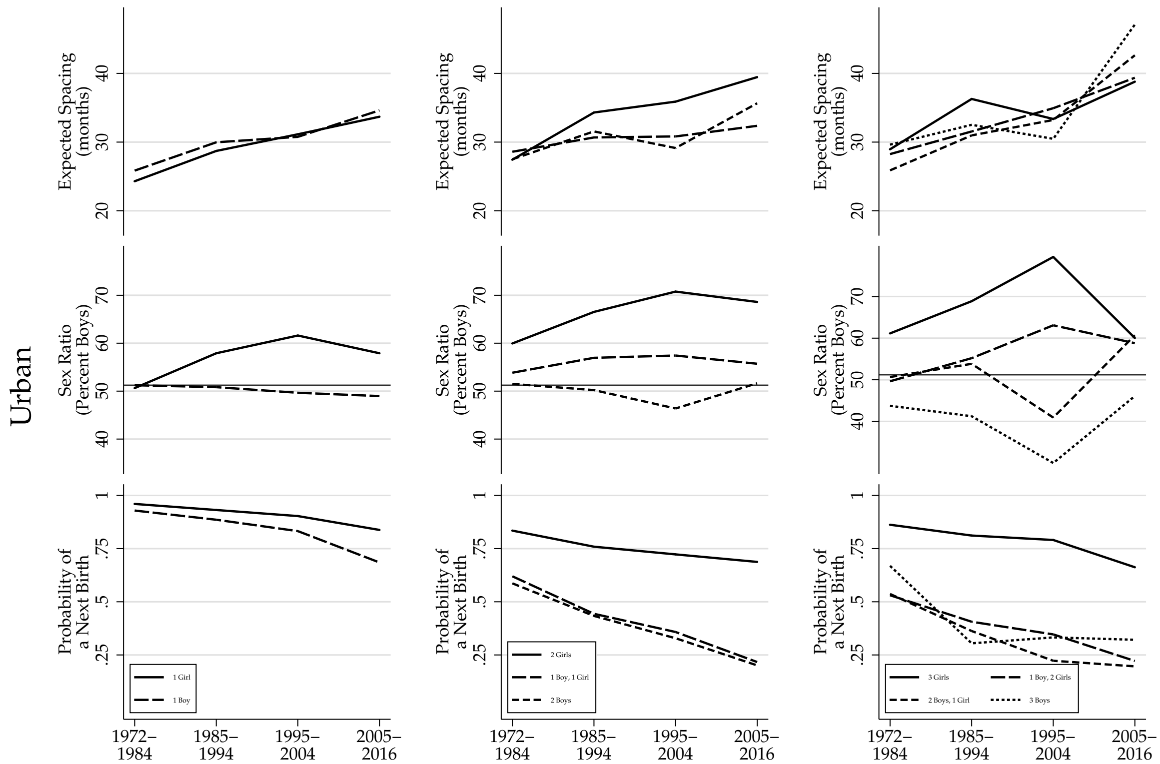
Table 1: Definition of Regions

Region	States
West	Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu, Maharashtra, Punjab, Rajasthan
North	Bihar, Madhya Pradesh, Uttar Pradesh
East	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, West Bengal
South	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu

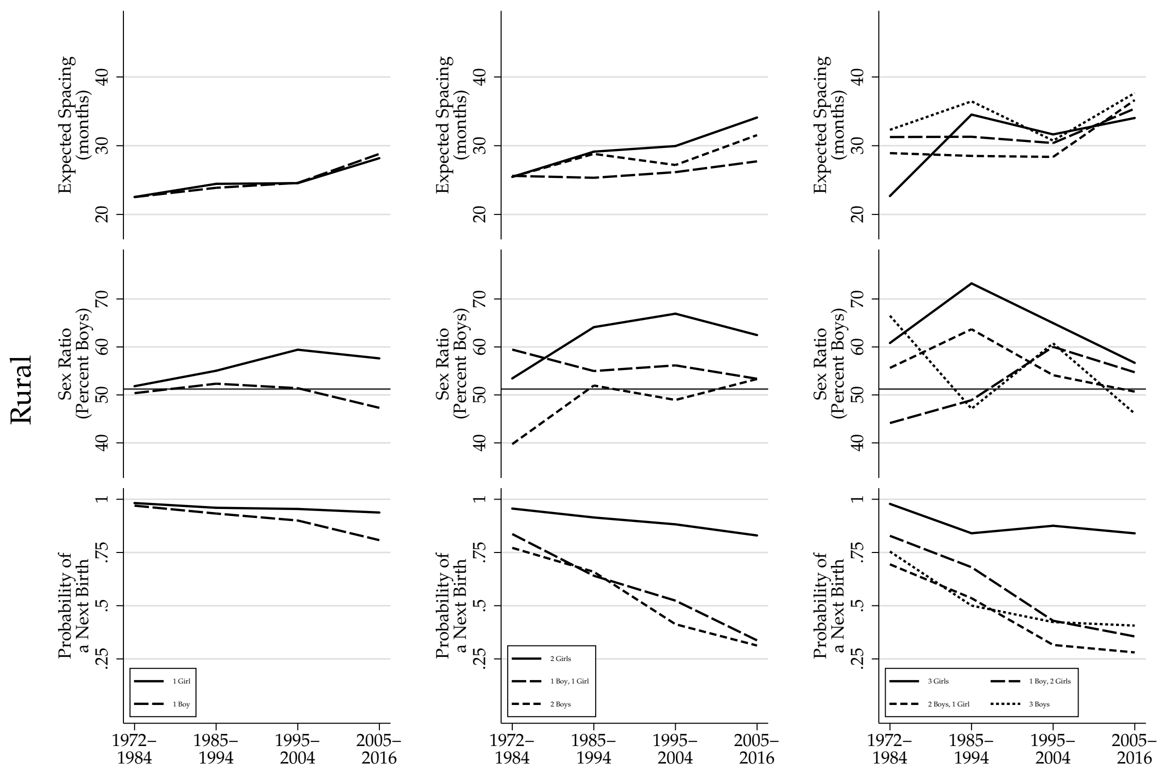
Note. The state names reflect those in existence at the time of the NFHS-1 data collection in 1992/1993. States created later are allocated as close as possible to their original state.

Figure 6 shows the predicted average birth intervals, sex ratios, and likelihoods of having a child by the end of the spell over time for the three spells in the "West." What most stands out is how close to the national estimates the "West" estimates are. The predicted second spell average birth spacing is similar across families with a girl or a boy, and the average spacing substantially higher in the absence of boys than when there is at least one boy for the third spell. The main difference is that the very high predicted sex ratios reflect the expected higher use of sex selection. For the second spell, the predicted sex ratios are around 60 percent for both urban and rural women, and for the third spell it is around 70 percent for urban women and consistently above 60 percent for rural women. This higher use of sex selection, in turn, translates into longer average spacing. Furthermore, fertility has fallen faster than the national trend, especially for women with one or more sons.

Figure 7 shows the same outcomes for the "North" region. Despite the idea that the "North" has high fertility and lower likelihood of sex selection the differences to the "West" region are surprisingly small, at least in the urban areas. Fertility is, indeed, higher than in the "West" region, but the declines in the probability of parity progression have been

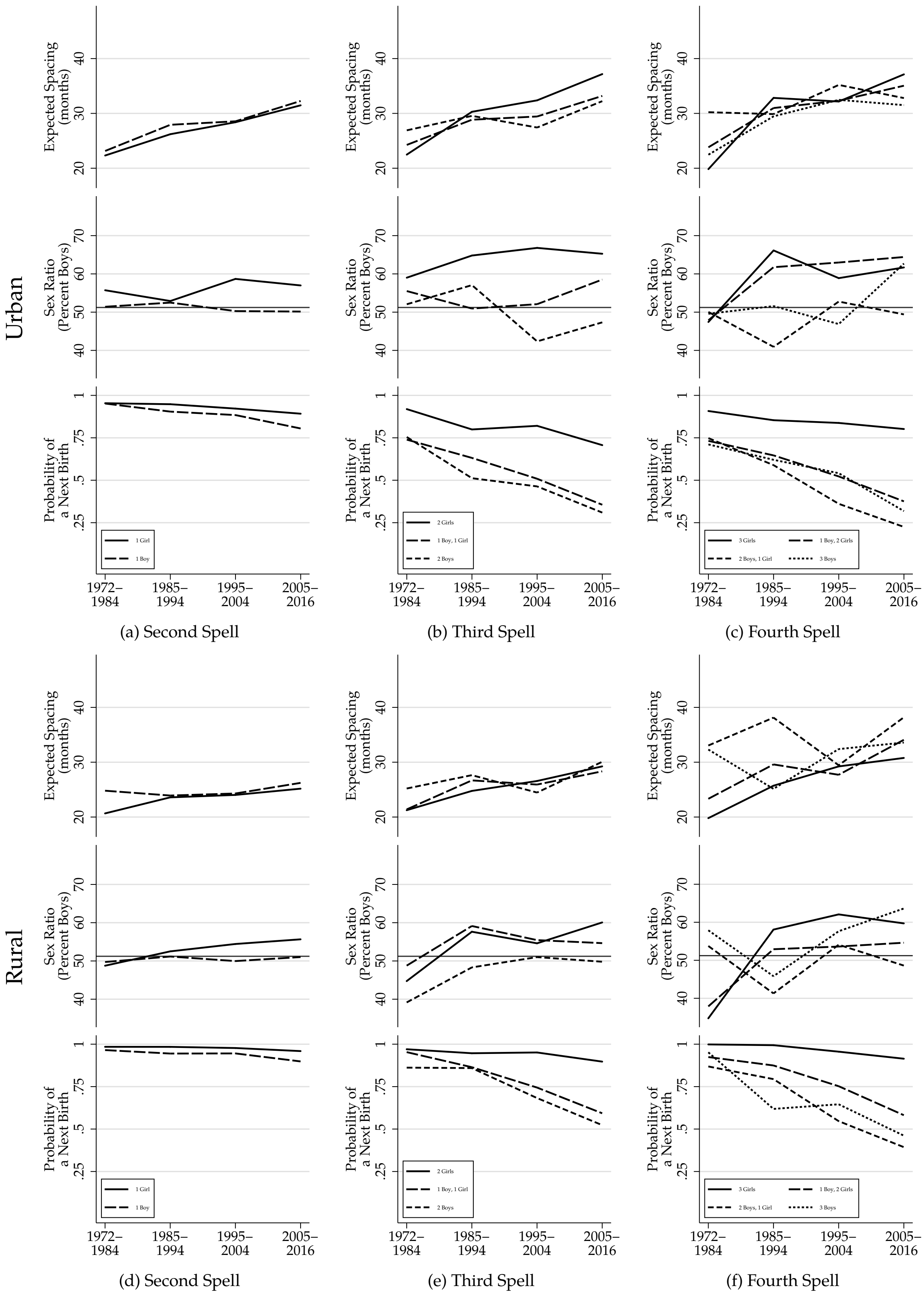


(a) Second Spell (b) Third Spell (c) Fourth Spell



(d) Second Spell (e) Third Spell (f) Fourth Spell

Figure 6: Estimated average spell length, sex ratio, and probability of a next birth for women with eight or more years of education in the "West"



(a) Second Spell (b) Third Spell (c) Fourth Spell

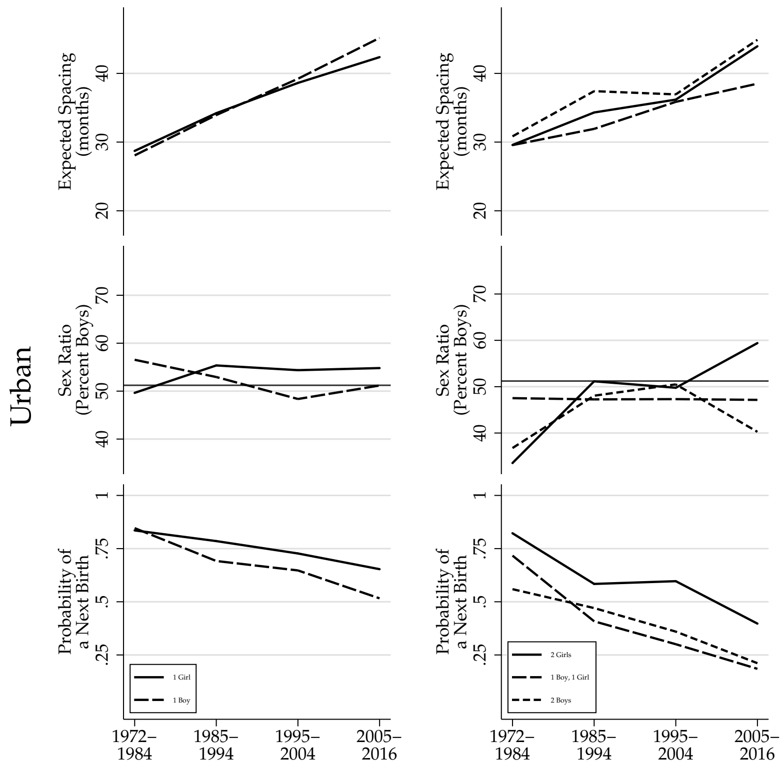
(d) Second Spell (e) Third Spell (f) Fourth Spell

Figure 7: Estimated average spell length, sex ratio, and probability of a next birth for women with eight or more years of education in the "North"

relatively rapid and mirror the national one. The use of sex selection is also close to the "West," and there is the same reversal of spacing pattern as there. The rural areas of the "North" are a slightly different story. Fertility is substantially higher, and the use of sex selection much lower than in the rural areas of the "West." That said, there still is clear evidence that the sex ratio is substantially above normal at close to 60 percent for the latest decade.

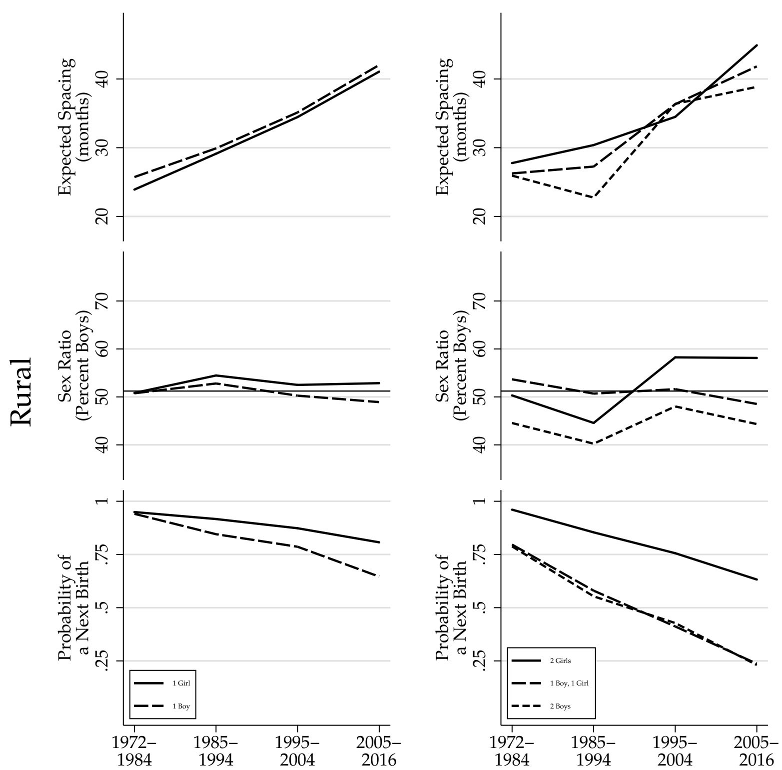
The results for the "East" region of India are shown in Figure 8, although it does not include the fourth spell results because the sample size is smaller for this region and the fourth spell results very noisy. Despite the "South" region generally considered to be the low fertility region, the reduction in fertility has been even faster in the "East." For the last decade, only half of the urban women with a first-born son are predicted to have a second child by the end of the spell, which means almost nine years after the first birth. The probability is only slightly higher for those in urban areas with a first-born daughter and still less than 70 percent. Not surprisingly, the probabilities are higher in rural areas, but still below the national pattern. Similarly, conditionally on having a second child, the probabilities of having a third child are low, even in the absence of sons. In urban areas, a woman with two girls has only around a 40 percent likelihood of having a third child.

What stands out, however, is the rapid increase in the lengths of birth intervals, especially for the second spell. In both urban and rural areas, the predicted average birth intervals have gone up by more than a year across the four decades, and that is independent of whether the first-born was a boy or a girl. The increases in birth intervals are slightly smaller for the third spell but still substantial. Although the spacing pattern is consistent with some son preference, with the average spacing slightly shorter in the absence of boys than when at least one boy is present, there is little evidence of sex-selective abortions. The sex ratios after a first-born daughter are slightly elevated but much lower than the prior two regions. There is more evidence for the third spell, where the sex ratio is close to 60 percent in the last period for urban women and the last two for rural women,



(a) Second Spell

(b) Third Spell



(c) Second Spell

(d) Third Spell

Figure 8: Estimated average spell length, sex ratio, and probability of a next birth for women with eight or more years of education in the "East"

but recall that there is a much smaller likelihood of even making it to the third spell for this region than the other or the national average.

The final region is the "South," shown in Figure 9. This region is historically thought to have the lowest degree of son preference of the regions of India. As for the "East," I do not show the fourth spell results because of the small sample size and the associated noisy estimates. Judging from the second spell progression rate and the associated spacing pattern, it does, initially, appear that there is little son preference in this region. The likelihood of having a second birth is relatively high at around 80 to 90 percent and is close to independent of the sex of the first birth in both urban and rural areas. The predicted average spacing also show no sign of son preference, and the predicted sex ratios are close to the natural rate. The average birth spacing started high relative to the other regions, and with little change in fertility and no significant use of sex selection, it has increased only slightly over time.

Despite the second spell's apparent lack of son preference behavior, for the third spell in urban areas the average birth interval has increased substantially for those with only girls relative to those with a boy and a girl, corresponding to a predicted sex ratio close to 60 percent with only girls. The signs of the use of sex selection also show up for rural women with no sons. Furthermore, over the four decades, the likelihood of having a third birth has decreased much less than for either a boy and a girl or two boys.[32] The differences in parity progression and the sex ratios suggest that despite originally having less son preference, the "South" now appears to have longer average spacing in the absence of sons and the higher sex ratio associated with the use of sex selection.

[32]The relatively high parity progression for women without son does raise the question of whether "daughter avoidance" is behind the fertility behavior in this region as suggested by Diamond-Smith et al. (2008).

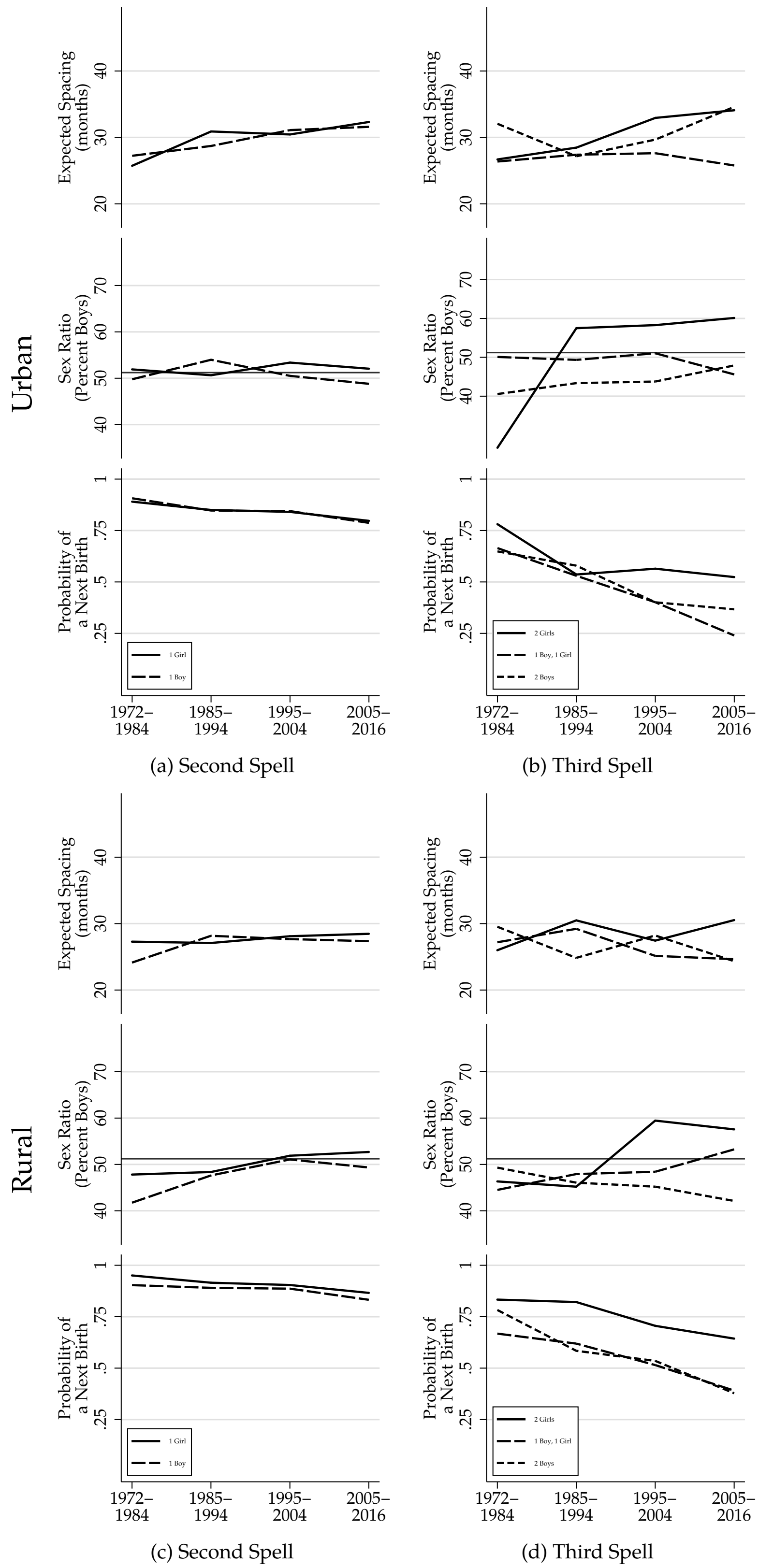


Figure 9: Estimated average spell length, sex ratio, and probability of a next birth for women with eight or more years of education in the "South"

5 Conclusion

The central question addressed here is the extent to which spacing patterns significantly changed as prenatal sex determination became available. The underlying idea is that in the absence of sex selection son preference leads to shorter spacing after the birth of a girl than after the birth of a boy, whereas when prenatal sex selection is available son preference increases the spacing after the birth of a girl relative to after the birth of a boy. I introduce an empirical method that simultaneously accounts for spacing between births and the potential use of sex selection. I apply the method to over four decades of data from India's NFHS.

Three major, interrelated trends over the four decades emerge from the data. First, fertility has declined for all groups, as shown by the parity progression probabilities, with a larger decline the more educated the woman. Across all groups, the likelihood of having an additional child in each spell depends strongly on the number of sons, with women with none or only one son having the highest probability of a birth. Second, there has been a general increase in the length of average birth intervals for all education groups. The increase in the average birth interval is larger the higher the spell and the higher the education group. Finally, as shown by the increasing sex ratios for women with no or only one son there has been a substantial increase in the use of sex selection over time. As for fertility and birth intervals, this increase is larger the higher the spell and with higher education.

The results show two very different approaches to son preference with significant impacts on spacing patterns. At one extreme, rural women without education mostly follow the standard pattern of shorter spacing when a woman does not have the desired number of sons. The strength of this pattern does, however, depend critically on spell number. For the second spell, although the average interval after a first-born girl is shorter than the average interval after a first-born boy, the difference is small. The differences in spacing are larger for the third spell and largest for the fourth. For the fourth spell, the divergence in intervals across sex compositions has increased over time, with the largest increases in average intervals for women with two or three boys. There has also been an increase in average spacing for women with only girls, and there is some limited evidence of biased sex ratios, which suggests that this increases in spacing follow from the use of sex selection.

At the other extreme, urban women with eight or more years of education have experienced an almost complete reversal of the traditional spacing patterns as a result of falling fertility and the associated extensive use of sex selection. Women with either no or one son now have substantially longer spacing than if they have two or more sons, rather than having the next birth sooner as they mostly did before sex selection became available. As shown by the increasingly significant deviations in the sex ratio from the natural sex ratio, these changes are due to increased use of sex selection rather than a sudden reversal in son preference. Only the second spell has not seen a reversal despite a substantially increased use of sex selection, mainly because the average spacing with a first-born boy has increased independently by more than nine months.

Despite the differences in average spacing across sex compositions of prior children, the picture of how son preference affects spacing is more complicated than excepted. First, for the second spell, the differences in birth intervals for the first 25 percent of births are negligible across sex compositions, despite that these birth intervals are clearly within the durations considered the most likely to generate adverse outcomes. Furthermore, there is little difference in this spacing patterns across education. Hence, most of the divergence in spacing patterns across sex compositions arise from longer spells, which are likely to have less negative impacts on children and the mother. Second, one of the side-effects of the extensive use of sex selection for third and fourth spells is that only-girls families are much less likely to have a short, i.e., less than 18 months, interpregnancy interval, which may reduce the sibling competition for resources.

With a country as large as India, it is natural to expect variation in both fertility behavior, spacing patterns, and the degree of son preference. The regional results confirm this, although differences are less apparent than one would expect given the prior research on regional differences. The "North" and the "West" regions have relatively similar spacing patterns, likely precipitated by rapidly declining fertility and substantial use of sex selection. The exception is that the rural areas of the "North" still have higher fertility and consequently less use of sex selection and have, therefore, not yet experienced the same reversal of spacing patterns. Even the "South," which is otherwise considered the area with the least son preference, has seen a substantial increase in the use of sex selection and the associated changes in the spacing patterns. Even though the "South" is often mentioned as the low-fertility region of India, fertility has declined fastest in the "East" region, although this does not appear to have translated into the use of sex selection.

The results here lead to a set of broader questions that future research should address. First, what is behind the substantial increases in spacing even for women who are unlikely to use sex selection, and, related, why does spacing appear to increase with declining parity progression probabilities? The distributional results provide an initial indication that most of the increases in average birth intervals come from the upper end of the birth intervals rather a general increase across the distribution. It is, however, unclear why we are seeing relatively more very long birth intervals over time, and the longer average spacing seems to run counter to a general reduction in the length of women's reproductive spans found in earlier research (Padmadas, Hutter and Willekens, 2004). Understanding whether the longer average spacing is by choice at the beginning of the spell, because of unplanned pregnancies, or because of changes in economic circumstances that allow families to have an additional child later has important implications for both policy design and outcomes for mother and children.

Second, to what extent are the improvements in health for girls relative to boys the result of selection, the longer spacing between births, or changing son preference? We know that health outcomes for girls appear to improve in the presence of sex selection (Lin, Liu and Qian, 2014; Hu and Schlosser, 2015). Furthermore, there is some evidence that sample selection can make it appear that girls are healthier, even though the underlying cause is a combination of sex selection and higher mortality together with recall error (Pörtner and Su, 2018). Understanding what role these factors play in better health for girls is especially important when evaluating policies that aim to directly limit the use of sex selection rather than changing preferences or incentives. If the better health outcomes for girls are, for example, an unintended side-effect of the longer spacing that arises from sex-selective abortions, rather than because the smaller number of girls makes them more valued as is often assumed, then an effective ban on sex selection may, at least temporarily, worsen health outcomes for girls.

Finally, we need to understand how female labor force participation interacts with the use of sex selection. Increased autonomy for women, arising, for example, from better opportunities for working outside the home, has been suggested as a way to increase women's status and thereby lower the use of sex selection (Das Gupta, 2016). This approach may, however, be a double-edged sword. On the one hand, it is a clear benefit to the women who gain bargaining power, and it increases the cost of repeated sex-selective abortions because the increased duration between births would cause a stronger disruption in labor market participation. On the other hand, it may further lower desired fertility, and that may, everything else equal, lead to higher use of sex selection. Understanding the trade-off between long-term benefits from improvements in women's labor force participation and short-term costs from potential increases in sex selection is of paramount importance.

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Appendices for Online Publication

These appendices are intended for online publication. They provide the descriptive statistics, additional estimated duration tables, and graphs for all education groups and spells.

A Recall Error and the Sex Ratio

The reliability of the results depends on the correctness of the birth histories provided by the respondents. A significant concern here is underreporting of child mortality, especially a systematic recall error where respondents' likelihood of reporting a deceased child depends on the sex of that child. This section assesses the degree of recall error across the surveys and discusses methods to address it.

NFHS enumerators probe for any missed births, although the method depends on the survey. NFHS-1 probe for each calendar birth interval that is four or more years. NFHS-2 asked for stillbirths, spontaneous and induced abortions and also probed for each calendar birth interval four or more years. NFHS-3 and NFHS-4 did not directly use birth intervals, but asked whether there were any other live births between (name of previous birth) and (name), including any children who died after birth, and asked for births before the birth listed as first birth and after the last birth listed as the last birth.

Probing catches many initially missed births, but systematic recall error based on son preference may still be a problem. First, son preference leads to significantly higher mortality for girls than boys. Secondly, son preference makes it more likely that parents will remember deceased boys than deceased girls. Finally, in the absence of sex-selective abortions, parents with a preference for sons may have the next birth sooner if the last child was a girl than if it was a boy. If this girl subsequently dies, she is more likely to be missed if probing for missed births is only done for long intervals as in NFHS-1 and NFHS-2.

I use two approaches to examine the degree of recall error. The first approach is to test whether the observed sex ratio is significantly different from the natural sex ratio. Prenatal sex determination techniques did not become widely available until the mid-1980s, so any significant deviation from the natural sex ratio before that time is likely the result of recall error. The second approach is to compare births that took place during the same period but where captured in different surveys. Recall error is likely to increase with time, so births and deaths that took place earlier are more likely to be subject to recall error than more recent events.

Table A.1 shows the sex ratios of children recorded as first-born by year of birth, together with tests for whether the observed sex ratio is significantly higher than the natural sex ratio and whether more recent surveys have a higher sex ratio for the cohort than earlier surveys for the same period births. Births are combined into five-year cohorts to achieve sufficient power.

The "first-born" sex ratios illustrate the systematic recall error problem well. In all four surveys around 55 percent of children reported as first-born are boys for the first cohort

Table A.1: Observed Ratio of Boys for Children Listed as First-born by Year of Birth in Five-Year Cohorts

	NFHS-1 1992–1993	NFHS-2 1998–1999	NFHS-3 2005–2006	NFHS-4 2015–2016	Diff. test[a]
1960–1964	0.5430***	.	.	.	
	(0.0007)	(.)	(.)	(.)	
	[2,744]	[.]	[.]	[.]	
1965–1969	0.5295***	0.5500***	.	.	A
	(0.0052)	(0.0004)	(.)	(.)	
	[5,551]	[2,011]	[.]	[.]	
1970–1974	0.5365***	0.5329***	0.5432*	.	
	(0.0000)	(0.0011)	(0.0851)	(.)	
	[7,898]	[5,543]	[521]	[.]	
1975–1979	0.5206*	0.5151	0.5257*	.	
	(0.0577)	(0.3126)	(0.0512)	(.)	
	[8,913]	[7,455]	[3,738]	[.]	
1980–1984	0.5213**	0.5240**	0.5271***	0.5567***	CEF
	(0.0272)	(0.0104)	(0.0048)	(0.0000)	
	[11,241]	[9,618]	[7,646]	[4,135]	
1985–1989	0.5180	0.5134	0.5121	0.5562***	CEF
	(0.1095)	(0.4060)	(0.5080)	(0.0000)	
	[11,293]	[10,912]	[9,345]	[22,243]	
1990–1994	0.5197	0.5193*	0.5176	0.5481***	CEF
	(0.1150)	(0.0643)	(0.1357)	(0.0000)	
	[6,523]	[11,457]	[10,475]	[41,624]	
1995–1999	.	0.5237**	0.4980	0.5322***	EF
	(.)	(0.0171)	(0.9986)	(0.0000)	
	[.]	[8,514]	[10,996]	[50,480]	
2000–2004	.	.	0.5123	0.5214***	F
	(.)	(.)	(0.4924)	(0.0000)	
	[.]	[.]	[10,743]	[56,853]	
2005–2009	.	.	0.5171	0.5182***	
	(.)	(.)	(0.3160)	(0.0017)	
	[.]	[.]	[2,537]	[59,383]	
2010–2016	.	.	.	0.5197***	
	(.)	(.)	(.)	(0.0000)	
	[.]	[.]	[.]	[73,474]	

Note. Sample consists of Hindu women only. First number in cell is ratio of boys to children. Second number, in parentheses, is p-value for the hypothesis that observed sex ratio is greater than 105/205 using a binomial probability test (bitest in Stata 13) with significance levels: * sign. at 10%; ** sign. at 5%; *** sign. at 1%. Third number, in square brackets, is number of observations.

[a] Test (prtest in Stata 13) whether recall error increases with time passed, which would manifest itself in a higher sex ratio for a more recent survey than an earlier for the same cohort. A: Cohort sex ratio significantly larger in NFHS-2 than NFHS-1 at the 10 percent level. B: Cohort sex ratio significantly larger in NFHS-3 than NFHS-1 at the 10 percent level. C: Cohort sex ratio significantly larger in NFHS-4 than NFHS-1 at the 10 percent level. D: Cohort sex ratio significantly larger in NFHS-3 than NFHS-2 at the 10 percent level. E: Cohort sex ratio significantly larger in NFHS-4 than NFHS-2 at the 10 percent level. F: Cohort sex ratio significantly larger in NFHS-4 than NFHS-3 at the 10 percent level.

of births observed. Given that these cohorts cover from 1960-1964 to 1980-1984, which is before sex selection techniques became available in India, the most likely explanation for the skewed sex ratio is that some children listed as first-borns were not, in fact, the first children born in their families. Instead, for a substantial proportion of families, their first-born was a girl who died and went unreported when enumerators asked about birth history.

As expected, the difference between the observed sex ratio and the natural sex ratio is less pronounced the closer to the survey date the cohort is. The observed sex ratio for children born just before the NFHS-1 survey and listed as first-born is 0.517, which is not statistically significantly different from the natural sex ratio. The same general pattern holds for the other three surveys, with cohorts further away from the survey date more likely to have a sex ratio skewed male.

Finally, across surveys, the same cohort tends to show a higher sex ratio the more recent the survey (births in the cohort took place earlier relative to the survey date). Despite this, few cohorts show significantly different sex ratios across surveys, most likely because of a lack of power. The exception is that comparisons involving NFHS-4 are mostly statistically significant since the number of surveyed households in NFHS-4 were much larger than in prior surveys.

The problem with the above approach is that the year of birth is affected by recall error; a second born child listed as first-born is born later than the real first born child. Year of marriage should, however, be affected neither by parental recall error nor the use of sex-selective abortions. Tables A.2 and A.3, therefore, shows sex ratios of children recorded as first-born and second-born by year of parents' marriage, together with tests for whether the observed sex ratio is significantly higher than the natural sex ratio and whether more recent surveys show a higher sex ratio for the cohort than earlier surveys. The basic recall error pattern remains, with women married longer ago more likely to report that their first-born is a boy. Similarly, comparing women married in the same five-year period across surveys shows that women married longer ago are more likely to report having a son.

The relationship between the length of marriage and recall error can also be seen in Figures A.1 and A.2, which show the observed sex ratio for children reported as first born as a function of the duration of marriage at the time of the survey. The solid line is the sex ratio of children reported as first-born by the number of years between the survey and marriage, while the dashed lines indicate the 95 percent confidence interval and the horizontal line the natural sex ratio (approximately 0.512). To ensure sufficient cell sizes I group years into twos. In line with the results from Tables A.2 and A.3, the observed ratio of boys is increasingly above the expected value the longer ago the parents were married.

Table A.2: Observed Ratio of Boys for Children Listed as First-born by Year of Parents' Marriage in Five-Year Cohorts

	NFHS-1 1992–1993	NFHS-2 1998–1999	NFHS-3 2005–2006	NFHS-4 2015–2016	Diff. test[a]
1960–1964	0.5364***	.	.	.	
	(0.0001)	(.)	(.)	(.)	
	[6,298]	[.]	[.]	[.]	
1965–1969	0.5357***	0.5431***	.	.	
	(0.0001)	(0.0000)	(.)	(.)	
	[6,801]	[4,279]	[.]	[.]	
1970–1974	0.5242**	0.5223*	0.5269	.	
	(0.0150)	(0.0526)	(0.1010)	(.)	
	[8,274]	[6,527]	[1,953]	[.]	
1975–1979	0.5269***	0.5203*	0.5314***	0.5617***	CDEF
	(0.0017)	(0.0666)	(0.0019)	(0.0005)	
	[9,956]	[8,602]	[5,749]	[1,127]	
1980–1984	0.5152	0.5133	0.5192	0.5512***	CEF
	(0.2658)	(0.4166)	(0.1023)	(0.0000)	
	[10,894]	[9,805]	[8,237]	[12,033]	
1985–1989	0.5176	0.5210**	0.5094	0.5530***	CEF
	(0.1409)	(0.0339)	(0.7148)	(0.0000)	
	[10,017]	[10,825]	[9,620]	[33,241]	
1990–1994	0.5237	0.5196*	0.5119	0.5405***	CEF
	(0.1460)	(0.0663)	(0.5315)	(0.0000)	
	[2,198]	[10,464]	[10,458]	[45,940]	
1995–1999	.	0.5257**	0.5019	0.5254***	F
	(.)	(0.0292)	(0.9846)	(0.0000)	
	[.]	[5,007]	[10,863]	[52,679]	
2000–2004	.	.	0.5166	0.5207***	
	(.)	(.)	(0.2022)	(0.0000)	
	[.]	[.]	[9,119]	[56,143]	
2005–2009	.	.	.	0.5204***	
	(.)	(.)	(.)	(0.0000)	
	[.]	[.]	[.]	[58,511]	
2010–2016	.	.	.	0.5176***	
	(.)	(.)	(.)	(0.0091)	
	[.]	[.]	[.]	[48,481]	

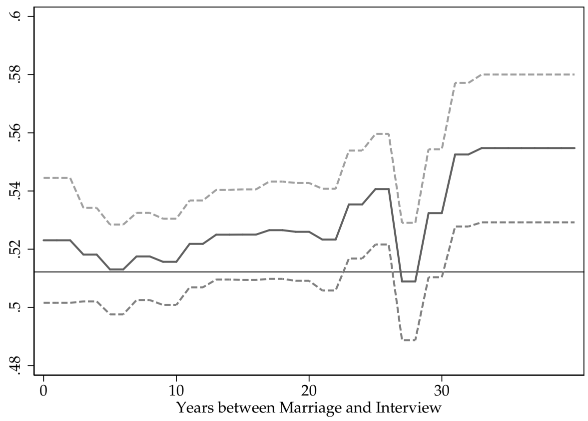
Note. Sample consists of Hindu women only. First number in cell is ratio of boys to children. Second number, in parentheses, is p-value for the hypothesis that observed sex ratio is greater than 105/205 using a binomial probability test (bitest in Stata 13) with significance levels: * sign. at 10%; ** sign. at 5%; *** sign. at 1%. Third number, in square brackets, is number of observations. [a] Test (prtest in Stata 13) whether recall error increases with time passed, which would manifest itself in a higher sex ratio for a more recent survey than an earlier for the same cohort. A: Cohort sex ratio significantly larger in NFHS-2 than NFHS-1 at the 10 percent level. B: Cohort sex ratio significantly larger in NFHS-3 than NFHS-1 at the 10 percent level. C: Cohort sex ratio significantly larger in NFHS-4 than NFHS-1 at the 10 percent level. D: Cohort sex ratio significantly larger in NFHS-3 than NFHS-2 at the 10 percent level. E: Cohort sex ratio significantly larger in NFHS-4 than NFHS-2 at the 10 percent level. F: Cohort sex ratio significantly larger in NFHS-4 than NFHS-3 at the 10 percent level.

Table A.3: Observed Ratio of Boys for Children Listed as Second-born by Year of Parents' Marriage' in Five-Year Cohorts

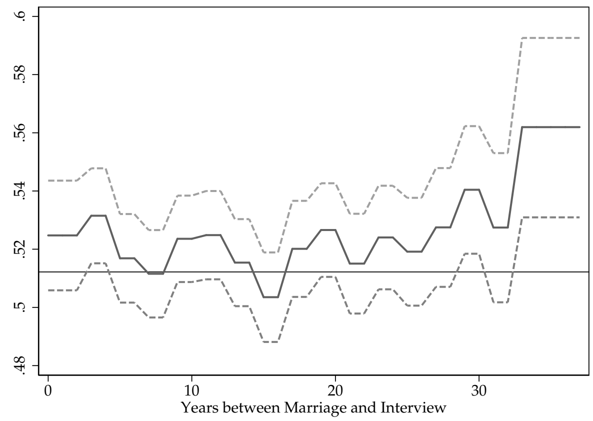
	NFHS-1 1992–1993	NFHS-2 1998–1999	NFHS-3 2005–2006	NFHS-4 2015–2016	Diff. test[a]
1960–1964	0.5264**	.	.	.	
	(0.0135)	(.)	(.)	(.)	
	[6,113]	[.]	[.]	[.]	
1965–1969	0.5269***	0.5378***	.	.	
	(0.0090)	(0.0005)	(.)	(.)	
	[6,571]	[4,163]	[.]	[.]	
1970–1974	0.5192	0.5220*	0.5374**	.	B
	(0.1085)	(0.0619)	(0.0148)	(.)	
	[7,984]	[6,307]	[1,898]	[.]	
1975–1979	0.5147	0.5198*	0.5287***	0.5453**	BCE
	(0.3143)	(0.0850)	(0.0072)	(0.0172)	
	[9,469]	[8,288]	[5,582]	[1,049]	
1980–1984	0.5213**	0.5173	0.5170	0.5346***	CEF
	(0.0348)	(0.1650)	(0.1984)	(0.0000)	
	[9,932]	[9,343]	[7,866]	[11,513]	
1985–1989	0.5133	0.5178	0.5251***	0.5301***	BCE
	(0.4376)	(0.1312)	(0.0074)	(0.0000)	
	[5,901]	[10,036]	[9,035]	[31,639]	
1990–1994	0.4362	0.5197*	0.5256***	0.5274***	ABC
	(0.9737)	(0.0926)	(0.0045)	(0.0000)	
	[149]	[7,918]	[9,555]	[43,344]	
1995–1999	.	0.5630***	0.5312***	0.5230***	
	(.)	(0.0007)	(0.0002)	(0.0000)	
	[.]	[1,016]	[8,940]	[49,053]	
2000–2004	.	.	0.5252*	0.5199***	
	(.)	(.)	(0.0688)	(0.0003)	
	[.]	[.]	[3,307]	[50,804]	
2005–2009	.	.	.	0.5231***	
	(.)	(.)	(.)	(0.0000)	
	[.]	[.]	[.]	[46,164]	
2010–2016	.	.	.	0.5218**	
	(.)	(.)	(.)	(0.0110)	
	[.]	[.]	[.]	[14,370]	

Note. Sample consists of Hindu women only. First number in cell is ratio of boys to children. Second number, in parentheses, is p-value for the hypothesis that observed sex ratio is greater than 105/205 using a binomial probability test (bitest in Stata 13) with significance levels: * sign. at 10%; ** sign. at 5%; *** sign. at 1%. Third number, in square brackets, is number of observations.

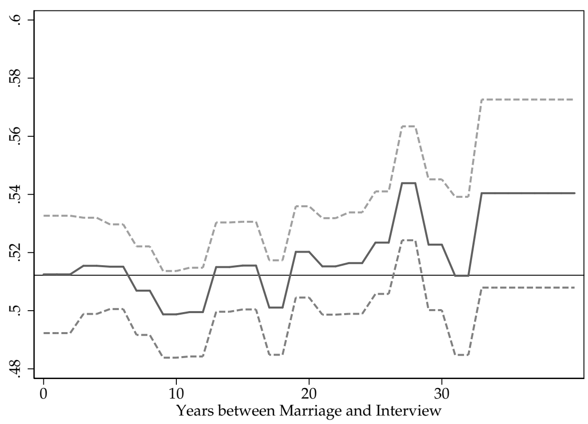
[a] Test (prtest in Stata 13) whether recall error increases with time passed, which would manifest itself in a higher sex ratio for a more recent survey than an earlier for the same cohort. A: Cohort sex ratio significantly larger in NFHS-2 than NFHS-1 at the 10 percent level. B: Cohort sex ratio significantly larger in NFHS-3 than NFHS-1 at the 10 percent level. C: Cohort sex ratio significantly larger in NFHS-4 than NFHS-1 at the 10 percent level. D: Cohort sex ratio significantly larger in NFHS-3 than NFHS-2 at the 10 percent level. E: Cohort sex ratio significantly larger in NFHS-4 than NFHS-2 at the 10 percent level. F: Cohort sex ratio significantly larger in NFHS-4 than NFHS-3 at the 10 percent level.



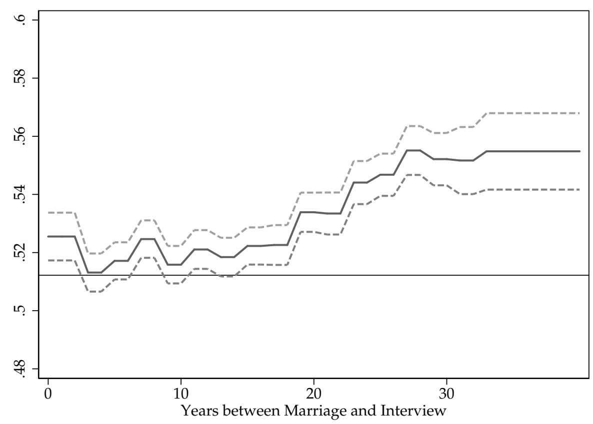
(a) NFHS-1



(b) NFHS-2



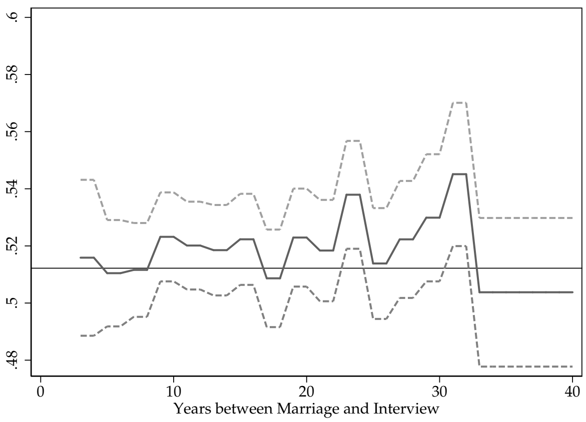
(c) NFHS-3



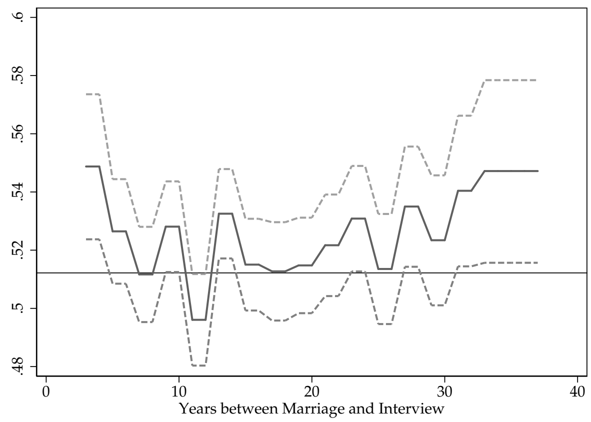
(d) NFHS-3

Figure A.1: Ratio of Boys for "First" Births by Survey Round

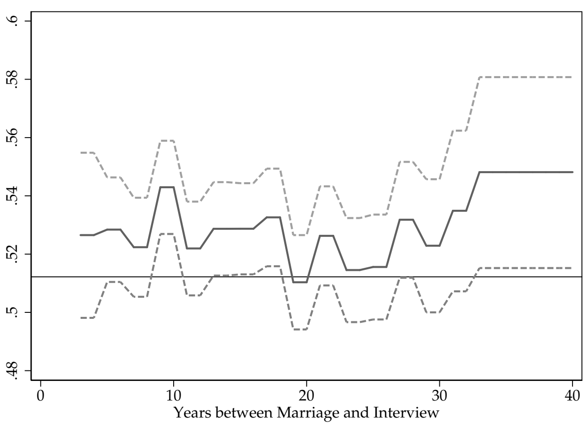
The increasingly unequal sex ratio with increasing marriage duration suggests that a solution to the recall error problem is to drop observations for women who were married "too far" from the survey year. The main problem is establishing what the best cut-off point should be, with the trade-off between retaining enough observations and the correctness of the information. As Tables A.2 and A.3 show, there are differences in recall error across the three surveys and between the two birth orders, although this may be the result of differences in the number of observations across surveys. Furthermore, the recall error pattern is not entirely consistent across observed birth orders. Since most of the surveys start showing significantly biased sex ratio from around 22 years of marriage on, I drop all observations where the marriage took place 22 years or more.



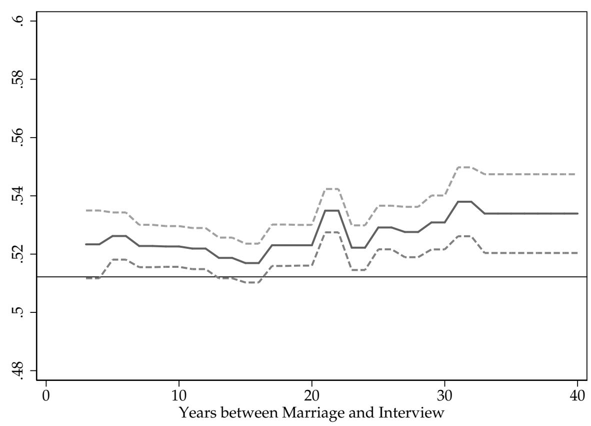
(a) NFHS-1



(b) NFHS-2



(c) NFHS-3



(d) NFHS-3

Figure A.2: Ratio of Boys for "Second" Births by Survey Round

B Descriptive Statistics

Table B.1: Descriptive Statistics by Education Level and Beginning of Spell

		No Education				1–7 Years of Education				8+ Years of Education			
		1972–1984	1985–1994	1995–2004	2005–2016	1972–1984	1985–1994	1995–2004	2005–2016	1972–1984	1985–1994	1995–2004	2005–2016
Second Spell	Boy born	0.504	0.452	0.468	0.413	0.493	0.450	0.460	0.380	0.476	0.419	0.426	0.301
		(0.500)	(0.498)	(0.499)	(0.492)	(0.500)	(0.498)	(0.498)	(0.485)	(0.499)	(0.493)	(0.495)	(0.459)
	Girl born	0.464	0.421	0.440	0.380	0.474	0.423	0.426	0.353	0.452	0.370	0.374	0.271
		(0.499)	(0.494)	(0.496)	(0.485)	(0.499)	(0.494)	(0.494)	(0.478)	(0.498)	(0.483)	(0.484)	(0.444)
	Censored	0.032	0.127	0.092	0.207	0.032	0.127	0.114	0.266	0.072	0.211	0.200	0.428
		(0.175)	(0.333)	(0.289)	(0.405)	(0.177)	(0.333)	(0.317)	(0.442)	(0.259)	(0.408)	(0.400)	(0.495)
	1 boy	0.523	0.515	0.518	0.516	0.521	0.514	0.522	0.519	0.518	0.520	0.522	0.519
		(0.499)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
	1 girl	0.477	0.485	0.482	0.484	0.479	0.486	0.478	0.481	0.482	0.480	0.478	0.481
		(0.499)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
	Urban	0.169	0.175	0.155	0.122	0.350	0.341	0.259	0.192	0.684	0.622	0.482	0.350
		(0.375)	(0.380)	(0.362)	(0.327)	(0.477)	(0.474)	(0.438)	(0.394)	(0.465)	(0.485)	(0.500)	(0.477)
	Age	17.773	18.274	19.432	20.740	18.637	19.141	19.485	20.527	21.068	21.545	21.440	21.963
		(2.739)	(3.005)	(3.410)	(3.520)	(2.889)	(3.176)	(3.284)	(3.271)	(3.430)	(3.612)	(3.726)	(3.643)
	Owns land	0.602	0.573	0.510	0.482	0.506	0.493	0.474	0.468	0.321	0.371	0.418	0.478
		(0.509)	(0.503)	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)	(0.499)	(0.467)	(0.483)	(0.493)	(0.500)
	Sched. caste/tribe	0.347	0.391	0.444	0.486	0.154	0.219	0.337	0.416	0.063	0.113	0.193	0.262
		(0.476)	(0.488)	(0.497)	(0.500)	(0.361)	(0.414)	(0.473)	(0.493)	(0.243)	(0.317)	(0.395)	(0.440)
	3 months periods	163,580	232,552	392,924	244,364	59,182	106,165	255,925	229,242	71,133	177,898	564,921	670,849
	Women	18,650	27,563	43,952	29,527	6,889	12,191	27,225	26,446	6,884	16,428	48,826	68,402
Third Spell	Boy born	0.492	0.428	0.421	0.341	0.464	0.397	0.356	0.273	0.374	0.272	0.262	0.169
		(0.500)	(0.495)	(0.494)	(0.474)	(0.499)	(0.489)	(0.479)	(0.445)	(0.484)	(0.445)	(0.440)	(0.375)
	Girl born	0.455	0.398	0.386	0.314	0.437	0.360	0.325	0.236	0.332	0.222	0.211	0.133
		(0.498)	(0.489)	(0.487)	(0.464)	(0.496)	(0.480)	(0.469)	(0.424)	(0.471)	(0.416)	(0.408)	(0.340)
	Censored	0.053	0.174	0.193	0.345	0.100	0.243	0.319	0.492	0.293	0.506	0.527	0.697
		(0.224)	(0.379)	(0.395)	(0.475)	(0.300)	(0.429)	(0.466)	(0.500)	(0.455)	(0.500)	(0.499)	(0.459)
	2 boys	0.275	0.256	0.251	0.249	0.251	0.246	0.241	0.239	0.270	0.244	0.242	0.226
		(0.447)	(0.436)	(0.434)	(0.432)	(0.434)	(0.431)	(0.427)	(0.426)	(0.444)	(0.430)	(0.428)	(0.418)
	1 boy, 1 girl	0.489	0.502	0.504	0.499	0.506	0.502	0.509	0.505	0.486	0.510	0.523	0.522
		(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)	(0.500)
	2 girls	0.235	0.243	0.245	0.252	0.243	0.252	0.251	0.256	0.244	0.246	0.235	0.252
		(0.424)	(0.429)	(0.430)	(0.434)	(0.429)	(0.434)	(0.434)	(0.436)	(0.430)	(0.431)	(0.424)	(0.434)
	Urban	0.173	0.171	0.159	0.121	0.365	0.341	0.263	0.192	0.687	0.634	0.469	0.350
		(0.379)	(0.376)	(0.365)	(0.326)	(0.482)	(0.474)	(0.440)	(0.394)	(0.464)	(0.482)	(0.499)	(0.477)
	Age	19.987	20.593	21.641	23.055	20.839	21.367	21.735	22.821	23.017	23.792	23.624	24.391
		(2.896)	(3.150)	(3.490)	(3.665)	(2.954)	(3.228)	(3.372)	(3.441)	(3.430)	(3.756)	(3.822)	(3.949)
	Owns land	0.607	0.581	0.523	0.489	0.507	0.509	0.493	0.475	0.325	0.377	0.447	0.486
		(0.506)	(0.497)	(0.499)	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)	(0.468)	(0.485)	(0.497)	(0.500)
	Sched. caste/tribe	0.339	0.392	0.444	0.479	0.154	0.218	0.334	0.410	0.064	0.109	0.200	0.254
		(0.473)	(0.488)	(0.497)	(0.500)	(0.361)	(0.413)	(0.472)	(0.492)	(0.244)	(0.312)	(0.400)	(0.435)
	3 months periods	105,997	194,166	295,808	267,436	42,088	84,124	182,266	209,481	55,416	132,218	357,899	481,638
	Women	12,119	22,858	31,218	29,446	4,384	8,785	16,346	20,850	3,870	9,632	23,808	39,102
Fourth Spell	Boy born	0.483	0.390	0.357	0.286	0.414	0.358	0.293	0.222	0.325	0.239	0.236	0.155
		(0.500)	(0.488)	(0.479)	(0.452)	(0.493)	(0.479)	(0.455)	(0.416)	(0.469)	(0.427)	(0.424)	(0.361)
	Girl born	0.424	0.367	0.327	0.266	0.405	0.305	0.254	0.199	0.308	0.204	0.176	0.119
		(0.494)	(0.482)	(0.469)	(0.442)	(0.491)	(0.461)	(0.435)	(0.400)	(0.462)	(0.403)	(0.381)	(0.324)
	Censored	0.093	0.243	0.316	0.448	0.180	0.337	0.453	0.578	0.367	0.557	0.588	0.726
		(0.290)	(0.429)	(0.465)	(0.497)	(0.385)	(0.473)	(0.498)	(0.494)	(0.482)	(0.497)	(0.492)	(0.446)
	3 boys	0.136	0.123	0.115	0.105	0.110	0.107	0.099	0.087	0.108	0.100	0.087	0.073
		(0.343)	(0.329)	(0.319)	(0.307)	(0.312)	(0.310)	(0.299)	(0.281)	(0.310)	(0.300)	(0.282)	(0.260)
	2 boys, 1 girl	0.372	0.355	0.352	0.335	0.343	0.329	0.327	0.314	0.359	0.307	0.320	0.289
		(0.483)	(0.478)	(0.478)	(0.472)	(0.475)	(0.470)	(0.469)	(0.464)	(0.480)	(0.461)	(0.466)	(0.453)
	1 boys, 2 girls	0.362	0.392	0.397	0.407	0.400	0.407	0.413	0.423	0.392	0.437	0.441	0.459
		(0.481)	(0.488)	(0.489)	(0.491)	(0.490)	(0.491)	(0.492)	(0.494)	(0.488)	(0.496)	(0.497)	(0.498)
	3 girls	0.130	0.130	0.137	0.153	0.147	0.157	0.162	0.176	0.141	0.156	0.152	0.179
		(0.337)	(0.336)	(0.343)	(0.360)	(0.354)	(0.363)	(0.368)	(0.381)	(0.348)	(0.363)	(0.359)	(0.384)
	Urban	0.168	0.168	0.159	0.114	0.358	0.330	0.258	0.189	0.668	0.583	0.404	0.286
		(0.374)	(0.374)	(0.365)	(0.318)	(0.479)	(0.470)	(0.438)	(0.392)	(0.471)	(0.493)	(0.491)	(0.452)
	Age	21.948	22.777	23.583	25.284	22.644	23.444	23.821	24.893	24.280	25.411	25.038	25.979
		(3.019)	(3.296)	(3.497)	(3.799)	(2.910)	(3.385)	(3.455)	(3.523)	(3.179)	(3.712)	(3.776)	(3.909)
	Owns land	0.615	0.594	0.542	0.497	0.522	0.537	0.508	0.480	0.340	0.422	0.492	0.520
		(0.509)	(0.496)	(0.498)	(0.500)	(0.500)	(0.499)	(0.500)	(0.500)	(0.474)	(0.494)	(0.500)	(0.500)
	Sched. caste/tribe	0.333	0.402	0.451	0.481	0.148	0.219	0.339	0.414	0.082	0.112	0.228	0.285
		(0.471)	(0.490)	(0.498)	(0.500)	(0.355)	(0.413)	(0.473)	(0.493)	(0.275)	(0.315)	(0.419)	(0.451)
	3 months periods	55,942	140,909	162,841	217,023	20,121	46,646	75,858	110,944	17,311	43,997	89,486	145,548
	Women	6,421	16,278	17,105	22,496	2,008	4,771	6,496	10,620	1,242	3,363	6,140	11,886

Note. Means without parentheses and standard deviation in parentheses. Interactions between variables, baseline hazard dummies and squares not shown.

C Duration Results Tables

The first set of tables, Tables C.1, C.2, and C.3, show predicted average birth intervals, sex ratios, and probabilities of having a birth by decade, spell, and sex composition for the three education levels separated by the area of residence, together with standard errors for all three outcomes. The standard errors are based on bootstrapping for all three measures, where the model is repeatedly estimated using resampling with replacement.

I also show whether durations for sex composition other than only girls are statistically significantly different from the duration with only girls based on bootstrapped differences. The cleanest test is comparing durations after only boys with durations after only girls, but the number of births to women with only sons becomes small in the later periods. Hence, it is possible to have substantial differences in spacing that are not statistically significant because of low power, especially for the third and fourth spell.

Each predicted percent of boys is tested against the natural percentage of boys using the bootstrapped standard errors. The natural sex ratio is approximately 105 boys to 100 girls or 51.2% (Ben-Porath and Welch, 1976; Jacobsen, Moller and Mouritsen, 1999; Pörtner, 2015). The predicted percentage boys may differ from the natural rate because of natural variation, any remaining recall error not corrected for, or sex selection.

Table C.1: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with No Education

		1972–1984			1985–1994			1995–2004			2005–2016		
Spell	Composition of prior Children	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]
							Urban						
2	1 girl	21.7	52.2	0.970	22.5	52.5	0.953	23.8	51.7	0.950	24.1	56.0***	0.932
		(0.4)	(1.3)	(0.004)	(0.3)	(1.0)	(0.005)	(0.3)	(0.9)	(0.005)	(0.5)	(1.2)	(0.009)
	1 boy	23.2***	52.9	0.961	24.3***	50.8	0.959	24.4	52.1	0.951	24.1	50.3	0.905
		(0.4)	(1.3)	(0.005)	(0.4)	(1.2)	(0.004)	(0.3)	(0.9)	(0.004)	(0.5)	(1.2)	(0.008)
3	2 girls	23.3	51.4	0.968	23.1	51.5	0.967	25.3	52.4	0.932	27.3	52.6	0.895
		(0.7)	(2.2)	(0.009)	(0.6)	(1.6)	(0.007)	(0.5)	(1.5)	(0.008)	(0.9)	(2.0)	(0.014)
	1 boy, 2 girl	22.3	54.6**	0.946	24.4*	50.7	0.925	25.6	52.2	0.875	25.0**	53.8*	0.745
		(0.5)	(1.5)	(0.007)	(0.4)	(1.3)	(0.007)	(0.4)	(1.2)	(0.008)	(0.7)	(1.5)	(0.014)
	2 boys	23.5	48.6	0.962	24.9*	48.3	0.916	25.5	48.2*	0.854	27.5	51.6	0.752
		(0.7)	(2.1)	(0.008)	(0.7)	(1.9)	(0.013)	(0.6)	(1.6)	(0.011)	(1.1)	(2.2)	(0.020)
4	3 girls	20.9	57.2	0.977	25.0	51.3	0.955	26.1	54.4	0.945	29.2	55.7	0.923
		(1.3)	(4.1)	(0.016)	(0.9)	(2.5)	(0.013)	(1.0)	(2.9)	(0.016)	(1.0)	(3.1)	(0.016)
	1 boy, 2 girls	23.3	54.9	0.954	25.7	54.4*	0.940	27.5	52.9	0.850	30.8	49.6	0.760
		(0.8)	(2.4)	(0.011)	(0.6)	(1.9)	(0.009)	(0.8)	(1.8)	(0.016)	(0.9)	(2.1)	(0.018)
	2 boys, 1 girl	25.5***	54.8	0.919	29.3***	50.1	0.909	30.0***	55.0*	0.760	32.2*	54.8	0.569
		(0.9)	(2.6)	(0.017)	(0.7)	(2.0)	(0.012)	(0.9)	(2.2)	(0.018)	(1.3)	(2.8)	(0.023)
	3 boys	26.6***	60.6**	0.965	29.6***	57.1*	0.912	26.5	51.2	0.779	31.9	47.8	0.703
		(1.6)	(3.7)	(0.018)	(1.1)	(3.5)	(0.019)	(1.5)	(3.5)	(0.031)	(2.1)	(4.1)	(0.037)
							Rural						
2	1 girl	22.4	51.2	0.974	23.4	52.1**	0.965	24.0	51.7	0.969	24.0	51.7	0.959
		(0.2)	(0.6)	(0.002)	(0.2)	(0.4)	(0.002)	(0.1)	(0.4)	(0.001)	(0.2)	(0.5)	(0.003)
	1 boy	23.1***	52.7**	0.968	24.1***	51.4	0.962	24.3*	51.1	0.960	24.5**	52.2*	0.936
		(0.2)	(0.6)	(0.002)	(0.2)	(0.5)	(0.002)	(0.1)	(0.4)	(0.002)	(0.2)	(0.5)	(0.003)
3	2 girls	21.2	49.6	0.974	23.8	53.7***	0.962	24.1	53.9***	0.965	24.8	52.9**	0.942
		(0.3)	(1.1)	(0.003)	(0.3)	(0.7)	(0.004)	(0.2)	(0.7)	(0.002)	(0.2)	(0.7)	(0.005)
	1 boy, 2 girl	22.8***	53.0**	0.962	23.9	51.7	0.950	24.6*	52.4**	0.913	26.1***	51.8	0.851
		(0.2)	(0.7)	(0.003)	(0.2)	(0.6)	(0.003)	(0.2)	(0.5)	(0.003)	(0.2)	(0.6)	(0.004)
	2 boys	22.7***	51.9	0.957	25.0***	51.3	0.933	25.4***	50.7	0.881	26.9***	50.9	0.795
		(0.3)	(1.0)	(0.004)	(0.3)	(0.9)	(0.005)	(0.2)	(0.7)	(0.005)	(0.3)	(0.7)	(0.008)
4	3 girls	22.1	54.5	0.977	24.2	50.5	0.977	24.4	52.8	0.971	27.0	54.0***	0.955
		(0.6)	(2.0)	(0.006)	(0.4)	(1.2)	(0.004)	(0.4)	(1.2)	(0.004)	(0.3)	(1.0)	(0.005)
	1 boy, 2 girls	23.3*	52.2	0.976	26.4***	53.1**	0.958	26.8***	52.8*	0.911	29.5***	52.2	0.870
		(0.4)	(1.1)	(0.004)	(0.3)	(0.9)	(0.003)	(0.2)	(0.8)	(0.005)	(0.3)	(0.8)	(0.005)
	2 boys, 1 girl	23.7**	53.2*	0.958	27.8***	49.8	0.926	29.0***	51.1	0.822	33.2***	50.5	0.694
		(0.4)	(1.2)	(0.006)	(0.3)	(0.9)	(0.005)	(0.3)	(0.9)	(0.007)	(0.4)	(0.9)	(0.009)
	3 boys	24.3**	51.5	0.962	28.3***	50.7	0.924	29.2***	52.0	0.851	32.7***	51.6	0.753
		(0.6)	(2.1)	(0.009)	(0.5)	(1.3)	(0.010)	(0.6)	(1.8)	(0.012)	(0.7)	(1.7)	(0.015)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table C.2: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with One to Seven Years of Education

		1972–1984			1985–1994			1995–2004			2005–2016		
Spell	Composition of prior Children	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]
								Urban					
	1 girl	20.4	51.5	0.970	23.4	52.6	0.942	24.9	53.2**	0.928	26.3	52.7	0.909
2		(0.4)	(1.5)	(0.005)	(0.4)	(1.2)	(0.007)	(0.3)	(0.9)	(0.005)	(0.5)	(1.3)	(0.009)
	1 boy	22.4***	51.3	0.961	24.4	51.3	0.936	25.2	49.9	0.922	27.7**	51.0	0.862
		(0.5)	(1.6)	(0.006)	(0.4)	(1.1)	(0.006)	(0.3)	(1.0)	(0.006)	(0.6)	(1.2)	(0.009)
	2 girls	21.7	56.0	0.955	25.7	52.3	0.928	28.2	56.6***	0.890	30.4	56.5**	0.839
		(0.8)	(3.1)	(0.012)	(0.9)	(2.2)	(0.012)	(0.8)	(1.7)	(0.013)	(0.8)	(2.2)	(0.017)
3	1 boy, 2 girl	24.1**	53.0	0.889	26.2	53.8*	0.836	26.6	51.6	0.728	27.5**	55.7***	0.608
		(0.6)	(1.7)	(0.011)	(0.6)	(1.5)	(0.013)	(0.6)	(1.2)	(0.012)	(0.9)	(1.7)	(0.017)
	2 boys	23.1	48.2	0.894	27.2	50.8	0.843	26.8	49.3	0.702	29.3	52.2	0.567
		(0.8)	(2.3)	(0.016)	(0.8)	(2.2)	(0.017)	(0.8)	(2.4)	(0.017)	(1.3)	(2.4)	(0.020)
	3 girls	24.1	49.8	0.944	26.3	55.9	0.922	31.9	61.6***	0.877	30.7	57.7*	0.845
		(1.8)	(5.1)	(0.030)	(1.3)	(3.5)	(0.021)	(1.3)	(3.5)	(0.027)	(1.3)	(3.6)	(0.029)
	1 boy, 2 girls	24.9	54.2	0.885	29.3*	56.4**	0.792	29.3	55.3*	0.657	29.4	51.3	0.579
4		(1.1)	(3.0)	(0.021)	(0.9)	(2.6)	(0.021)	(1.0)	(2.4)	(0.026)	(1.1)	(2.7)	(0.023)
	2 boys, 1 girl	26.4	50.7	0.851	31.7***	56.0	0.731	30.5	55.3	0.580	36.2**	49.2	0.437
		(1.4)	(3.6)	(0.031)	(1.2)	(3.2)	(0.026)	(1.4)	(3.0)	(0.027)	(1.8)	(4.1)	(0.027)
	3 boys	27.2	55.0	0.738	29.7*	41.7**	0.855	29.9	43.1*	0.693	36.8*	60.1	0.542
		(3.5)	(6.7)	(0.068)	(1.6)	(4.5)	(0.030)	(2.3)	(4.5)	(0.043)	(3.2)	(6.7)	(0.053)
								Rural					
	1 girl	21.9	51.6	0.977	23.3	51.4	0.965	24.5	53.3***	0.963	25.4	52.8**	0.950
2		(0.3)	(1.1)	(0.003)	(0.3)	(0.9)	(0.003)	(0.2)	(0.5)	(0.002)	(0.3)	(0.7)	(0.004)
	1 boy	23.4***	50.0	0.971	24.0*	51.5	0.954	24.9	51.1	0.945	26.3***	50.5	0.908
		(0.3)	(0.9)	(0.004)	(0.3)	(0.9)	(0.004)	(0.2)	(0.5)	(0.002)	(0.2)	(0.6)	(0.004)
	2 girls	20.6	50.6	0.966	22.4	54.1**	0.937	25.7	53.6**	0.934	27.5	55.5***	0.892
		(0.5)	(1.9)	(0.007)	(0.4)	(1.5)	(0.008)	(0.4)	(1.0)	(0.005)	(0.4)	(1.0)	(0.007)
3	1 boy, 2 girl	23.3***	51.4	0.928	25.3***	51.7	0.886	25.8	52.5	0.791	28.1	53.6**	0.705
		(0.5)	(1.3)	(0.008)	(0.4)	(1.3)	(0.007)	(0.3)	(0.8)	(0.006)	(0.4)	(1.0)	(0.008)
	2 boys	25.3***	49.6	0.928	26.0***	50.9	0.864	26.4	49.5	0.740	28.3	49.5	0.631
		(0.8)	(1.9)	(0.011)	(0.7)	(1.6)	(0.012)	(0.5)	(1.1)	(0.010)	(0.6)	(1.4)	(0.011)
	3 girls	22.6	49.5	0.983	26.0	54.2	0.962	28.5	55.5**	0.947	30.4	57.7***	0.920
		(1.1)	(3.7)	(0.011)	(0.7)	(2.7)	(0.009)	(0.7)	(1.8)	(0.009)	(0.5)	(1.5)	(0.011)
	1 boy, 2 girls	25.4**	50.0	0.930	27.9**	55.1**	0.893	29.3	52.9	0.755	31.7*	51.9	0.702
4		(0.8)	(2.4)	(0.014)	(0.6)	(1.6)	(0.011)	(0.7)	(1.4)	(0.014)	(0.5)	(1.4)	(0.013)
	2 boys, 1 girl	27.6***	46.5*	0.885	30.1***	51.0	0.846	30.7**	52.1	0.597	35.0***	52.4	0.541
		(0.9)	(2.7)	(0.020)	(0.8)	(2.0)	(0.016)	(0.8)	(1.8)	(0.016)	(0.7)	(1.8)	(0.014)
	3 boys	24.7	55.0	0.939	28.9**	56.7	0.883	32.6***	51.6	0.686	33.5**	44.1*	0.546
		(1.4)	(4.5)	(0.022)	(1.2)	(3.4)	(0.024)	(1.3)	(3.8)	(0.027)	(1.4)	(3.7)	(0.027)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table C.3: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with Eight or More Years of Education

		1972–1984			1985–1994			1995–2004			2005–2016		
Spell	Composition of prior Children	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]
							Urban						
	1 girl	24.9	52.1	0.925	29.5	55.2***	0.889	31.2	58.0***	0.866	33.6	56.1***	0.820
2		(0.4)	(1.1)	(0.005)	(0.3)	(0.8)	(0.005)	(0.2)	(0.5)	(0.003)	(0.3)	(0.7)	(0.005)
	1 boy	25.9*	51.9	0.917	29.8	52.1	0.844	31.2	49.9**	0.823	34.2	49.6**	0.720
		(0.4)	(1.2)	(0.005)	(0.3)	(0.9)	(0.005)	(0.2)	(0.5)	(0.003)	(0.4)	(0.8)	(0.006)
	2 girls	26.8	55.4*	0.838	32.9	63.1***	0.708	34.2	64.9***	0.712	38.3	66.3***	0.631
		(0.8)	(2.1)	(0.014)	(0.7)	(1.6)	(0.013)	(0.6)	(1.4)	(0.009)	(0.7)	(1.3)	(0.012)
3	1 boy, 2 girl	27.5	53.8*	0.664	30.0***	53.4*	0.486	30.5***	53.2*	0.410	32.7***	55.6***	0.272
		(0.8)	(1.5)	(0.013)	(0.6)	(1.2)	(0.011)	(0.5)	(1.2)	(0.008)	(0.8)	(1.3)	(0.007)
	2 boys	28.5	49.8	0.622	31.4	51.6	0.476	29.5***	45.1***	0.393	34.6**	48.6	0.269
		(1.0)	(2.5)	(0.018)	(1.1)	(2.4)	(0.015)	(0.8)	(1.6)	(0.011)	(1.2)	(2.4)	(0.010)
	3 girls	27.4	58.4	0.829	35.0	67.4***	0.803	35.2	63.2***	0.787	38.9	63.0***	0.722
		(1.8)	(5.4)	(0.037)	(1.3)	(3.4)	(0.025)	(1.1)	(3.5)	(0.025)	(1.1)	(3.1)	(0.027)
	1 boy, 2 girls	26.6	50.5	0.607	32.7	52.7	0.488	33.7	62.2***	0.443	36.3	62.2***	0.301
4		(1.6)	(3.6)	(0.028)	(1.2)	(3.0)	(0.021)	(1.2)	(2.9)	(0.017)	(1.5)	(2.8)	(0.014)
	2 boys, 1 girl	27.5	52.5	0.608	30.9**	46.4	0.452	34.3	50.1	0.285	34.3*	50.9	0.202
		(1.5)	(4.2)	(0.032)	(1.7)	(3.6)	(0.024)	(1.8)	(4.2)	(0.018)	(2.4)	(4.5)	(0.015)
	3 boys	28.1	57.5	0.654	32.9	58.7	0.461	31.4	44.4	0.432	38.9	55.0	0.299
		(3.0)	(7.3)	(0.064)	(2.9)	(6.1)	(0.047)	(2.5)	(6.6)	(0.034)	(3.7)	(8.5)	(0.037)
							Rural						
	1 girl	23.9	51.8	0.968	25.9	53.0*	0.946	27.0	55.1***	0.936	29.1	55.3***	0.910
2		(0.5)	(1.5)	(0.006)	(0.4)	(1.1)	(0.005)	(0.2)	(0.5)	(0.003)	(0.2)	(0.5)	(0.003)
	1 boy	23.9	48.0**	0.944	26.0	51.1	0.907	27.0	50.6	0.889	29.4	49.4***	0.813
		(0.5)	(1.5)	(0.007)	(0.4)	(1.0)	(0.006)	(0.2)	(0.5)	(0.003)	(0.2)	(0.5)	(0.004)
	2 girls	25.5	54.0	0.925	28.5	57.4***	0.892	29.0	59.5***	0.857	33.0	60.2***	0.801
		(1.1)	(2.9)	(0.016)	(0.9)	(1.9)	(0.015)	(0.5)	(1.0)	(0.006)	(0.4)	(0.8)	(0.006)
3	1 boy, 2 girl	25.2	53.7	0.807	26.7	54.4**	0.676	27.4**	54.5***	0.592	29.2***	53.6***	0.440
		(0.9)	(2.1)	(0.018)	(0.7)	(1.5)	(0.013)	(0.4)	(0.9)	(0.007)	(0.5)	(0.9)	(0.005)
	2 boys	26.4	47.0	0.790	26.4	48.6	0.670	27.5**	49.4	0.548	30.4***	49.1	0.401
		(1.3)	(3.1)	(0.020)	(1.1)	(2.4)	(0.020)	(0.5)	(1.4)	(0.011)	(0.8)	(1.4)	(0.010)
	3 girls	22.8	48.5	0.979	32.5	62.1**	0.864	32.3	62.1***	0.869	33.4	59.5***	0.826
		(2.2)	(7.3)	(0.025)	(1.3)	(4.6)	(0.026)	(0.9)	(2.1)	(0.017)	(0.5)	(1.8)	(0.014)
	1 boy, 2 girls	28.9**	44.1	0.866	31.6	51.1	0.742	29.7**	55.0**	0.589	34.7	55.1**	0.458
4		(1.7)	(4.4)	(0.034)	(1.0)	(2.7)	(0.023)	(0.7)	(1.9)	(0.017)	(0.7)	(1.7)	(0.013)
	2 boys, 1 girl	31.4***	51.0	0.751	33.9	53.1	0.592	31.7	52.9	0.473	38.0***	49.8	0.355
		(2.1)	(5.4)	(0.043)	(1.5)	(4.0)	(0.035)	(1.2)	(2.5)	(0.019)	(1.2)	(2.3)	(0.015)
	3 boys	29.4*	57.8	0.830	30.7	41.7	0.596	33.1	57.9	0.561	35.2	60.5**	0.427
		(3.3)	(8.4)	(0.067)	(2.8)	(7.5)	(0.057)	(2.2)	(4.7)	(0.034)	(1.8)	(4.6)	(0.026)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table C.4: Estimated 25th, 50th, and 75th Percentile Durations for Women with No Education

		1972–1984			1985–1994			1995–2004			2005–2016		
		Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
Spell	Composition of Prior Children	25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
							Urban						
	1 girl	11.8	17.6	28.5	11.7	18.4	29.2	12.1	19.0	30.8	12.4	19.7	31.7
2		(0.4)	(0.3)	(0.6)	(0.3)	(0.3)	(0.5)	(0.2)	(0.3)	(0.5)	(0.4)	(0.5)	(0.8)
	1 boy	12.6*	18.9***	29.2	12.5**	20.1***	32.1***	12.3	19.6	32.3**	12.6	20.1	31.5
		(0.3)	(0.4)	(0.5)	(0.3)	(0.3)	(0.6)	(0.2)	(0.3)	(0.5)	(0.3)	(0.5)	(0.8)
	2 girls	11.8	19.1	30.9	11.9	18.5	30.0	12.6	20.1	32.8	13.6	22.0	36.4
		(0.7)	(0.7)	(1.2)	(0.5)	(0.5)	(1.0)	(0.4)	(0.5)	(1.0)	(0.5)	(0.8)	(1.8)
3	1 boy, 1 girl	12.5	18.3	28.2*	13.3***	19.8**	30.8	13.3	20.4	32.4	12.9	20.1**	32.9
		(0.3)	(0.4)	(0.7)	(0.3)	(0.4)	(0.7)	(0.2)	(0.4)	(0.7)	(0.4)	(0.5)	(1.2)
	2 boys	12.9	19.0	30.6	13.4**	21.3***	32.0	13.3	21.0	33.3	13.8	22.8	35.1
		(0.4)	(0.7)	(1.2)	(0.4)	(0.8)	(1.0)	(0.4)	(0.7)	(0.9)	(0.5)	(1.0)	(1.8)
	3 girls	9.5	17.8	25.4	12.0	20.2	31.9	11.7	20.7	34.1	14.2	23.2	40.2
		(1.2)	(0.8)	(1.7)	(0.9)	(0.7)	(1.8)	(1.2)	(0.8)	(2.2)	(0.9)	(1.0)	(2.1)
	1 boy, 2 girls	10.6	18.9	28.1	11.1	20.3	33.7	12.4	21.1	35.1	14.0	23.2	43.6
4		(0.9)	(0.6)	(1.3)	(0.6)	(0.5)	(1.4)	(0.8)	(0.6)	(2.3)	(0.8)	(0.7)	(2.4)
	2 boys, 1 girl	11.4	20.0**	31.4**	13.7	23.0***	40.5***	13.5	22.6*	41.8**	15.1	24.0	46.7
		(1.1)	(0.7)	(2.0)	(0.7)	(0.6)	(1.4)	(0.9)	(0.7)	(2.4)	(0.9)	(0.9)	(3.5)
	3 boys	12.4	21.5**	35.8***	14.4	23.4**	40.9***	11.0	20.2	31.8	15.9	24.0	45.0
		(1.8)	(1.5)	(2.9)	(1.1)	(1.1)	(2.2)	(1.2)	(0.9)	(3.9)	(1.3)	(1.5)	(5.8)
							Rural						
	1 girl	12.6	18.6	28.4	12.8	19.4	30.0	13.0	19.7	30.7	12.9	19.7	30.6
2		(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.3)	(0.1)	(0.1)	(0.2)	(0.1)	(0.1)	(0.2)
	1 boy	13.0**	19.6***	29.6***	13.1**	20.1***	30.9***	13.0	19.8	31.3**	13.2*	20.1*	31.7***
		(0.1)	(0.2)	(0.2)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.2)	(0.1)	(0.2)	(0.3)
	2 girls	11.9	17.8	27.3	13.1	19.9	30.5	13.3	19.9	31.2	13.5	20.3	31.9
		(0.3)	(0.3)	(0.4)	(0.2)	(0.3)	(0.4)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.3)
3	1 boy, 1 girl	13.0***	19.0***	28.6**	13.1	19.8	30.7	13.4	20.0	31.7	14.0**	21.1**	33.4***
		(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.4)
	2 boys	12.9***	19.0***	28.8**	13.5	20.8**	32.2***	13.8**	20.9***	32.1*	14.3***	21.9***	34.5***
		(0.2)	(0.3)	(0.4)	(0.2)	(0.3)	(0.5)	(0.1)	(0.2)	(0.4)	(0.2)	(0.3)	(0.5)
	3 girls	9.9	18.4	27.4	11.4	20.1	31.7	11.3	19.9	31.2	13.6	21.8	35.6
		(0.7)	(0.4)	(0.8)	(0.4)	(0.3)	(0.7)	(0.4)	(0.3)	(0.7)	(0.4)	(0.2)	(0.6)
	1 boy, 2 girls	10.7	19.2*	29.4*	13.1***	21.3***	34.6***	12.6**	21.0***	34.2***	14.3	22.8***	40.2***
4		(0.3)	(0.3)	(0.7)	(0.3)	(0.2)	(0.5)	(0.3)	(0.2)	(0.7)	(0.3)	(0.2)	(0.7)
	2 boys, 1 girl	11.2*	19.3*	28.8	13.2***	22.0***	37.3***	13.1***	22.1***	39.2***	16.0***	25.0***	48.5***
		(0.4)	(0.2)	(0.6)	(0.3)	(0.3)	(0.6)	(0.3)	(0.2)	(0.9)	(0.2)	(0.3)	(0.8)
	3 boys	10.6	19.6*	31.0**	14.1***	22.4***	37.9***	13.5***	22.4***	40.0***	15.5***	24.9***	47.7***
		(0.6)	(0.5)	(1.3)	(0.5)	(0.4)	(1.1)	(0.6)	(0.5)	(1.6)	(0.5)	(0.6)	(1.4)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] Percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a given percent chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 40% mark on her survival curve. The reported statistics is the average of a given percentile duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

Table C.5: Estimated 25th, 50th, and 75th Percentile Durations for Women with One to Seven Years of Education

		1972–1984			1985–1994			1995–2004			2005–2016		
	Composition of	Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
Spell	Prior Children	25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
							Urban						
	1 girl	10.9	17.4	26.2	11.9	18.6	30.0	12.2	19.9	33.1	13.2	21.4	34.5
2		(0.4)	(0.3)	(0.6)	(0.3)	(0.4)	(0.7)	(0.2)	(0.4)	(0.6)	(0.3)	(0.4)	(0.8)
	1 boy	12.1**	18.3	28.6***	12.3	20.2***	31.2	12.9**	20.5	33.4	13.5	22.3	37.3**
		(0.3)	(0.5)	(0.7)	(0.3)	(0.4)	(0.6)	(0.3)	(0.4)	(0.5)	(0.3)	(0.5)	(1.0)
	2 girls	11.4	17.6	27.8	13.2	20.6	33.2	14.3	22.9	37.4	15.4	23.7	40.0
		(0.6)	(0.7)	(1.3)	(0.5)	(0.7)	(1.2)	(0.5)	(0.8)	(1.6)	(0.4)	(0.7)	(1.9)
3	1 boy, 1 girl	13.1***	19.8***	29.9	13.6	20.4	33.8	13.9	21.0**	34.6	14.3*	22.1	35.2*
		(0.3)	(0.5)	(0.8)	(0.3)	(0.6)	(1.0)	(0.3)	(0.5)	(1.0)	(0.4)	(0.8)	(1.6)
	2 boys	13.3**	19.3	29.4	14.0	21.2	35.3	14.4	21.7	35.0	14.9	23.5	39.4
		(0.6)	(0.9)	(1.2)	(0.4)	(0.8)	(1.7)	(0.5)	(0.7)	(1.6)	(0.6)	(1.1)	(2.0)
	3 girls	9.7	19.0	30.5	11.6	20.7	34.6	15.2	25.6	45.6	14.5	23.8	43.3
		(1.5)	(1.4)	(3.3)	(1.2)	(1.0)	(2.9)	(1.1)	(1.8)	(2.5)	(1.1)	(1.3)	(3.2)
	1 boy, 2 girls	11.0	19.5	29.2	12.7	22.2	40.5	11.8**	21.8**	40.6	13.5	22.2	38.5
4		(1.1)	(0.7)	(2.1)	(0.9)	(0.8)	(2.5)	(1.0)	(0.8)	(3.2)	(1.1)	(0.7)	(3.8)
	2 boys, 1 girl	11.7	20.3	32.2	14.3*	24.0**	46.1***	13.8	22.8	42.3	17.4**	26.9	54.8**
		(1.3)	(0.9)	(3.5)	(1.0)	(1.1)	(2.8)	(1.2)	(1.0)	(4.2)	(0.9)	(1.8)	(3.6)
	3 boys	11.0	20.5	33.7	14.4	22.9	40.5	14.1	22.5	40.1	16.3	28.3	56.8**
		(2.4)	(2.5)	(7.7)	(1.3)	(1.4)	(4.0)	(1.7)	(1.6)	(6.2)	(2.3)	(4.5)	(5.4)
							Rural						
	1 girl	12.4	18.0	28.0	12.3	19.1	30.2	13.1	20.1	31.7	13.3	20.5	32.6
2		(0.2)	(0.3)	(0.5)	(0.2)	(0.3)	(0.4)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.4)
	1 boy	13.2***	19.6***	30.0***	13.0**	19.8*	30.8	13.2	20.5	32.3	13.7**	21.3**	34.4***
		(0.2)	(0.3)	(0.4)	(0.2)	(0.3)	(0.4)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.4)
	2 girls	12.1	18.0	27.0	12.3	19.3	28.6	13.8	21.4	33.5	14.6	22.3	35.7
		(0.5)	(0.4)	(0.6)	(0.3)	(0.4)	(0.6)	(0.2)	(0.4)	(0.6)	(0.2)	(0.4)	(0.7)
3	1 boy, 1 girl	13.2*	19.1*	29.0**	13.6***	20.5**	32.6***	14.0	21.0	32.7	14.5	22.2	35.9
		(0.3)	(0.4)	(0.6)	(0.2)	(0.3)	(0.6)	(0.2)	(0.2)	(0.5)	(0.2)	(0.3)	(0.7)
	2 boys	14.3***	21.0***	31.9***	14.0***	20.9**	33.0***	14.0	21.3	33.8	14.7	23.2	36.8
		(0.5)	(0.7)	(0.9)	(0.4)	(0.6)	(1.2)	(0.3)	(0.5)	(0.8)	(0.3)	(0.5)	(1.1)
	3 girls	12.0	19.2	27.9	13.3	21.3	34.0	14.5	23.2	38.6	16.0	24.3	41.4
		(1.3)	(0.7)	(1.6)	(0.7)	(0.6)	(1.5)	(0.6)	(0.6)	(1.2)	(0.4)	(0.4)	(1.0)
	1 boy, 2 girls	12.3	20.2	31.1	13.4	21.8	36.8	13.8	22.2	39.1	15.3	23.8	44.9**
4		(1.0)	(0.6)	(1.6)	(0.6)	(0.5)	(1.3)	(0.6)	(0.5)	(1.9)	(0.3)	(0.4)	(1.4)
	2 boys, 1 girl	14.1	21.5**	34.8**	14.5	23.1**	41.5***	14.2	22.9	42.5	16.0	26.3**	53.2***
		(0.9)	(0.7)	(2.4)	(0.6)	(0.7)	(1.9)	(0.8)	(0.6)	(2.6)	(0.5)	(0.6)	(1.3)
	3 boys	11.4	19.7	30.3	13.5	22.4	39.3*	13.8	24.5	48.7***	15.9	24.9	49.4**
		(1.3)	(0.9)	(2.8)	(1.1)	(1.1)	(2.7)	(1.2)	(1.3)	(3.0)	(0.8)	(1.1)	(3.5)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] Percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a given percent chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 40% mark on her survival curve. The reported statistics is the average of a given percentile duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

Table C.6: Estimated 25th, 50th, and 75th Percentile Durations for Women with Eight or More Years of Education

		1972–1984			1985–1994			1995–2004			2005–2016		
		Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
Spell	Composition of Prior Children	25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
							Urban						
2	1 girl	12.1	19.7	32.6	13.6	24.4	40.8	15.2	26.2	43.4	16.7	29.0	47.0
		(0.3)	(0.4)	(0.7)	(0.2)	(0.4)	(0.6)	(0.2)	(0.3)	(0.4)	(0.2)	(0.3)	(0.5)
	1 boy	12.3	20.7*	35.1**	14.4**	25.0	40.9	15.2	25.8	43.0	16.7	29.0	47.5
		(0.3)	(0.4)	(0.8)	(0.2)	(0.3)	(0.5)	(0.2)	(0.3)	(0.4)	(0.2)	(0.4)	(0.6)
3	2 girls	13.8	21.7	34.4	15.7	27.0	45.5	17.1	28.8	46.9	18.8	33.3	54.2
		(0.5)	(0.7)	(1.4)	(0.5)	(0.8)	(1.4)	(0.4)	(0.7)	(1.1)	(0.5)	(0.9)	(1.4)
	1 boy, 1 girl	12.9	21.0	35.8	14.0***	24.3***	40.6***	14.8***	24.1***	41.1***	16.0***	26.7***	43.8***
		(0.4)	(0.7)	(1.6)	(0.3)	(0.6)	(1.0)	(0.4)	(0.5)	(0.9)	(0.4)	(0.8)	(1.6)
	2 boys	14.0	22.3	37.9	14.7	25.5	41.9	15.4***	23.5***	38.6***	15.7***	28.2***	48.5*
		(0.6)	(1.2)	(2.0)	(0.6)	(1.1)	(2.1)	(0.3)	(0.7)	(1.1)	(0.5)	(1.3)	(2.8)
4	3 girls	13.7	21.3	34.6	16.8	29.8	50.6	17.1	29.2	51.2	19.7	34.0	56.4
		(1.4)	(1.3)	(4.2)	(1.2)	(1.9)	(1.8)	(0.9)	(1.6)	(1.7)	(1.0)	(1.8)	(1.3)
	1 boy, 2 girls	10.3*	20.0	32.8	15.0	24.4***	47.9	14.8*	25.1**	51.2	16.7**	27.0***	55.9
		(1.2)	(1.1)	(3.8)	(0.8)	(0.9)	(3.0)	(0.9)	(1.0)	(2.8)	(0.9)	(1.5)	(2.7)
	2 boys, 1 girl	11.4	20.7	34.0	12.7**	22.9***	44.7	13.9*	25.3	53.5	14.1***	25.3***	53.6
		(1.3)	(1.0)	(4.3)	(1.4)	(1.3)	(4.8)	(1.5)	(1.7)	(3.8)	(1.7)	(2.0)	(5.3)
	3 boys	12.1	21.2	36.2	13.3	24.4	50.0	13.8	23.3**	45.2	17.3	30.4	60.7
		(2.3)	(2.2)	(7.2)	(2.3)	(2.8)	(6.8)	(1.9)	(1.8)	(7.2)	(2.9)	(5.5)	(6.4)
							Rural						
2	1 girl	12.1	20.3	30.6	13.3	21.3	34.2	13.9	22.2	35.7	14.6	23.9	39.2
		(0.4)	(0.6)	(0.7)	(0.2)	(0.3)	(0.7)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.3)
	1 boy	12.4	19.7	31.2	13.3	21.2	34.1	13.9	22.0	35.8	14.6	24.1	39.8
		(0.4)	(0.5)	(1.0)	(0.2)	(0.4)	(0.7)	(0.1)	(0.2)	(0.3)	(0.1)	(0.2)	(0.4)
3	2 girls	14.4	20.9	31.8	15.0	23.6	37.6	14.8	23.8	38.1	16.9	27.4	44.5
		(0.6)	(0.9)	(1.6)	(0.5)	(0.8)	(1.6)	(0.2)	(0.5)	(0.8)	(0.2)	(0.4)	(0.8)
	1 boy, 1 girl	13.8	20.3	30.9	14.2	22.4	34.9	14.2**	21.9***	35.6**	14.6***	23.2***	38.2***
		(0.4)	(0.7)	(1.1)	(0.4)	(0.6)	(1.0)	(0.2)	(0.4)	(0.7)	(0.2)	(0.3)	(0.8)
	2 boys	14.1	21.9	32.3	13.8	22.0	33.8	14.2	21.7***	35.4**	15.3***	24.1***	39.8***
		(0.9)	(1.3)	(1.5)	(0.6)	(0.8)	(1.8)	(0.3)	(0.5)	(0.9)	(0.3)	(0.7)	(1.3)
4	3 girls	10.6	19.5	30.6	15.6	27.3	46.3	16.8	26.0	44.9	16.7	27.1	47.6
		(2.1)	(1.9)	(3.3)	(1.3)	(1.8)	(2.1)	(0.5)	(1.0)	(1.6)	(0.4)	(0.8)	(0.9)
	1 boy, 2 girls	15.1*	22.6	38.2	14.0	24.2	46.0	13.8***	22.3***	39.4*	15.9	25.9	52.6***
		(1.4)	(1.5)	(3.8)	(0.8)	(1.1)	(2.2)	(0.7)	(0.5)	(2.4)	(0.5)	(0.7)	(1.5)
	2 boys, 1 girl	15.5*	23.8	43.8**	15.5	25.6	50.7	15.3*	23.7*	44.6	17.0	29.0	59.1***
		(1.6)	(1.9)	(4.9)	(1.1)	(1.6)	(3.2)	(0.7)	(0.8)	(3.5)	(0.7)	(1.9)	(1.9)
	3 boys	13.7	22.7	40.5	12.7	22.9	44.1	16.3	24.7	47.5	16.6	26.2	53.2
		(2.7)	(3.3)	(6.8)	(2.1)	(2.3)	(6.9)	(1.3)	(1.7)	(5.4)	(1.0)	(1.6)	(4.0)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] Percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a given percent chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 40% mark on her survival curve. The reported statistics is the average of a given percentile duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

D Results by Region

Table D.1: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with Eight or More Years of Education in the "West"

		1972–1984			1985–1994			1995–2004			2005–2016		
Spell	Composition of prior Children	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]
							Urban						
	1 girl	24.3	50.6	0.960	28.7	57.9***	0.932	31.1	61.6***	0.903	33.7	57.9***	0.838
2		(0.6)	(1.6)	(0.005)	(0.5)	(1.0)	(0.007)	(0.4)	(0.9)	(0.006)	(0.6)	(1.0)	(0.009)
	1 boy	25.8**	51.2	0.929	30.0*	50.8	0.886	30.8	49.7*	0.832	34.6	49.0*	0.685
		(0.6)	(1.4)	(0.007)	(0.6)	(1.2)	(0.008)	(0.4)	(0.8)	(0.006)	(0.6)	(1.3)	(0.011)
	2 girls	27.4	59.9***	0.835	34.3	66.5***	0.759	35.9	70.8***	0.723	39.5	68.6***	0.687
		(1.0)	(3.1)	(0.019)	(1.1)	(2.3)	(0.018)	(0.9)	(2.0)	(0.021)	(1.0)	(2.2)	(0.021)
3	1 boy, 2 girl	28.6	53.8	0.620	30.7**	57.0***	0.443	30.8***	57.4***	0.358	32.4***	55.7*	0.217
		(1.1)	(2.5)	(0.018)	(1.0)	(1.9)	(0.015)	(0.9)	(1.7)	(0.011)	(1.3)	(2.7)	(0.011)
	2 boys	27.5	51.5	0.587	31.6	50.2	0.434	29.1***	46.4	0.329	35.7	51.6	0.201
		(1.3)	(3.7)	(0.026)	(1.7)	(3.0)	(0.024)	(1.4)	(3.4)	(0.017)	(2.5)	(4.5)	(0.019)
	3 girls	29.0	61.1	0.862	36.3	68.9***	0.811	33.4	79.5***	0.791	38.8	60.0	0.662
		(2.4)	(7.3)	(0.041)	(1.8)	(4.8)	(0.035)	(1.9)	(5.3)	(0.042)	(2.0)	(6.7)	(0.044)
	1 boy, 2 girls	28.3	49.6	0.531	31.6*	55.2	0.406	34.9	63.1**	0.347	39.4	58.8	0.222
4		(2.1)	(5.8)	(0.042)	(1.9)	(4.6)	(0.033)	(2.3)	(5.1)	(0.030)	(2.7)	(5.7)	(0.023)
	2 boys, 1 girl	25.9	50.7	0.537	31.0	53.8	0.363	33.2	40.9	0.223	42.6	60.7	0.197
		(2.6)	(7.0)	(0.051)	(2.9)	(5.6)	(0.031)	(3.5)	(7.8)	(0.031)	(4.5)	(15.2)	(0.033)
	3 boys	29.6	43.8	0.669	32.5	41.3	0.305	30.5	30.0*	0.333	47.1	46.1	0.321
		(3.8)	(8.5)	(0.082)	(6.1)	(13.7)	(0.073)	(6.2)	(12.4)	(0.076)	(5.9)	(17.5)	(0.089)
							Rural						
	1 girl	22.5	51.8	0.982	24.5	55.0**	0.960	24.6	59.4***	0.954	28.2	57.6***	0.938
2		(0.9)	(2.7)	(0.007)	(0.6)	(1.7)	(0.008)	(0.3)	(0.9)	(0.004)	(0.4)	(0.9)	(0.006)
	1 boy	22.5	50.4	0.970	23.9	52.3	0.933	24.6	51.4	0.900	28.8	47.3***	0.808
		(0.8)	(2.3)	(0.009)	(0.6)	(1.9)	(0.010)	(0.3)	(0.9)	(0.006)	(0.5)	(0.9)	(0.008)
	2 girls	25.5	53.4	0.956	29.1	64.1***	0.915	30.0	66.9***	0.882	34.1	62.5***	0.830
		(1.6)	(5.4)	(0.016)	(1.1)	(3.9)	(0.019)	(0.7)	(1.7)	(0.012)	(0.7)	(1.7)	(0.012)
3	1 boy, 2 girl	25.6	59.5*	0.837	25.3**	55.0	0.641	26.2***	56.2***	0.524	27.7***	53.4	0.337
		(1.4)	(4.6)	(0.025)	(1.3)	(3.0)	(0.022)	(0.7)	(1.9)	(0.012)	(1.0)	(1.8)	(0.011)
	2 boys	25.5	39.7**	0.772	28.8	52.0	0.659	27.2*	48.9	0.413	31.5	53.3	0.313
		(2.2)	(5.5)	(0.041)	(2.0)	(4.4)	(0.035)	(1.5)	(3.1)	(0.026)	(2.1)	(3.8)	(0.019)
	3 girls	22.7	60.8	0.978	34.5	73.3***	0.840	31.6	65.0***	0.876	34.0	56.7*	0.840
		(3.1)	(12.9)	(0.034)	(2.3)	(8.0)	(0.047)	(1.8)	(4.4)	(0.031)	(1.0)	(3.2)	(0.028)
	1 boy, 2 girls	31.3**	44.1	0.828	31.3	48.9	0.681	30.4	60.0**	0.429	35.4	54.7	0.356
4		(3.0)	(8.1)	(0.062)	(1.8)	(5.4)	(0.038)	(1.9)	(4.3)	(0.030)	(1.8)	(3.7)	(0.025)
	2 boys, 1 girl	28.9	55.6	0.694	28.5	63.7	0.535	28.4	54.1	0.316	36.6	50.7	0.281
		(4.0)	(8.2)	(0.075)	(3.1)	(7.8)	(0.061)	(2.8)	(7.6)	(0.035)	(3.8)	(6.3)	(0.037)
	3 boys	32.3	66.5	0.755	36.5	47.1	0.500	30.7	60.8	0.423	37.7	46.1	0.406
		(6.9)	(20.6)	(0.129)	(5.7)	(17.7)	(0.104)	(5.5)	(15.4)	(0.082)	(4.6)	(12.7)	(0.082)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table D.2: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with Eight or More Years of Education in the "North"

		1972–1984			1985–1994			1995–2004			2005–2016		
Spell	Composition of prior Children	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]
							Urban						
	1 girl	22.3	55.7	0.954	26.2	52.9	0.948	28.4	58.7***	0.922	31.5	57.0***	0.892
2		(0.9)	(2.9)	(0.012)	(0.7)	(1.9)	(0.007)	(0.3)	(0.9)	(0.006)	(0.5)	(0.9)	(0.008)
	1 boy	23.2	51.4	0.952	27.9*	52.5	0.904	28.6	50.3	0.884	32.3	50.2	0.805
		(0.9)	(2.7)	(0.011)	(0.8)	(1.8)	(0.010)	(0.4)	(0.9)	(0.006)	(0.5)	(1.1)	(0.010)
	2 girls	22.5	59.0	0.919	30.3	64.8**	0.799	32.4	66.8***	0.821	37.2	65.3***	0.707
		(1.7)	(5.8)	(0.027)	(1.9)	(5.8)	(0.031)	(0.9)	(1.8)	(0.014)	(1.0)	(2.0)	(0.019)
3	1 boy, 2 girl	24.3	55.5	0.739	28.8	50.9	0.632	29.4**	52.1	0.509	33.2***	58.5***	0.356
		(1.6)	(4.8)	(0.023)	(1.2)	(2.4)	(0.024)	(0.8)	(1.9)	(0.012)	(1.0)	(2.1)	(0.012)
	2 boys	26.9	52.1	0.755	29.5	57.1	0.512	27.4***	42.4***	0.464	32.2***	47.3	0.310
		(1.8)	(5.9)	(0.032)	(2.3)	(5.6)	(0.034)	(0.9)	(2.5)	(0.017)	(1.6)	(3.2)	(0.016)
	3 girls	19.8	47.4	0.908	32.8	66.1	0.854	32.2	58.9	0.838	37.1	61.7**	0.802
		(4.3)	(12.6)	(0.072)	(2.4)	(10.9)	(0.043)	(1.7)	(5.1)	(0.031)	(1.4)	(4.2)	(0.030)
	1 boy, 2 girls	23.8	47.9	0.732	31.0	61.8**	0.647	32.3	63.0***	0.523	35.1	64.4***	0.376
4		(2.4)	(6.9)	(0.056)	(1.9)	(4.7)	(0.043)	(1.7)	(3.3)	(0.025)	(1.6)	(3.7)	(0.026)
	2 boys, 1 girl	30.2**	50.0	0.748	29.9	40.9*	0.589	35.2	52.8	0.361	32.8	49.4	0.225
		(2.7)	(7.6)	(0.049)	(2.8)	(5.6)	(0.051)	(2.5)	(4.9)	(0.033)	(3.2)	(6.0)	(0.024)
	3 boys	22.5	49.6	0.711	29.5	51.6	0.621	32.5	46.9	0.542	31.5	62.7	0.318
		(5.0)	(25.9)	(0.134)	(4.3)	(10.6)	(0.081)	(3.4)	(8.5)	(0.059)	(4.6)	(14.2)	(0.052)
							Rural						
	1 girl	20.7	48.8	0.984	23.6	52.5	0.984	24.0	54.4***	0.977	25.2	55.7***	0.959
2		(1.0)	(3.9)	(0.009)	(0.7)	(2.1)	(0.007)	(0.2)	(0.8)	(0.003)	(0.3)	(0.6)	(0.004)
	1 boy	24.8***	49.7	0.965	23.9	51.2	0.945	24.3	50.0	0.946	26.2**	51.0	0.899
		(1.4)	(4.3)	(0.013)	(0.7)	(1.9)	(0.010)	(0.3)	(0.9)	(0.004)	(0.4)	(0.8)	(0.005)
	2 girls	21.2	44.7	0.970	24.8	57.6	0.947	26.6	54.6**	0.951	29.2	60.1***	0.897
		(2.5)	(7.6)	(0.024)	(1.5)	(4.8)	(0.025)	(0.6)	(1.5)	(0.007)	(0.6)	(1.2)	(0.010)
3	1 boy, 2 girl	21.4	48.8	0.953	26.7	59.1**	0.865	25.9	55.4***	0.745	28.3	54.7***	0.593
		(1.2)	(4.5)	(0.019)	(1.1)	(3.1)	(0.018)	(0.4)	(1.2)	(0.009)	(0.5)	(1.0)	(0.008)
	2 boys	25.2	39.2	0.862	27.6	48.3	0.859	24.5**	51.0	0.683	30.1	49.8	0.523
		(2.8)	(8.6)	(0.047)	(1.6)	(4.0)	(0.030)	(0.7)	(1.8)	(0.015)	(1.0)	(2.1)	(0.016)
	3 girls	19.8	34.7	0.999	25.7	58.1	0.994	29.2	62.1***	0.956	30.8	59.7***	0.915
		(3.8)	(15.3)	(0.005)	(2.5)	(9.0)	(0.015)	(1.1)	(2.8)	(0.013)	(0.6)	(2.2)	(0.012)
	1 boy, 2 girls	23.3	37.9**	0.924	29.6	52.9	0.875	27.7	53.6	0.753	34.1***	54.6*	0.582
4		(2.6)	(6.7)	(0.053)	(1.5)	(5.1)	(0.035)	(0.9)	(2.3)	(0.019)	(0.8)	(2.1)	(0.018)
	2 boys, 1 girl	33.0***	53.8	0.869	38.1***	41.3	0.794	29.4	54.1	0.547	38.2***	48.6	0.394
		(2.9)	(10.2)	(0.063)	(2.2)	(6.3)	(0.051)	(1.4)	(3.0)	(0.021)	(1.2)	(3.0)	(0.018)
	3 boys	32.3**	57.9	0.952	25.1	45.8	0.619	32.4	57.6	0.646	33.6	63.6**	0.461
		(4.3)	(22.1)	(0.086)	(5.5)	(12.1)	(0.112)	(2.1)	(5.3)	(0.041)	(2.3)	(5.1)	(0.042)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table D.3: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with Eight or More Years of Education in the "East"

Spell	Composition of prior Children	1972–1984 Duration[a] (Mos)	1972–1984 Percent[b] boys	1972–1984 Probability birth[c]	1985–1994 Duration[a] (Mos)	1985–1994 Percent[b] boys	1985–1994 Probability birth[c]	1995–2004 Duration[a] (Mos)	1995–2004 Percent[b] boys	1995–2004 Probability birth[c]	2005–2016 Duration[a] (Mos)	2005–2016 Percent[b] boys	2005–2016 Probability birth[c]
							Urban						
	1 girl	28.7	49.6	0.836	34.2	55.4*	0.785	38.6	54.4**	0.727	42.4	54.8*	0.653
2		(1.0)	(2.9)	(0.017)	(1.0)	(2.4)	(0.015)	(0.7)	(1.5)	(0.012)	(1.0)	(1.9)	(0.017)
	1 boy	28.1	56.5	0.846	33.9	52.9	0.692	39.2	48.4*	0.647	45.2*	51.2	0.516
		(1.3)	(3.5)	(0.018)	(0.9)	(2.2)	(0.017)	(0.8)	(1.6)	(0.012)	(1.2)	(2.2)	(0.019)
	2 girls	29.6	33.5***	0.822	34.3	51.2	0.584	36.2	49.8	0.597	43.9	59.4	0.398
		(2.5)	(6.0)	(0.046)	(2.4)	(4.7)	(0.035)	(1.6)	(4.2)	(0.033)	(2.4)	(5.1)	(0.030)
3	1 boy, 2 girl	29.6	47.5	0.717	31.9	47.3	0.408	35.9	47.3	0.301	38.5	47.2	0.185
		(2.2)	(4.6)	(0.035)	(1.7)	(4.0)	(0.026)	(1.5)	(3.6)	(0.019)	(2.5)	(5.8)	(0.018)
	2 boys	30.8	36.8**	0.559	37.4	48.1	0.471	36.9	50.5	0.360	44.9	40.3	0.211
		(2.5)	(6.4)	(0.049)	(2.4)	(5.3)	(0.036)	(2.4)	(5.2)	(0.029)	(3.7)	(8.2)	(0.030)
	3 girls	30.1	63.7	0.822	32.8	57.4	0.734	43.6	40.9	0.777	44.3	70.0	0.525
		(4.9)	(14.9)	(0.073)	(3.6)	(8.4)	(0.071)	(2.6)	(7.5)	(0.075)	(3.4)	(18.3)	(0.078)
	1 boy, 2 girls	24.5	36.8	0.636	39.9	36.8**	0.494	41.6	60.7	0.363	37.2	66.7	0.215
4		(4.4)	(11.1)	(0.081)	(2.7)	(6.6)	(0.059)	(3.7)	(10.8)	(0.054)	(4.6)	(12.1)	(0.034)
	2 boys, 1 girl	23.9	50.2	0.531	31.3	42.7	0.482	44.8	47.4	0.159	24.4**	36.5	0.128
		(3.3)	(11.3)	(0.078)	(3.5)	(8.7)	(0.061)	(7.4)	(16.4)	(0.042)	(7.2)	(15.2)	(0.041)
	3 boys	34.3	23.3	0.708	43.5	46.7	0.403	34.3	55.6	0.340	54.9	43.6	0.232
		(12.6)	(19.3)	(0.222)	(7.5)	(20.1)	(0.103)	(9.2)	(22.5)	(0.103)	(9.1)	(23.2)	(0.107)
							Rural						
	1 girl	23.9	50.8	0.949	29.1	54.5*	0.917	34.5	52.5	0.873	41.1	52.9	0.807
2		(1.2)	(4.0)	(0.015)	(1.0)	(1.9)	(0.013)	(0.4)	(1.1)	(0.008)	(0.5)	(1.3)	(0.009)
	1 boy	25.7	50.8	0.941	29.9	52.8	0.845	35.1	50.3	0.786	42.0	48.9	0.646
		(1.3)	(3.4)	(0.018)	(0.9)	(2.4)	(0.017)	(0.5)	(1.0)	(0.008)	(0.7)	(1.4)	(0.013)
	2 girls	27.8	50.3	0.961	30.4	44.6	0.854	34.5	58.3***	0.756	44.9	58.1***	0.632
		(2.9)	(8.8)	(0.026)	(1.9)	(4.9)	(0.031)	(1.1)	(2.6)	(0.017)	(1.1)	(2.6)	(0.018)
3	1 boy, 2 girl	26.3	53.7	0.796	27.3	50.7	0.580	36.3	51.6	0.412	41.8	48.5	0.237
		(2.3)	(5.6)	(0.041)	(1.5)	(4.0)	(0.025)	(1.1)	(2.7)	(0.014)	(1.6)	(3.0)	(0.013)
	2 boys	25.9	44.6	0.788	22.7***	40.2**	0.553	36.4	48.0	0.428	38.9**	44.3	0.231
		(2.6)	(6.4)	(0.052)	(2.3)	(5.5)	(0.045)	(1.5)	(3.7)	(0.021)	(2.3)	(4.3)	(0.019)
	3 girls	18.2	10.6***	0.916	31.9	62.5	0.858	43.3	55.5	0.648	43.0	62.9*	0.512
		(4.8)	(11.2)	(0.102)	(3.4)	(15.0)	(0.066)	(2.5)	(8.6)	(0.062)	(2.2)	(6.2)	(0.052)
	1 boy, 2 girls	32.7**	56.0	0.947	35.6	52.7	0.644	37.1*	55.8	0.402	42.0	58.2	0.215
4		(4.0)	(9.5)	(0.057)	(2.6)	(6.5)	(0.058)	(2.5)	(5.7)	(0.040)	(2.7)	(6.2)	(0.028)
	2 boys, 1 girl	25.5	46.3	0.704	31.8	66.3	0.420	44.1	49.7	0.400	42.6	55.0	0.294
		(4.7)	(13.0)	(0.084)	(3.3)	(10.9)	(0.050)	(2.9)	(8.2)	(0.050)	(3.0)	(6.7)	(0.035)
	3 boys	19.5	45.2	0.791	31.2	36.3	0.682	37.5	53.0	0.481	42.7	42.4	0.288
		(5.2)	(18.1)	(0.129)	(4.8)	(14.9)	(0.120)	(4.8)	(10.9)	(0.095)	(5.3)	(14.6)	(0.064)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table D.4: Estimated Expected Duration in Months, Sex Ratio, and Probability of Parity Progression for Women with Eight or More Years of Education in the "South"

		1972–1984			1985–1994			1995–2004			2005–2016		
Spell	Composition of prior Children	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]	Duration[a] (Mos)	Percent[b] boys	Probability birth[c]
							Urban						
2	1 girl	25.7	51.9	0.890	30.9	50.6	0.850	30.4	53.4**	0.841	32.3	52.1	0.797
		(1.0)	(2.4)	(0.013)	(0.8)	(2.2)	(0.013)	(0.5)	(1.0)	(0.007)	(0.7)	(1.5)	(0.014)
	1 boy	27.2	49.8	0.907	28.7*	54.0	0.847	31.1	50.5	0.845	31.6	48.8*	0.787
		(1.0)	(2.7)	(0.014)	(0.8)	(1.9)	(0.013)	(0.4)	(1.2)	(0.008)	(0.7)	(1.4)	(0.011)
3	2 girls	26.7	26.7***	0.781	28.5	57.5	0.536	32.9	58.3*	0.564	34.1	60.1*	0.524
		(2.3)	(4.7)	(0.043)	(2.1)	(5.5)	(0.036)	(1.5)	(4.2)	(0.030)	(2.0)	(5.1)	(0.031)
	1 boy, 2 girl	26.4	50.1	0.665	27.4	49.3	0.530	27.6**	51.0	0.401	25.8***	45.6	0.240
		(1.8)	(5.2)	(0.038)	(1.9)	(4.3)	(0.037)	(1.6)	(3.6)	(0.023)	(2.1)	(5.4)	(0.020)
	2 boys	32.1*	40.5	0.649	27.2	43.4	0.579	29.7	43.8	0.401	34.6	47.9	0.367
		(2.8)	(6.8)	(0.064)	(2.1)	(5.2)	(0.037)	(1.5)	(5.8)	(0.024)	(3.3)	(5.4)	(0.034)
4	3 girls	27.9	45.6	0.505	36.2	76.6	0.738	42.0	64.8	0.519	43.2	66.2	0.809
		(7.0)	(26.6)	(0.145)	(4.5)	(21.7)	(0.093)	(7.3)	(23.2)	(0.163)	(4.3)	(19.4)	(0.111)
	1 boy, 2 girls	29.1	56.8	0.722	27.3	36.6	0.536	27.1*	55.8	0.510	35.2	41.9	0.296
		(5.6)	(14.1)	(0.106)	(5.7)	(9.5)	(0.087)	(3.8)	(8.4)	(0.065)	(6.8)	(11.9)	(0.067)
	2 boys, 1 girl	28.2	63.9	0.659	36.1	39.7	0.458	20.9**	54.9	0.341	16.1***	28.9	0.125
		(4.8)	(15.6)	(0.087)	(6.9)	(18.8)	(0.109)	(4.5)	(13.9)	(0.068)	(5.0)	(20.5)	(0.065)
	3 boys	7.3	0.0***	0.158	27.7	51.1	0.579	14.1***	17.8**	0.314	15.5*	0.0***	0.130
		(20.1)	(0.0)	(0.119)	(6.5)	(16.7)	(0.136)	(5.2)	(14.1)	(0.124)	(13.2)	(0.0)	(0.089)
							Rural						
2	1 girl	27.3	47.8	0.951	27.1	48.4	0.915	28.1	51.9	0.904	28.5	52.7	0.866
		(1.1)	(2.8)	(0.014)	(0.8)	(2.0)	(0.015)	(0.5)	(1.1)	(0.007)	(0.5)	(1.2)	(0.008)
	1 boy	24.1**	41.7***	0.904	28.2	47.6	0.890	27.7	51.1	0.886	27.4	49.3	0.832
		(0.9)	(3.0)	(0.017)	(0.9)	(2.3)	(0.014)	(0.4)	(1.3)	(0.007)	(0.5)	(1.2)	(0.009)
3	2 girls	26.0	46.3	0.833	30.5	45.2	0.821	27.4	59.5**	0.706	30.5	57.6**	0.644
		(1.8)	(5.9)	(0.049)	(1.8)	(5.2)	(0.042)	(1.2)	(3.3)	(0.022)	(1.3)	(2.9)	(0.023)
	1 boy, 2 girl	27.2	44.5	0.668	29.2	47.9	0.619	25.1	48.4	0.515	24.6***	53.2	0.391
		(2.1)	(5.2)	(0.041)	(2.2)	(5.4)	(0.035)	(1.1)	(3.1)	(0.023)	(1.4)	(3.1)	(0.018)
	2 boys	29.5	49.3	0.783	24.8**	46.1	0.584	28.2	45.2	0.535	24.3***	42.1*	0.378
		(2.7)	(9.5)	(0.047)	(2.1)	(8.2)	(0.051)	(1.6)	(4.7)	(0.027)	(2.0)	(5.2)	(0.030)
4	3 girls	27.5	45.2	0.998	33.4	40.8	0.741	25.8	67.6	0.782	33.7	63.3*	0.703
		(5.0)	(20.6)	(0.015)	(3.8)	(11.3)	(0.077)	(3.5)	(11.8)	(0.077)	(2.5)	(6.8)	(0.064)
	1 boy, 2 girls	26.1	34.8	0.759	31.0	50.2	0.753	29.3	50.8	0.447	32.7	58.7	0.310
		(4.0)	(11.6)	(0.093)	(3.7)	(9.2)	(0.080)	(4.1)	(9.4)	(0.059)	(4.7)	(10.3)	(0.049)
	2 boys, 1 girl	41.7	26.3	0.650	30.7	40.2	0.667	28.2	45.7	0.394	21.1**	38.9	0.245
		(7.2)	(15.5)	(0.145)	(4.5)	(14.0)	(0.094)	(5.8)	(14.6)	(0.076)	(4.6)	(15.0)	(0.059)
	3 boys	33.3	50.0	0.913	25.3	21.1*	0.590	35.6	0.0	0.241	36.6	61.6	0.488
		(7.6)	(20.3)	(0.096)	(9.2)	(17.1)	(0.189)	(21.7)	(0.0)	(0.168)	(7.6)	(19.2)	(0.105)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] The expected duration is calculated as follows. For each woman in a given spell/period combination sample, I calculate the probability of that she will give birth for each period, conditional on the likelihood that she will eventually give birth in that spell, and use these probabilities as weights to calculated the expected or average duration. The reported statistics is the average of this expected duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at 9 months after the birth of the prior child. Durations for sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

[b] Percent boys is calculated as follows. For each woman in a given spell/period combination sample, I calculate the predicted percent boys for each month and sum this across the length of the spell using the likelihood of having a child in each month as the weight. The percent boys is then averaged across all women in the given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. The result is the predicted percent boys that will be born to women in the sample once child bearing for that spell is over. The predicted percent boys is tested against the natural percentage boys, 105 boys per 100 girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at 10% level.

[c] Probability of giving birth by the end of the spell period.

Table D.5: Estimated 25th, 50th, and 75th Percentile Durations for Women with Eight or More Years of Education in the "West"

		1972–1984			1985–1994			1995–2004			2005–2016		
		Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
Spell	Composition of Prior Children	25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
						Urban							
	1 girl	11.8	19.5	32.3	13.3	23.7	39.8	15.3	26.1	43.5	17.1	29.0	46.8
2		(0.4)	(0.5)	(1.0)	(0.3)	(0.6)	(0.9)	(0.3)	(0.4)	(0.7)	(0.4)	(0.7)	(1.0)
	1 boy	12.4	20.7	35.3**	14.6**	25.1**	41.3	15.2	25.5	42.4	17.4	30.2	47.4
		(0.4)	(0.6)	(1.0)	(0.4)	(0.5)	(0.9)	(0.3)	(0.4)	(0.7)	(0.4)	(0.6)	(0.8)
	2 girls	14.7	23.0	35.0	16.5	29.1	47.7	17.9	30.1	50.4	19.5	35.0	56.4
		(0.7)	(1.0)	(1.7)	(0.8)	(1.3)	(2.2)	(0.7)	(1.3)	(1.6)	(0.8)	(1.5)	(2.1)
3	1 boy, 1 girl	12.7**	21.7	38.4	14.2**	24.8**	41.6**	15.2***	24.5***	41.3***	16.7***	26.4***	41.5***
		(0.7)	(1.1)	(2.5)	(0.5)	(1.1)	(1.8)	(0.5)	(0.8)	(1.9)	(0.5)	(1.1)	(3.1)
	2 boys	13.4	20.5	37.7	14.0**	25.3*	44.0	15.6**	23.0***	37.9***	16.4**	29.6*	49.3
		(0.7)	(1.6)	(2.5)	(0.8)	(1.7)	(3.9)	(0.6)	(1.3)	(2.4)	(1.3)	(2.6)	(6.0)
	3 girls	15.7	22.6	37.3	17.8	32.1	52.3	15.6	26.9	48.6	19.3	33.2	56.9
		(1.7)	(1.9)	(5.0)	(1.8)	(2.6)	(2.4)	(1.7)	(2.5)	(3.3)	(1.7)	(3.3)	(2.8)
	1 boy, 2 girls	11.7*	21.2	36.8	13.8*	23.4***	45.7	15.3	26.0	53.9	16.6	31.7	62.2
4		(1.6)	(1.4)	(6.1)	(1.4)	(1.4)	(5.1)	(1.5)	(2.4)	(5.1)	(2.3)	(4.4)	(4.5)
	2 boys, 1 girl	11.6	20.2	28.7	12.6*	22.9**	44.9	14.1	24.5	50.6	19.5	37.9	65.9
		(2.2)	(1.5)	(4.8)	(2.1)	(2.0)	(8.1)	(2.7)	(2.8)	(9.0)	(3.9)	(7.4)	(6.6)
	3 boys	14.4	22.4	39.5	17.0	24.4	43.9	9.2*	21.1	48.2	25.1	45.3	68.7*
		(2.7)	(3.0)	(9.0)	(3.2)	(4.8)	(12.6)	(3.2)	(7.0)	(13.0)	(6.6)	(8.2)	(6.5)
						Rural							
	1 girl	11.1	19.4	28.3	12.5	19.9	32.3	12.9	20.3	32.2	14.3	23.1	37.3
2		(0.7)	(0.8)	(1.2)	(0.3)	(0.5)	(1.0)	(0.2)	(0.3)	(0.4)	(0.2)	(0.3)	(0.6)
	1 boy	12.3	18.6	29.4	12.3	19.1	30.5	12.9	20.0	31.4	14.7	23.9	38.4
		(0.6)	(0.7)	(1.5)	(0.3)	(0.4)	(1.0)	(0.2)	(0.3)	(0.5)	(0.2)	(0.4)	(0.7)
	2 girls	14.1	21.3	33.1	15.4	24.1	38.9	15.8	24.8	39.3	17.7	28.2	46.5
		(1.2)	(1.7)	(2.6)	(0.7)	(1.1)	(1.9)	(0.5)	(0.8)	(1.3)	(0.4)	(0.8)	(1.3)
3	1 boy, 1 girl	14.0	21.2	31.6	13.9	21.4*	33.1**	13.6***	21.1***	33.1***	14.2***	22.1***	35.6***
		(0.7)	(1.3)	(1.8)	(0.6)	(1.0)	(1.8)	(0.4)	(0.5)	(1.2)	(0.4)	(0.8)	(1.6)
	2 boys	14.7	21.0	31.8	14.0	23.2	39.2	13.8***	20.1***	35.4	14.6***	25.4	43.2
		(1.6)	(1.9)	(2.9)	(1.0)	(2.0)	(3.8)	(0.7)	(0.9)	(2.9)	(0.8)	(2.3)	(4.0)
	3 girls	10.6	19.6	30.7	16.9	29.3	49.6	16.4	26.1	44.0	16.9	28.7	48.6
		(2.9)	(2.8)	(4.4)	(2.1)	(3.2)	(3.7)	(1.5)	(2.2)	(2.9)	(0.9)	(1.6)	(1.6)
	1 boy, 2 girls	15.5	24.4	43.8*	13.7	23.6	45.5	14.1	22.8	41.3	15.3	26.4	55.0
4		(2.2)	(3.0)	(6.0)	(1.5)	(1.6)	(4.5)	(1.3)	(1.2)	(6.0)	(1.2)	(1.8)	(3.8)
	2 boys, 1 girl	12.6	21.8	39.1	13.0	21.6**	35.9*	16.9	22.6	29.0**	14.7	27.7	58.2
		(2.6)	(3.3)	(9.1)	(2.1)	(2.0)	(7.7)	(1.0)	(1.1)	(5.6)	(2.6)	(5.1)	(7.2)
	3 boys	13.8	24.8	47.8	14.9	28.8	56.7	14.5	23.0	41.9	18.6	28.2	56.7
		(5.4)	(7.3)	(11.7)	(4.7)	(7.7)	(9.8)	(3.0)	(4.8)	(12.0)	(3.2)	(5.6)	(9.2)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] 25th and 75th percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a 25% or 75% chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 20% or 60% mark on her survival curve. The reported statistics is the average of this median duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at marriage for spell 1 or at 9 months after the birth of the prior child for all other spells. For spells 2 and higher duration sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

Table D.6: Estimated 25th, 50th, and 75th Percentile Durations for Women with Eight or More Years of Education in the "North"

Spell	Composition of Prior Children	1972–1984			1985–1994			1995–2004			2005–2016		
		Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
		25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
						Urban							
	1 girl	10.7	18.2	28.1	12.9	21.6	35.7	13.8	23.2	39.0	15.2	26.7	44.0
2		(0.9)	(0.8)	(1.3)	(0.5)	(0.7)	(1.2)	(0.2)	(0.4)	(0.6)	(0.3)	(0.5)	(0.8)
	1 boy	11.8	19.2	31.1	13.6	22.7	37.5	13.8	23.0	38.8	15.8*	27.0	45.1
		(0.9)	(0.9)	(1.2)	(0.6)	(0.9)	(1.4)	(0.2)	(0.4)	(0.7)	(0.3)	(0.6)	(1.0)
	2 girls	12.2	18.0	28.2	13.0	22.2	44.1	16.5	27.6	43.6	17.9	31.7	52.7
		(0.9)	(1.4)	(2.6)	(1.3)	(1.7)	(4.5)	(0.6)	(1.0)	(1.6)	(0.7)	(1.4)	(2.1)
3	1 boy, 1 girl	12.5	17.9	30.1	14.1	22.8	38.4	14.1***	22.9***	39.4**	15.8**	27.0**	45.0***
		(0.7)	(1.1)	(2.6)	(0.6)	(1.1)	(2.3)	(0.5)	(0.8)	(1.5)	(0.6)	(1.1)	(2.1)
	2 boys	14.0	19.5	31.8	14.5	24.5	37.2	14.5**	22.1***	35.3***	14.9***	25.7***	44.0**
		(0.9)	(1.2)	(3.3)	(1.4)	(2.0)	(4.3)	(0.6)	(0.9)	(1.6)	(0.7)	(1.8)	(3.8)
	3 girls	7.7	16.2	24.5	15.3	27.4	47.4	15.2	25.5	46.2	18.7	32.2	53.5
		(2.9)	(3.3)	(5.9)	(2.5)	(3.3)	(3.9)	(1.5)	(2.1)	(3.0)	(1.4)	(2.3)	(1.9)
	1 boy, 2 girls	9.4	18.4	28.0	14.3	23.3	43.6	14.7	24.1	47.2	16.8	26.0**	52.7
4		(1.8)	(1.8)	(4.0)	(1.7)	(1.5)	(4.8)	(1.2)	(1.3)	(4.8)	(0.9)	(1.2)	(4.0)
	2 boys, 1 girl	13.8*	22.9	42.5**	10.5	21.8	44.2	13.7	26.4	55.7	12.9**	24.1**	50.4
		(2.1)	(2.7)	(6.2)	(1.7)	(2.5)	(7.3)	(2.0)	(3.1)	(4.8)	(2.2)	(2.5)	(8.4)
	3 boys	12.7	19.2	25.7	11.3	21.8	41.6	15.8	24.2	46.6	14.3	23.4**	44.9
		(3.5)	(2.7)	(6.1)	(2.9)	(3.6)	(9.4)	(2.1)	(3.1)	(8.7)	(2.7)	(3.4)	(11.1)
						Rural							
	1 girl	11.3	18.8	27.2	12.9	20.0	31.8	13.1	19.9	31.2	13.3	21.0	32.6
2		(0.9)	(1.2)	(1.0)	(0.5)	(0.7)	(1.1)	(0.2)	(0.3)	(0.4)	(0.1)	(0.3)	(0.4)
	1 boy	13.3	20.8	34.0**	12.7	20.0	31.4	13.1	20.0	31.1	13.5	21.6*	34.6***
		(0.9)	(1.3)	(2.8)	(0.5)	(0.7)	(1.0)	(0.2)	(0.3)	(0.5)	(0.1)	(0.2)	(0.5)
	2 girls	12.4	17.5	25.6	13.9	21.5	32.1	13.5	21.8	34.9	15.6	24.7	38.4
		(1.8)	(1.7)	(3.2)	(0.9)	(1.2)	(2.2)	(0.4)	(0.6)	(1.0)	(0.3)	(0.5)	(0.9)
3	1 boy, 1 girl	12.5	17.8	27.6	14.3	22.6	35.1	13.9	20.9	33.6	14.5***	22.8***	36.6
		(0.8)	(1.1)	(1.9)	(0.6)	(1.2)	(1.7)	(0.3)	(0.4)	(0.7)	(0.3)	(0.4)	(0.9)
	2 boys	12.1	22.4	31.9*	14.9	23.7	34.4	13.6	20.0*	30.6***	15.4	23.8	39.5
		(2.4)	(3.5)	(2.3)	(0.9)	(1.1)	(2.7)	(0.4)	(0.7)	(1.0)	(0.4)	(0.8)	(1.7)
	3 girls	10.7	18.4	26.5	13.1	24.7	36.0	16.4	24.4	38.9	16.0	25.3	42.5
		(3.3)	(3.4)	(5.4)	(2.3)	(2.7)	(3.1)	(0.7)	(1.0)	(1.8)	(0.5)	(0.8)	(1.2)
	1 boy, 2 girls	13.0	19.4	27.6	13.4	23.2	41.6	12.5***	21.1***	35.3	15.9	25.6	50.8***
4		(2.2)	(1.7)	(4.0)	(1.5)	(1.6)	(3.2)	(0.8)	(0.6)	(2.6)	(0.5)	(0.8)	(1.8)
	2 boys, 1 girl	17.7*	26.6*	45.4**	18.4*	34.2**	55.7***	13.4**	22.1	38.6	17.4	29.4*	59.2***
		(1.8)	(3.6)	(5.5)	(2.3)	(3.3)	(3.0)	(1.1)	(0.9)	(4.3)	(0.8)	(2.0)	(1.7)
	3 boys	19.6**	25.9	40.0	10.6	19.5	28.6	16.2	24.3	45.7	15.7	25.0	50.0
		(1.9)	(3.9)	(6.9)	(3.4)	(3.5)	(8.9)	(1.4)	(1.6)	(5.3)	(1.3)	(2.0)	(5.6)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] 25th and 75th percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a 25% or 75% chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 20% or 60% mark on her survival curve. The reported statistics is the average of this median duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at marriage for spell 1 or at 9 months after the birth of the prior child for all other spells. For spells 2 and higher duration sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

Table D.7: Estimated 25th, 50th, and 75th Percentile Durations for Women with Eight or More Years of Education in the "East"

		1972–1984			1985–1994			1995–2004			2005–2016		
		Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
Spell	Composition of Prior Children	25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
						Urban							
	1 girl	14.1	22.1	38.1	15.7	29.4	49.4	19.9	35.1	54.0	25.3	40.1	57.0
2		(0.7)	(0.9)	(2.4)	(0.9)	(1.1)	(1.7)	(0.7)	(1.0)	(1.1)	(1.0)	(1.5)	(1.7)
	1 boy	12.1*	21.7	38.7	16.0	29.9	47.6	21.2	35.6	53.9	24.7	42.6	64.3**
		(0.8)	(1.5)	(2.3)	(0.7)	(1.3)	(1.7)	(0.7)	(0.9)	(1.5)	(1.0)	(1.4)	(2.4)
	2 girls	14.8	23.6	39.2	18.5	28.4	46.1	18.0	31.3	49.2	26.6	40.8	60.5
		(1.7)	(2.0)	(5.7)	(1.6)	(2.3)	(4.6)	(1.3)	(2.1)	(2.7)	(2.6)	(2.7)	(4.9)
3	1 boy, 1 girl	12.9	22.3	41.0	14.3**	27.7	42.4	17.7	30.0	49.7	20.5*	36.3	51.5
		(1.5)	(2.2)	(5.3)	(0.9)	(2.2)	(3.4)	(1.0)	(1.7)	(2.6)	(2.0)	(2.7)	(3.6)
	2 boys	16.9	26.7	38.4	19.1	33.9	51.3	20.3	32.8	49.9	23.5	43.8	63.2
		(2.1)	(2.6)	(5.1)	(1.7)	(3.3)	(4.5)	(2.0)	(3.0)	(3.9)	(3.5)	(5.2)	(6.6)
	3 girls	13.5	23.1	43.1	14.9	25.5	48.0	25.1	40.7	60.7	23.6	39.8	63.5
		(3.4)	(4.7)	(9.2)	(2.6)	(4.4)	(7.1)	(3.4)	(3.6)	(3.5)	(3.1)	(5.5)	(4.3)
	1 boy, 2 girls	9.3	18.7	28.6	20.4*	31.3	58.8	18.4	37.0	64.4	13.6**	28.5	60.0
4		(3.0)	(3.4)	(7.6)	(1.7)	(4.1)	(4.3)	(3.8)	(6.5)	(4.6)	(3.4)	(6.4)	(9.1)
	2 boys, 1 girl	9.4	18.6	27.5	16.6	23.6	40.9	21.5	41.7	68.2	11.4**	20.0***	27.5***
		(2.6)	(2.4)	(5.0)	(1.9)	(2.2)	(8.9)	(7.7)	(10.8)	(10.5)	(3.9)	(4.5)	(11.8)
	3 boys	7.4	31.6	57.6	21.3	39.9	65.3	17.7	25.4*	48.9	38.6	56.1	75.1
		(8.3)	(14.7)	(18.9)	(8.0)	(10.1)	(10.5)	(5.3)	(8.3)	(15.3)	(11.7)	(9.2)	(9.4)
						Rural							
	1 girl	13.0	20.2	31.6	14.5	23.3	39.3	18.1	30.3	47.3	23.5	38.8	56.5
2		(0.7)	(1.2)	(2.1)	(0.6)	(0.8)	(2.0)	(0.4)	(0.5)	(0.8)	(0.6)	(0.7)	(0.8)
	1 boy	11.7	20.1	34.6	14.8	25.6**	40.6	18.4	31.6*	48.1	23.8	39.4	57.3
		(0.8)	(1.2)	(2.3)	(0.6)	(0.9)	(1.9)	(0.4)	(0.6)	(0.9)	(0.5)	(0.6)	(1.3)
	2 girls	15.6	21.1	32.3	15.1	23.9	41.1	17.5	29.4	47.1	25.2	41.7	63.1
		(1.6)	(2.0)	(6.7)	(1.1)	(1.6)	(3.9)	(0.9)	(1.2)	(1.7)	(1.0)	(1.7)	(2.0)
3	1 boy, 1 girl	13.9	19.2	31.9	14.4	24.1	35.8	17.5	30.0	50.8	21.3***	37.1*	59.6
		(0.8)	(1.8)	(3.8)	(0.8)	(1.4)	(2.4)	(0.8)	(1.3)	(2.2)	(1.2)	(2.2)	(3.6)
	2 boys	14.0	20.2	29.4	11.8**	20.2*	27.2***	18.6	31.2	49.7	21.0***	33.3***	52.7**
		(0.9)	(1.5)	(4.5)	(1.0)	(1.6)	(2.7)	(1.4)	(1.9)	(2.8)	(1.3)	(2.7)	(4.4)
	3 girls	6.0	14.0	22.9	14.6	25.6	45.7	22.6	39.7	62.9	21.9	38.9	63.3
		(2.9)	(4.0)	(6.3)	(3.1)	(4.0)	(6.1)	(2.8)	(4.0)	(2.6)	(2.3)	(3.7)	(2.2)
	1 boy, 2 girls	16.0**	28.7**	46.2**	15.8	27.8	53.9	19.0	27.2***	54.9	19.6	36.2	64.9
4		(4.0)	(4.8)	(6.1)	(2.2)	(3.8)	(4.2)	(1.1)	(2.3)	(5.4)	(2.2)	(5.2)	(3.4)
	2 boys, 1 girl	12.6	20.2	28.7	16.6	23.9	42.0	22.2	39.7	65.6	20.2	37.5	65.0
		(3.3)	(3.1)	(7.6)	(1.8)	(2.1)	(8.5)	(2.5)	(5.3)	(3.2)	(2.7)	(5.4)	(3.7)
	3 boys	8.9	17.0	23.7	14.7	23.9	43.2	19.0	27.8*	55.7	20.9	36.9	64.6
		(3.9)	(3.8)	(6.3)	(3.3)	(4.5)	(9.2)	(2.7)	(5.6)	(10.2)	(5.0)	(7.9)	(7.3)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] 25th and 75th percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a 25% or 75% chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 20% or 60% mark on her survival curve. The reported statistics is the average of this median duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at marriage for spell 1 or at 9 months after the birth of the prior child for all other spells. For spells 2 and higher duration sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

Table D.8: Estimated 25th, 50th, and 75th Percentile Durations for Women with Eight or More Years of Education in the "South"

Spell	Composition of Prior Children	1972–1984			1985–1994			1995–2004			2005–2016		
		Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile			Duration (Months)[a] Percentile		
		25th	50th	75th	25th	50th	75th	25th	50th	75th	25th	50th	75th
						Urban							
	1 girl	12.4	20.8	34.5	14.3	25.8	43.3	15.2	25.8	41.5	16.1	27.2	44.6
2		(0.7)	(1.4)	(1.9)	(0.5)	(1.0)	(1.5)	(0.4)	(0.6)	(0.8)	(0.4)	(0.7)	(1.2)
	1 boy	12.8	21.5	37.1	14.0	24.0	38.5**	15.2	26.0	42.3	15.4	25.9	42.7
		(0.7)	(1.0)	(2.0)	(0.5)	(0.9)	(1.2)	(0.3)	(0.5)	(0.8)	(0.4)	(0.7)	(1.1)
	2 girls	13.1	19.1	35.0	15.2	25.2	37.1	16.7	27.2	44.4	17.7	27.8	46.3
		(0.9)	(2.1)	(4.6)	(1.9)	(2.0)	(2.4)	(0.8)	(1.9)	(2.9)	(1.0)	(2.3)	(3.8)
3	1 boy, 1 girl	13.9	21.6	32.0	12.6	23.5	39.2	13.7***	21.7**	35.5**	12.9***	20.2***	34.9**
		(1.0)	(1.4)	(3.6)	(1.3)	(2.1)	(2.5)	(0.9)	(1.5)	(3.1)	(0.9)	(1.6)	(3.5)
	2 boys	16.0	28.7**	45.0*	14.3	22.5	36.3	15.3	22.2**	39.5	15.2	29.2	48.0
		(3.2)	(3.7)	(3.9)	(1.1)	(2.4)	(2.5)	(0.7)	(1.4)	(2.5)	(1.1)	(4.3)	(6.9)
	3 girls	16.7	22.1	30.0	18.9	30.9	51.3	21.6	35.4	61.6	26.9	41.3	59.0
		(4.3)	(5.4)	(10.6)	(4.2)	(5.9)	(6.7)	(5.8)	(8.9)	(11.3)	(5.5)	(5.2)	(5.4)
	1 boy, 2 girls	8.8	20.9	44.8	9.9*	20.0	36.1	9.0**	19.3*	37.1*	18.6	25.9**	50.0
4		(4.4)	(7.3)	(10.1)	(3.2)	(4.4)	(10.5)	(2.3)	(3.3)	(8.7)	(2.7)	(5.5)	(13.7)
	2 boys, 1 girl	8.7	19.9	41.6	16.7	28.6	54.1	9.9*	18.3*	25.4***	8.9**	17.0***	23.4***
		(3.0)	(5.1)	(10.0)	(5.6)	(8.0)	(11.6)	(3.4)	(2.9)	(4.9)	(4.9)	(5.4)	(6.4)
	3 boys	3.5	7.1	11.0	7.4**	18.0	42.9	6.6*	13.8*	21.4***	8.1*	16.1*	22.9*
		(10.6)	(20.3)	(29.8)	(3.7)	(7.7)	(12.2)	(4.5)	(5.6)	(7.0)	(8.4)	(13.5)	(19.1)
						Rural							
	1 girl	13.1	22.9	36.8	13.8	23.1	35.6	14.3	23.2	37.2	14.3	22.6	37.6
2		(1.1)	(1.2)	(2.0)	(0.6)	(0.9)	(1.3)	(0.3)	(0.5)	(0.9)	(0.3)	(0.4)	(1.0)
	1 boy	12.6	20.4*	30.0**	14.7	23.4	37.2	14.0	22.3	36.9	13.5**	21.9	36.0
		(0.8)	(0.7)	(1.8)	(0.5)	(0.9)	(1.6)	(0.2)	(0.4)	(0.7)	(0.2)	(0.4)	(0.8)
	2 girls	15.4	22.9	33.3	15.3	25.9	40.7	14.6	21.8	34.2	14.7	25.2	40.8
		(1.2)	(1.9)	(1.7)	(1.2)	(2.0)	(2.9)	(0.7)	(1.0)	(1.9)	(0.7)	(1.4)	(2.3)
3	1 boy, 1 girl	14.9	21.7	31.8	14.7	22.0*	39.8	13.8	20.9	32.4	12.0***	18.9***	32.2**
		(1.2)	(1.2)	(3.9)	(1.2)	(1.5)	(4.7)	(0.6)	(0.8)	(2.2)	(0.6)	(0.9)	(2.6)
	2 boys	14.9	26.5	38.1	14.2	20.1**	34.0	14.4	21.4	35.7	13.0	19.7***	31.4***
		(2.5)	(2.3)	(4.6)	(1.5)	(1.8)	(4.6)	(0.8)	(1.5)	(3.0)	(0.8)	(1.4)	(2.4)
	3 girls	19.1	26.8	35.4	17.5	27.9	46.8	11.9	20.1	31.2	16.8	26.0	48.4
		(5.5)	(4.7)	(5.4)	(3.1)	(4.6)	(6.2)	(2.4)	(2.4)	(6.1)	(1.7)	(2.7)	(5.3)
	1 boy, 2 girls	16.5	21.1	27.5	14.4	24.4	44.2	13.4	22.1	37.3	16.4	24.4	46.1
4		(2.2)	(2.0)	(5.8)	(3.1)	(4.2)	(7.0)	(2.8)	(2.9)	(9.8)	(2.6)	(3.1)	(11.1)
	2 boys, 1 girl	21.9	36.5	59.9**	13.0	23.4	45.0	11.7	21.2	34.8	10.1*	18.6*	25.6***
		(6.3)	(8.9)	(10.9)	(3.4)	(4.7)	(8.8)	(3.5)	(4.5)	(12.2)	(3.1)	(2.7)	(5.0)
	3 boys	11.8	31.5	49.5	8.6	18.2	33.0	7.5	29.6	62.4	17.3	27.9	55.3
		(7.7)	(9.0)	(10.3)	(4.5)	(7.9)	(14.3)	(18.1)	(23.3)	(27.3)	(5.1)	(7.9)	(13.1)

Note. The statistics for each spell/period combination are calculated based on the regression model for that combination as described in the main text, using bootstrapping to find the standard errors shown in parentheses. For bootstrapping, the original sample is resampled, the regression model run on the resampled data, and the statistics calculated. This process is repeated 100 times and the standard errors calculated.

[a] 25th and 75th percentile durations calculated as follows. For each woman in a given spell/period combination sample, I calculate the time point at which there is a 25% or 75% chance that she will have given birth, conditional on the probability that she will eventually give birth in that spell. For example, if there is an 80% chance that a woman will give birth by the end of the spell, her median duration is the predicted number of months before she passes the 20% or 60% mark on her survival curve. The reported statistics is the average of this median duration across all women in a given sample using the individual predicted probabilities of having had a birth by the end of the spell as weights. Duration begins at marriage for spell 1 or at 9 months after the birth of the prior child for all other spells. For spells 2 and higher duration sex compositions other than all girls are tested against the duration for all girls, with *** indicating significantly different at the 1% level, ** at the 5% level, and * at the 10% level.

E Graphs for All Education and Spell Groups

E.1 Second Spell

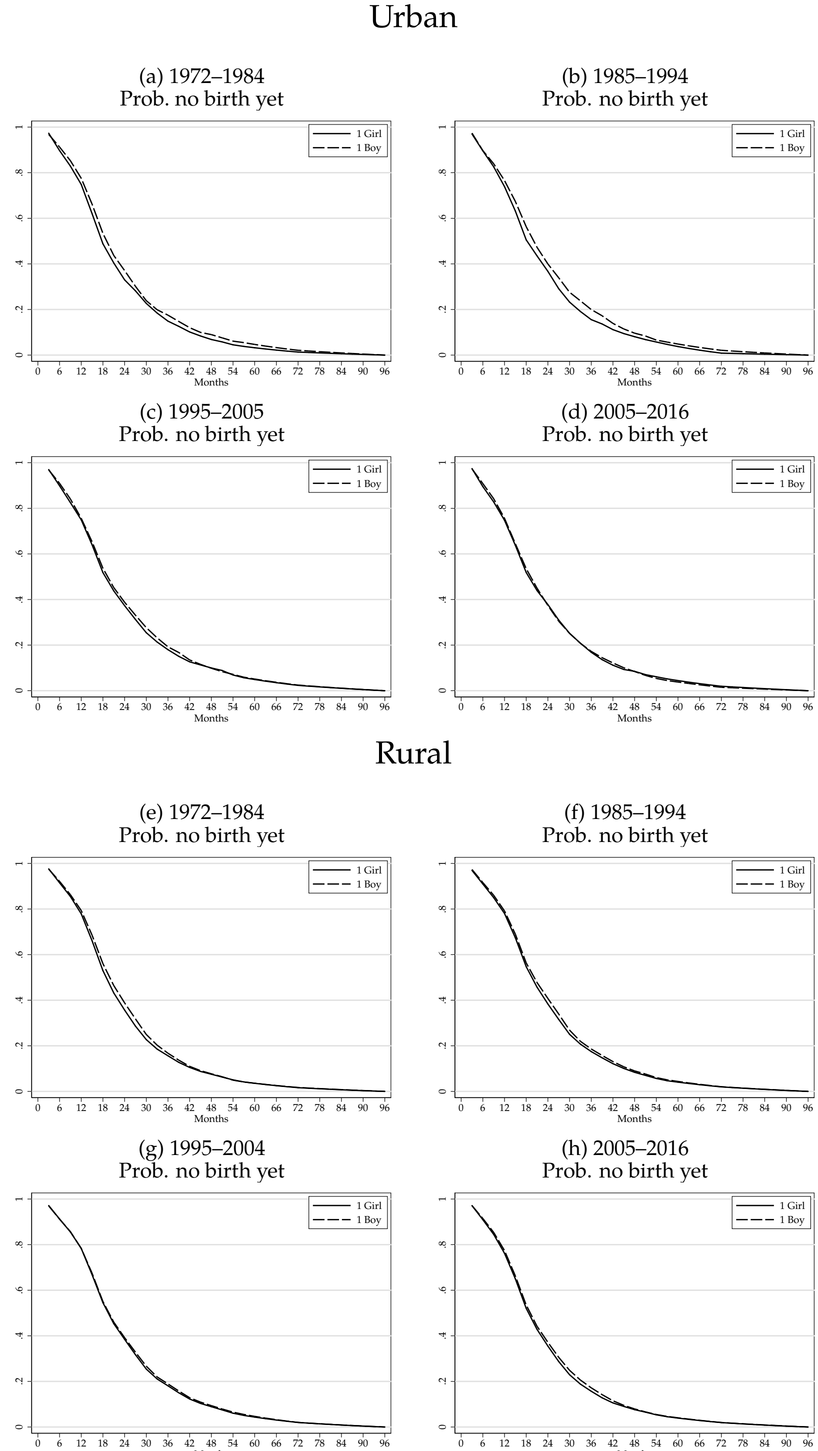


Figure E.1: Survival curves conditional on parity progression for women with no education by month beginning 9 months after prior birth.

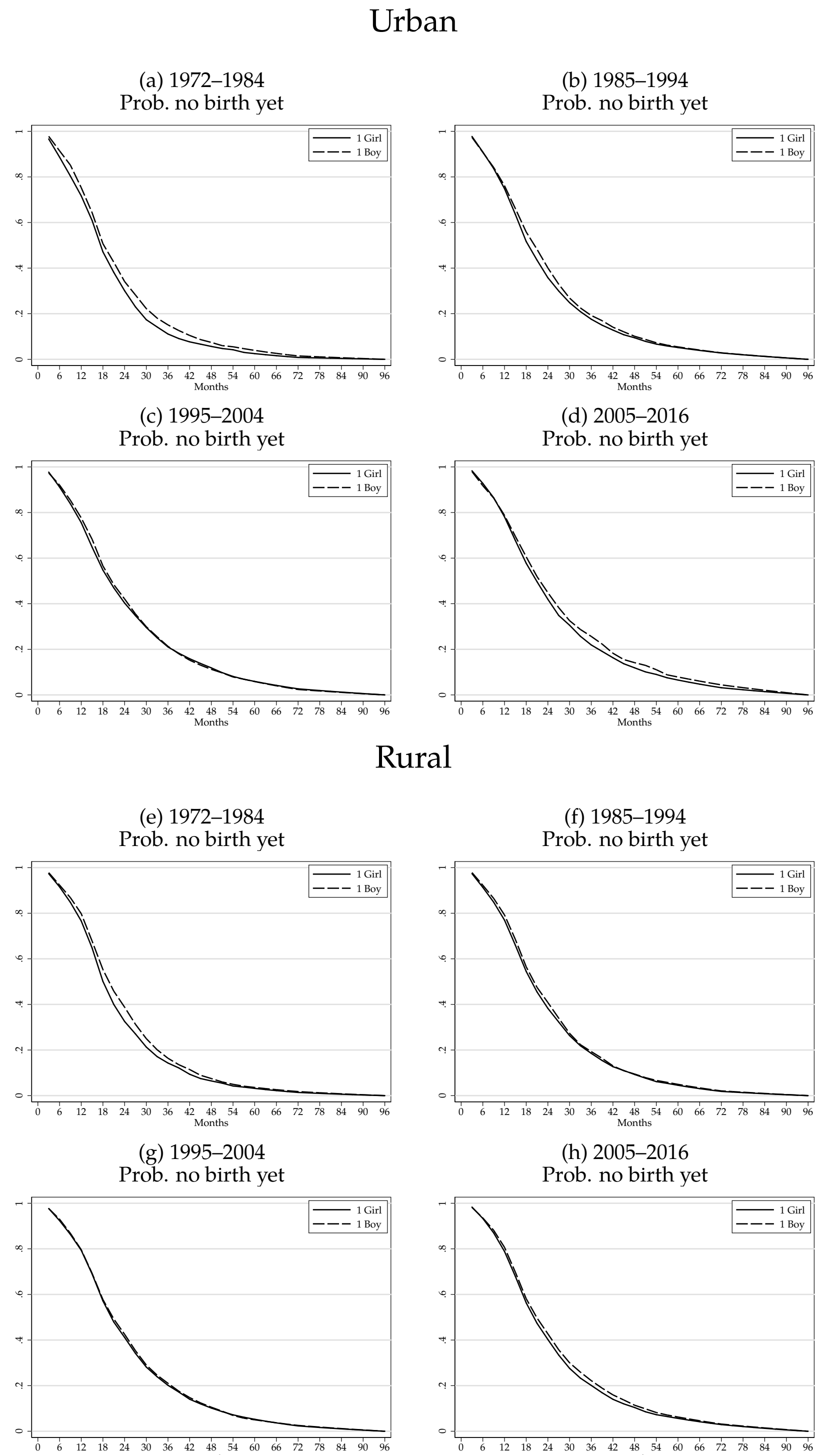


Figure E.2: Survival curves conditional on parity progression for women with 1-7 years of education by month beginning 9 months after prior birth.

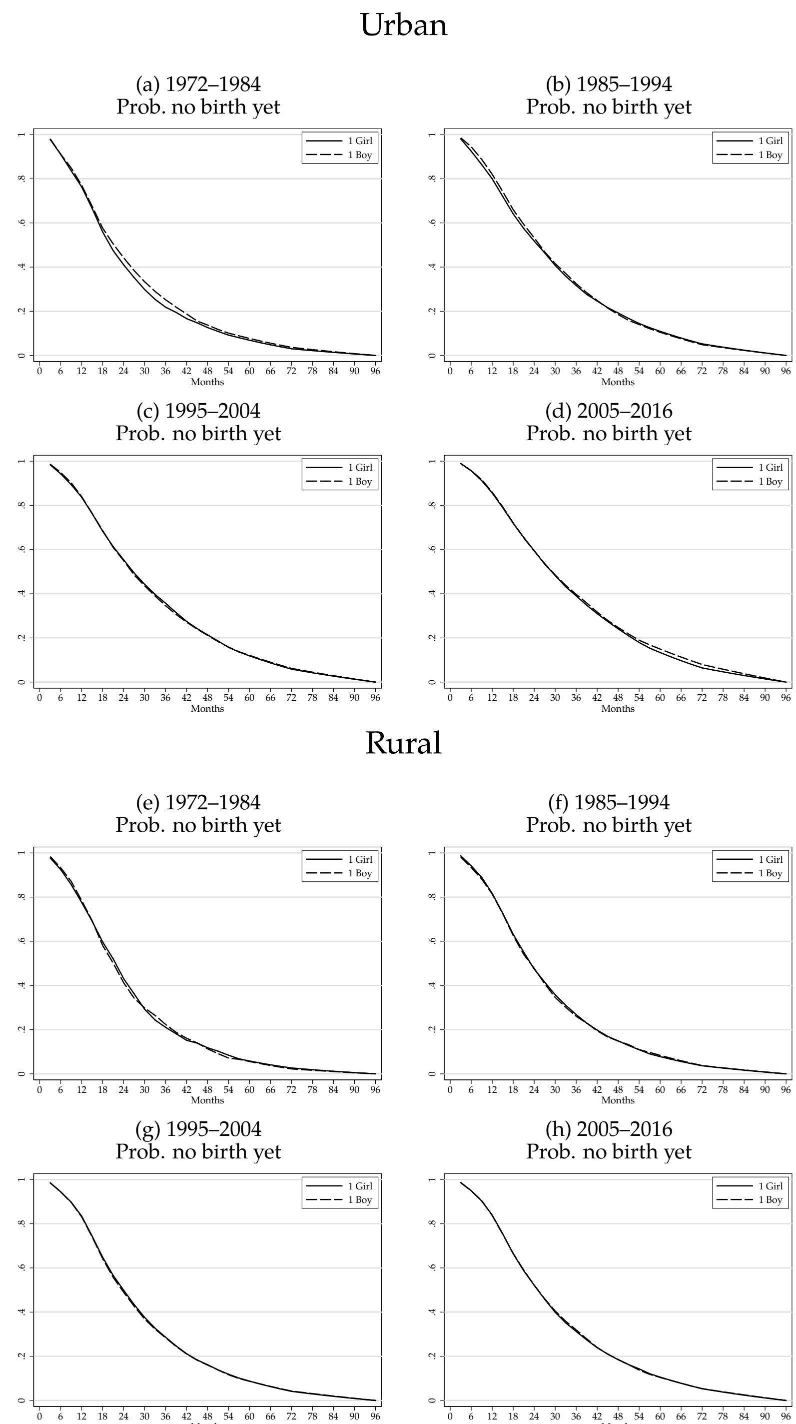


Figure E.3: Survival curves conditional on parity progression for women with 8 or more years of education by month beginning 9 months after prior birth.

E.2 Third Spell

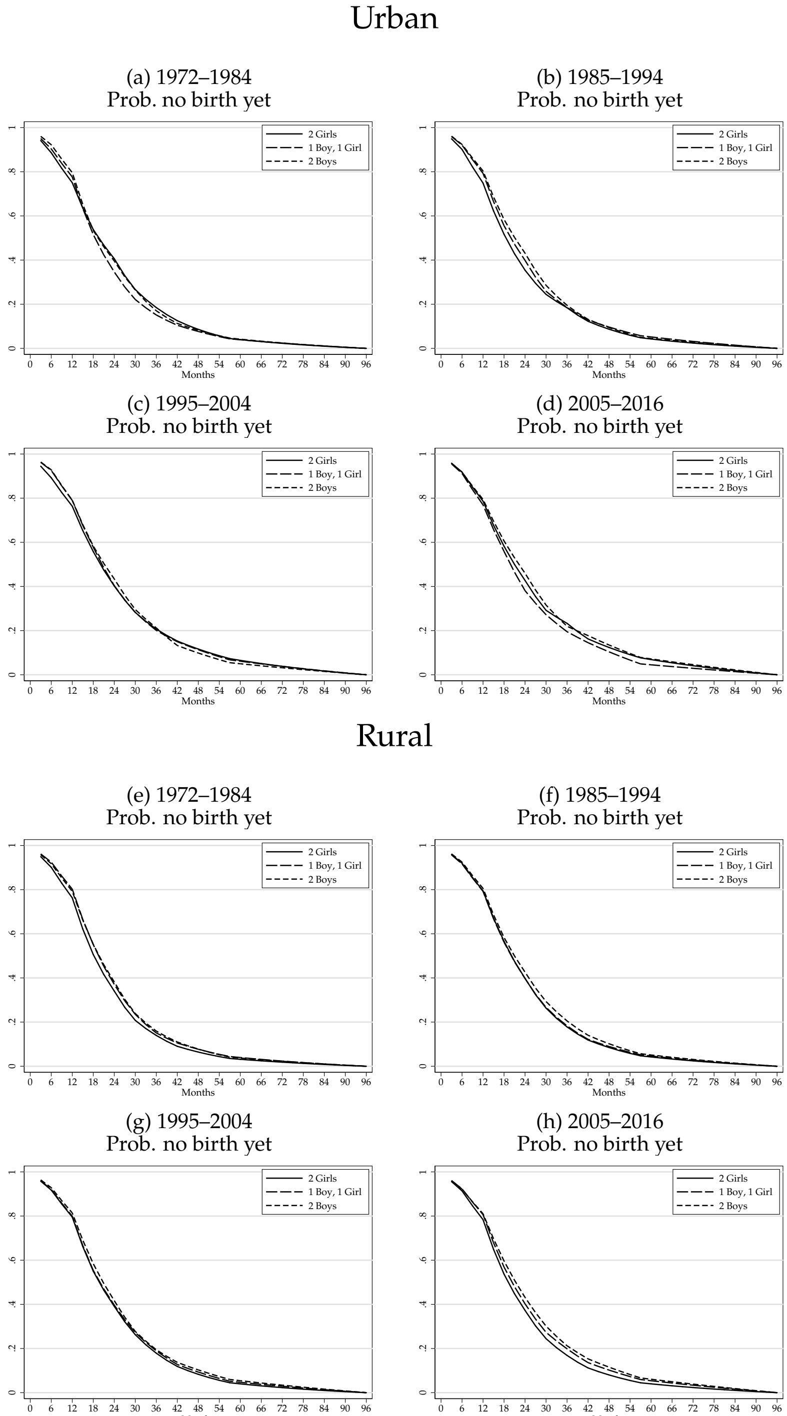


Figure E.4: Survival curves conditional on parity progression for women with no education by month beginning 9 months after prior birth.

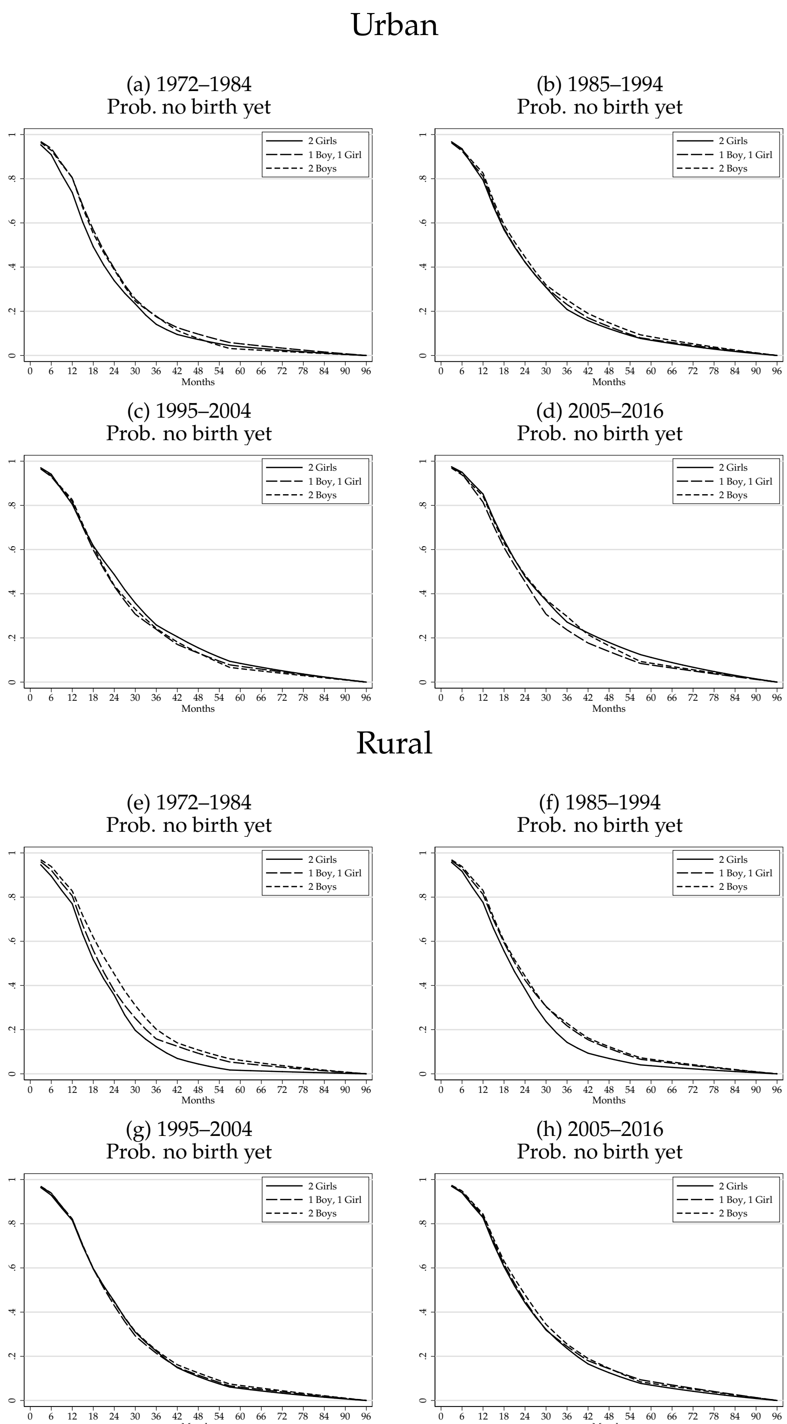


Figure E.5: Survival curves conditional on parity progression for women with 1 to 7 years of education by month beginning 9 months after prior birth.

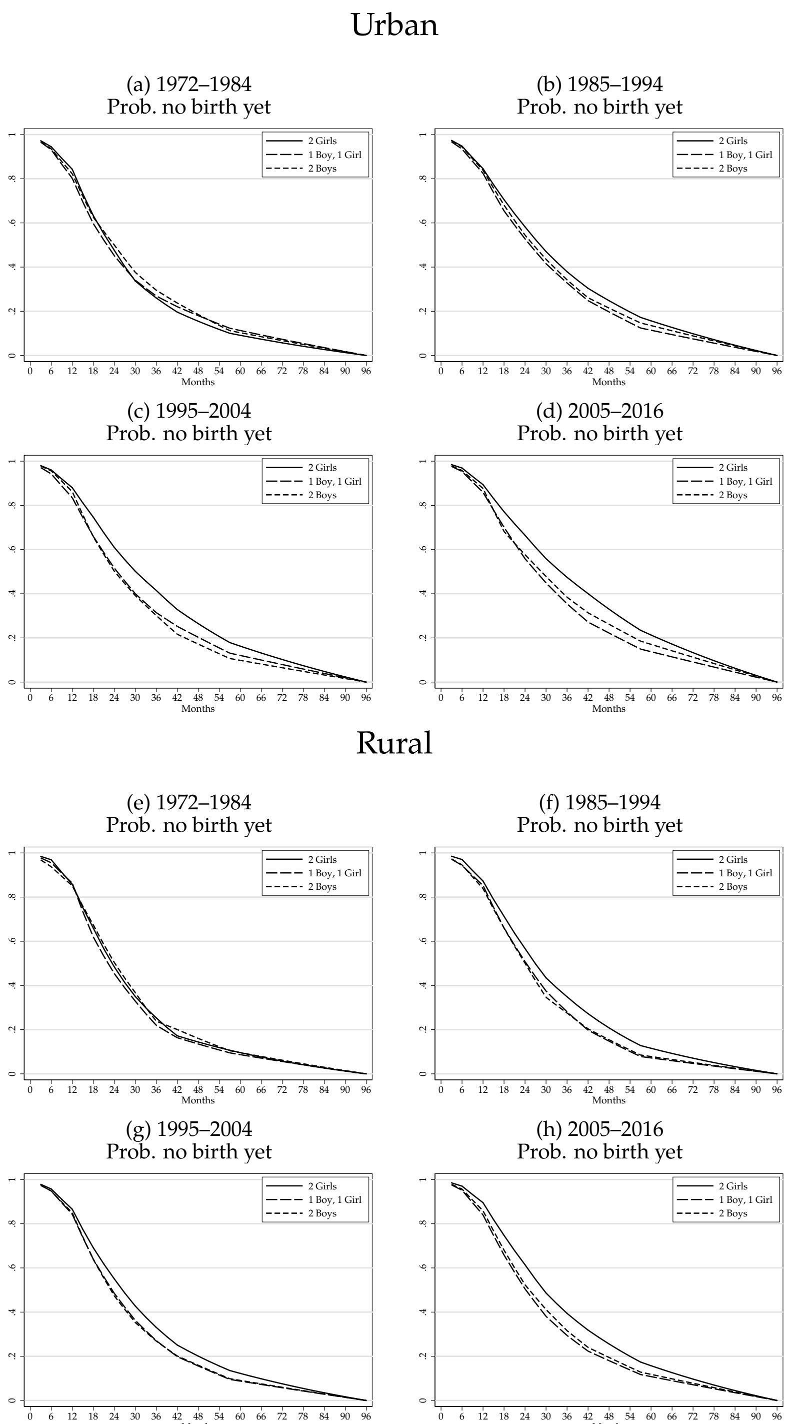


Figure E.6: Survival curves conditional on parity progression for women with 8 or more years of education by month beginning 9 months after prior birth.

E.3 Fourth Spell

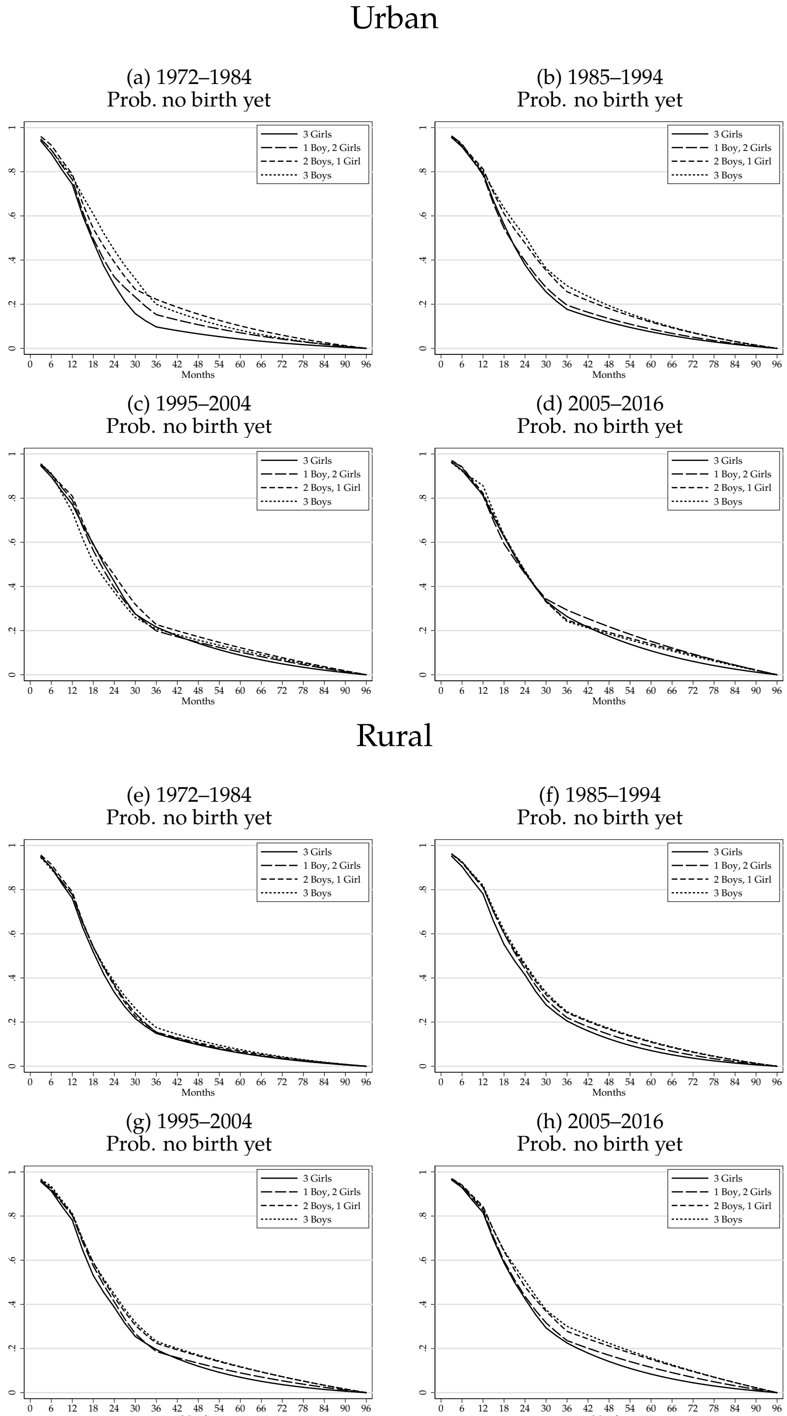


Figure E.7: Survival curves conditional on parity progression for women with no education by month beginning 9 months after prior birth.

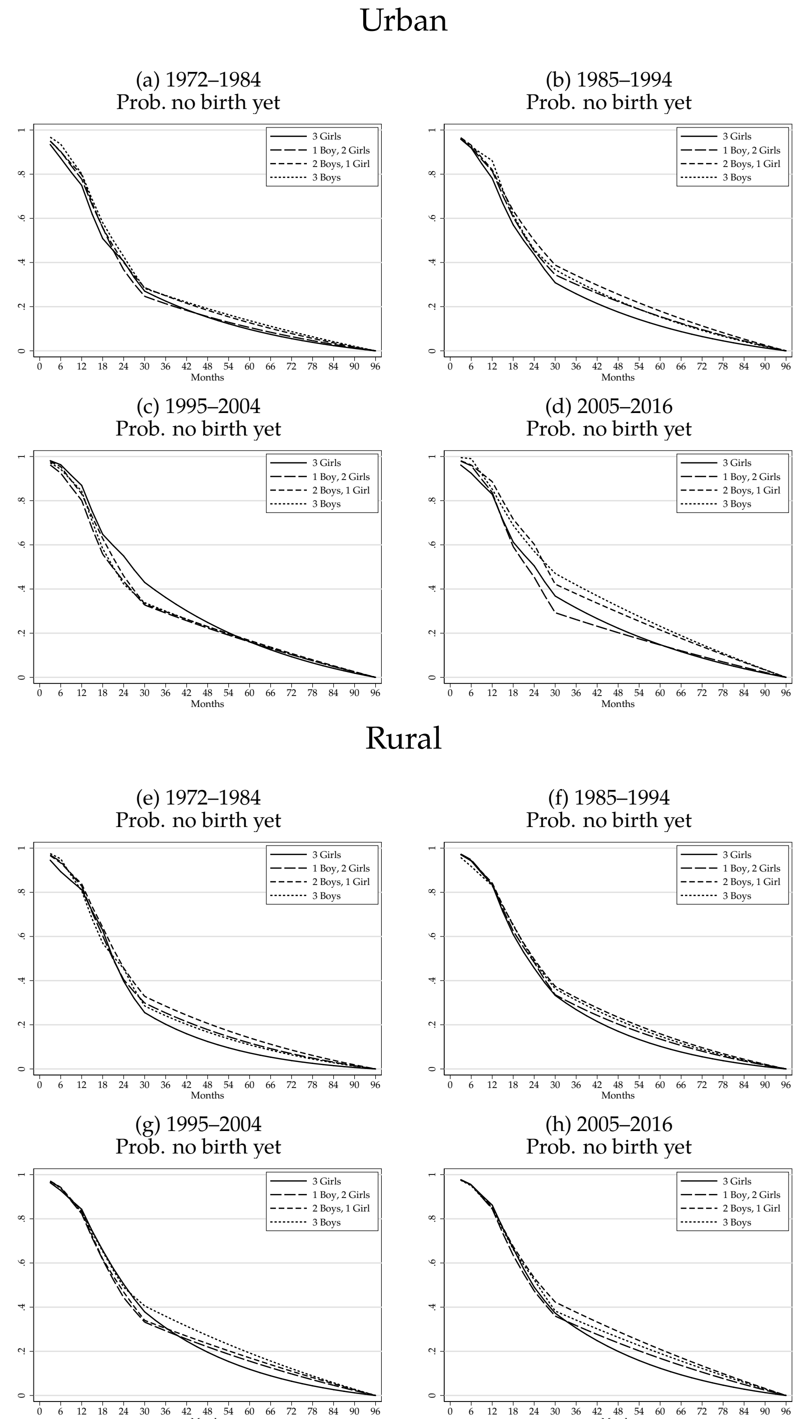
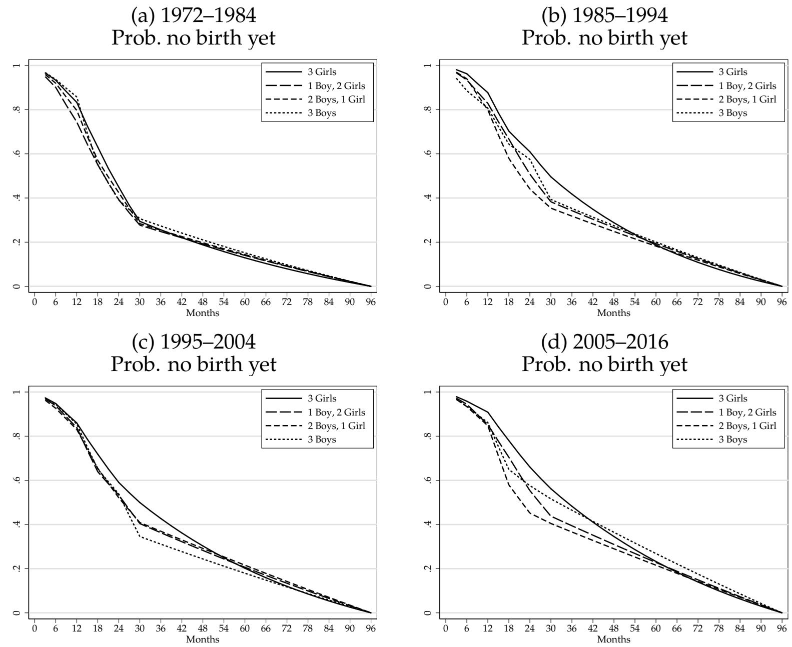


Figure E.8: Survival curves conditional on parity progression for women with 1 to 7 years of education by month beginning 9 months after prior birth.

Urban



Rural

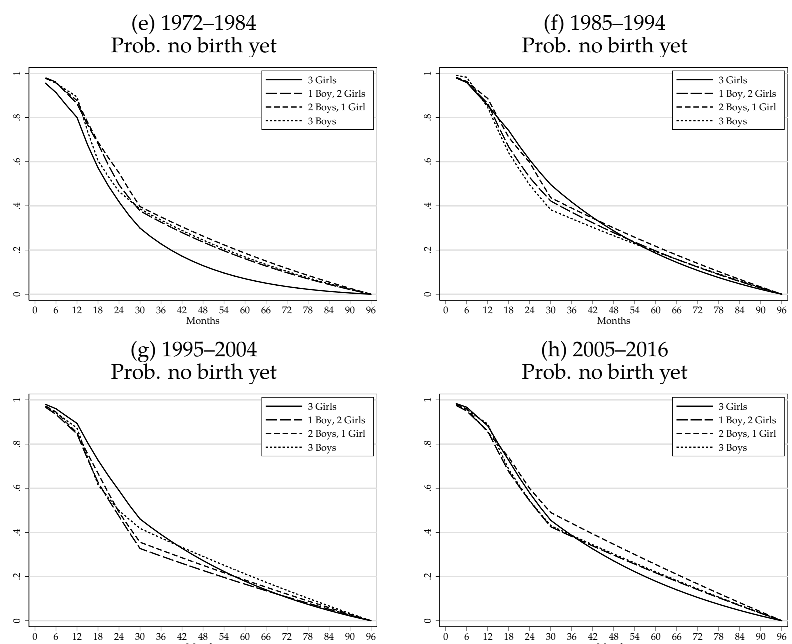


Figure E.9: Survival curves conditional on parity progression for women with 8 or more years of education by month beginning 9 months after prior birth.