Preference for Boys and Length of Birth Intervals

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Abstract

Son preference prevails widely in South and East Asia and is demonstrated by sex-selection methods such as differential stopping and sex-selective abortion. Differential birth-spacing is another possible way by which this disproportionate desire for sons could manifest itself. The time span before moving on to the next pregnancy may be short as long as sons have not been born. Shorter birth spacing leads to higher demand on the mother's body, leading to higher health risk to both mother and child. In addition there is greater competition among siblings for parental care and resources. In this study, we examine this phenomenon by using three demographic and health surveys of Pakistani households covering the period from 1990-91 to 2012-13 and carrying out a set of duration model estimations. We investigate if and how preference for sons affects birth-spacing, if this relationship has evolved over time, if it depends on the order, number or overall proportion of sons born,

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and whether it increases the probability of risky births (those less than 24 or 18 months from the previous birth). We gauge the type of households in which this phenomenon appears to be more prevalent. We find strong evidence for differential behaviour at early parities throughout the period. Women whose first or second children are sons have significantly longer subsequent birth intervals compared with women with no sons. Birth-spacing differs substantially by parity and number of children. Sex of the firstborn is another significant factor. The association seems to have undergone little significant change over the past two decades. Besides, the likelihood of risky births is higher among women without one or more sons. This phenomenon of gender-specific lengthy and risky birth intervals is prevalent more among households that are wealthier or nuclear and among women with greater say in intra-household decisions.

Key words: Birth spacing; Gender bias; Pakistan; Risky birth; Son preference; Survival analysis.

JEL codes: D13; J13; O15; C13; Z13.

Résumé

L'espacement différencié entre les naissances est un exemple démontrant comment le phénomène de préférence pour les garçons peut se manifester. La période précédant la prochaine grossesse peut être courte tant que le nombre désiré des garçons n'est pas né. Une période limitée entre les naissances entraine plus de pression sur le corps des femmes, plus de risques en matière de santé pour la mère et son enfant. De plus, il existe une plus grande rivalité entre les enfants concernant les soins et les ressources des parents. Nous étudions ce phénomène à partir de trois enquêtes démographiques et de santé réalisées auprès de différents ménages pakistanais de 1990-91 à 2012-2013. Nous voulons savoir si et comment la préférence pour les garçons affecte l'écart entre deux naissances, si cette relation évolue sur la période, si elle dépend de l'ordre de naissance, du nombre ou de la part de garçons nés, et si cela accroit la probabilité de naissances risquées. Nous étudions également le profil de ménage où ce phénomène est plus récurrent. En utilisant des méthodes d'estimation paramétriques semi et non paramétriques, nous trouvons des indices forts en faveure d'espacement différencié pour les premières naissances tout au long de la période. Les femmes qui ont d'abord eu deux garçons attendent entre 13 et 17% plus de temps avant une troisième naissance que celles qui n'ont pas eu de garçons. L'espacement varie de façon significative par ordre des naissances et le nombre d'enfants. Le sexe du premier enfant également joue un rôle important. En outre il existe une probabilité plus forte de naissances risquées. Ce comportement est plus répandu dans les familles plus riches ou nucléaires, avec des femmes plus âgées, plus éduquées ou qui ont un poids plus important dans les prises de décision au sein du ménage. Ces résultats ont des répercussions importantes pour la santé maternelle et infantile au Pakistan.

Mots clés: Préférence pour les garçons ; Biais de genre ; Espacement des naissances; Ordre des naissances ; Pakistan.

JEL codes: D13; J13; O15; C13; Z13.

1 Introduction

"The harvest is so ripe, yet why are daughters still born?" (A proverb from the Indian subcontinent)

The phenomenon of son preference has increasingly gained attention in the recent past as age-old customs, in conjunction with greater demand for small families and availability of modern medical technology find expression in terms of sex-selective abortion, female infanticide and daughter neglect. Sen (1990) famously pointed out that there were more than a hundred million missing girls in Asia due to parents' son-preferring attitudes.

Where the sex-selection methods are unavailable or less accessible or are not considered socially acceptable, parent fertility remains incomplete until and unless the desired number of sons is achieved. One potential demographic consequence of this disproportionate desire for sons is the household's altered birth parity and birth spacing. Couples with no sons at earlier parities may choose to shorten the interval to the next birth in search of male offspring (Milazzo, 2012). This shortening of birth spacing can have adverse effects on the mother's and children's health outcomes. There is a higher risk of maternal depletion, pregnancy-related complications and maternal mortality. Children with shorter preceding intervals face increased odds of both neonatal and under-five mortality, even though the impact may only appear in high parity births (Kozuki and Walker, 2013). Rutstein and Winter (2014) report 26 percent excess under–five mortality due to birth–to–conception intervals of less than 36 months. Greater stress on parental resources resulting from shorter intervals also affects the nutrition and health of existing children and worsens their chances of survival (sibling competition effect).

In this study, we investigate how preference for sons affects birth-to-birth intervals among Pakistani women. Pakistan is an interesting case study. It is the world's sixth most populous country with substantially biased sex ratios and high fertility rates. Under five and infant mortality rates at 78 and 64 per thousand births are also among the highest in Asia (PDHS, 2013). It is a Muslim-majority country where, unlike in China or India, sex-selective abortion remains limited[1](Javed and Mughal, 2018; Zaidi and Morgan, 2016).

Son preference therefore manifests itself through larger family size. The impact on spacing thus becomes an important issue, with possible repercussions on maternal and child health outcomes. This study makes a number of contributions to the son preference literature:

First, we carry out a comprehensive examination of changes in birth spacing with respect to various aspects of son preference using a set of parametric, semi- and non-parametric estimations. We analyze parity-wise effects of observed preference for sons on subsequent birth spacing. We look at the differential impact of the number of sons born to a woman at a given parity. In addition, we gauge the effect of the sex of the eldest child and the overall son-to-child ratio on the waiting time to the subsequent birth. We also check whether having one or more sons influences the length of the waiting period before the final birth and the use of contraceptives. We obtain strong evidence for son preference at parity 1. This significant impact seems to dissipate beyond the second parity. Women whose two first children are both sons are found to wait 13 to 17 % longer before their third birth than women with no sons. Women with one or more sons who have not completed their fertility

[1]This largely owes to strong Islamic injunctions against female infanticide and foeticide. For instance, the Quran states: "and when the girl-child that was buried alive is made to ask (9) for what crime she had been slain" (Surah At-Takwir (Shrouding In Darkness) 81:8).

are also more likely to be using contraceptives compared with women with no sons. Secondly, we study the son preference – spacing relationship using three demographic and health surveys of Pakistani households covering the period from 1990 to 2012. This allows us to understand the variation in the relationship over time. During this period, fertility rates in Pakistan have fallen and contraceptive prevalence has picked up[2].

We find that the son preference – spacing association has survived over the years.

Thirdly, we investigate whether disproportionate preference for male offspring increases the probability of risky births (those less than 24 or 18 months from the previous birth). We find evidence for significantly higher incidence of risky births among women with no sons.

We explore the characteristics of women who show sex-selective interval shortening behaviour. We find that this behaviour is more common among women with greater say in intra-household decisions and decisions related to their health. The effect is also higher among wealthier, nuclear and urban households as well as among consanguineous couples.

The remaining content of the paper is organized as follows:

Section 2 briefly overviews extant relevant literature. Section 3 presents the spacing situation in Pakistan. Section 4 describes the datasets used and discusses the empirical methodology and the models employed. Findings are presented in Section 5 followed by robustness measures in Section 6. Section 7 concludes and discusses possible implications of the findings.

[2]The country's Total Fertility Rate (TFR) fell from 5.4 children per woman in 1990 (PDHS 1990-91) to 3.8 children per woman in 2012 (PDHS 2012-13) and the Contraceptive Prevalence Rate (CPR) grew from 12 percent in 1990 (PDHS 1990-91) to 35 percent in 2012 (PDHS 2012-13).

2 Overview of Related Literature

There is a large and burgeoning literature on fertility choices of couples in the presence of son preference in the developing countries. In one of the first studies in this area, Repetto (1972) reported that son preference and number of living sons were not among the factors that influence actual current fertility levels in Bangladesh, India and Morocco. Rahman and Vanzo (1993) found that for Bangladeshi woman with at least one daughter, the risk of a subsequent birth was negatively related to the number of sons already born.

Effects of son preference on fertility were also discussed in other studies on Asian countries (for example see Jiang, Li, and Sánchez-Barricarte (2016) on China, Arnold, Choe, and Roy (1998) and Pörtner (2015) on India, Pong (1994) on Malaysia, Tsay and Chu (2005) on Taiwan and J. Haughton and D. Haughton (1995) on Vietnam).

Studies such as Arnold (1985) and Ben-Porath and Welch (1976) argued that gender preferences in least developed countries manifested themselves through association between birth interval and child sex ratios. Tu (1991) showed that while most women in Shaanxi Province, China tried to have their first birth as soon as possible after their first marriage, the length of the second and third birth intervals and the likelihood of going on to have a second or third birth was strongly influenced by the sex composition of the children already born. Larsen, Chung, and Gupta (1998) showed that South Korean women who had a son were less likely to have another child, and those with a son who progressed to have another child took longer to conceive the child. This pattern prevailed for women of parity one, two, and three, and became more pronounced with higher parity.

Although a few studies have examined the role of son preference on fertility among Pakistani households, the interaction between preference for male child and birth spacing in the country yet remains unexplored. In a pioneer study, Khan and Sirageldin (1977) reported that the negative inducement of the number of living sons in Pakistani households on the desire for additional children was three times that due to the number of living daughters, and was equally as true for wives' responses as for their spouses'. Besides this, the positive inducement of the deficit of surviving sons from the ideal number was two to three times that due to the deficit of surviving daughters from the ideal number. Similarly, Rukanuddin (1982) found that the tendency to compensate for child death was stronger among Pakistani couples having suffered the loss of a male child than those having suffered the loss of a female child. In contrast, De Tray (1984) found no clear evidence supporting an impact of son preference on fertility among Pakistani households.

Ali (1989) employed the Pakistan National Survey 1979-80 dataset and reported that the desire to have at least one son influenced the demand for additional children. Hussain, Fikree, and Berendes (2000) conducted two rounds of household surveys (1990-91 and 1995) in Karachi, Pakistan's most populous city, and reported that the sex of surviving children was strongly correlated with the couple's subsequent fertility and contraceptive behaviour.

Channon (2017) likewise showed that the association of son preference with parity progression and modern contraceptive use had become stronger in Pakistan over time.

3 Overview of Son Preference and Birth Spacing Among Pakistani Couples

3.1 Son Preference[3]

Pakistan's population sex ratio, though lower than India's or China's, remains substantially above the world average of 101. The ratio fell from 116 according to the 1951 population census to 105 in the latest 2017 census (Figure 1)[4][5].

This disproportionate preference for sons can be clearly seen in the country's skewed sex ratios at birth (SRB). SRB with one to four existing children according to PDHS 1990-91, 2006-07 and 2012-13 ranges from 125 to 191[6] (Table 1), suggesting that parents with one or more sons are more likely to stop childbearing compared with those who have none. Sex ratio at last birth (SRLB) is another depiction of this phenomenon. The ratio was a high 133 per hundred female children according to the 2012-13 PDHS.

Table 2 shows sex-wise parity progression for couples with one, two and three children. A higher percentage of parents with no son continue adding to the family than those with one or more sons. For instance, about 94 percent of the parents who have no son out of three existing children go on to have another child. The corresponding figures for parents with one or more sons ranges from 77 percent (one son) to 87 percent (two sons).

Table 3 shows profile of women with and without a son. Fewer women living in

[3]For a detailed exposé on son preference in Pakistan, see Javed and Mughal (2019).

[4]The improvement in the sex ratio seen over the decades is possibly the result of improving female survival rates.

[5]These unbalanced figures are partly an outcome of misreporting of female births (Mahmood 2007).

[6]These ratios are calculated for ever-married women of childbearing age having completed their fertility.

non-nuclear households (87% - 91%) have one or more sons compared with those living in nuclear settings (96% - 97%). Similarly, a lower proportion of women with no education or no employment have one or more sons than those with some education or a job. There are also signs of spatial variation, with a higher proportion of women living in urban areas reporting to have no son.

3.2 Birth Spacing Among Pakistani Couples

Average waiting time until the next birth among Pakistani couples is above World Health Organization's minimum endorsed benchmark of 24 months. Table 4 gives average succeeding birth intervals at parity 1, 2 and 3. In 2012-13, the average succeeding birth space at parity 1, 2 and 3 was reported to be 27.3, 29.2 and 29.5 months respectively. Average birth spacing has increased over time. In 2012, it was 1.1, 2.1 and 1.3 months above the 1990 levels for the first three parities respectively. Birth space shows increase with birth order. Spacing is higher at parity 1 among poor households (28 months in 2012-13) compared with that of non poor households (26.9 months in 2012-13). This changes at subsequent parities with 28.2 months vs 29.8 months average waiting time between the second and the third child and 28.8 months vs 30 months between the third and the fourth child birth for poor and non-poor households respectively (2012-13).

Spacing patterns in rural and urban areas have evolved over time:

In 1990-91, rural women had longer waiting periods to subsequent births at all the three parities. This reversed for birth spacing at the second and the third parity during the 2000s with urban women showing significantly higher waiting periods than do rural women. This trend is also seen with respect to women employment status. The difference in average succeeding birth space is also evident relative to woman and spouse education. Spacing does not show much variation with the joint or nuclear nature of family structure.

Just under half of the total birth spaces between the first and the second child are under 24 months, while 27 percent do not exceed 18 months (Table 5). The proportion of risky births decreases with parity.

Table 6 presents parity-wise statistics of subsequent birth spacing for women with at least one son. 50 percent of women with a first-born girl have a short subsequent birth spacing (less than 24 months) while 47 percent of women with a first-born son have a short birth interval. Similarly, 43 and 46 percent of women at parities 2 and 3, who have no sons, have a birth interval of under 24 months compared with 40 percent of women with at least one son. The proportion of women with short subsequent birth intervals decreases with the number of existing sons.

4 Empirical Strategy

4.1 Data Description

We employ data from three rounds of the Pakistan Demographic and Health Survey (PDHS). The PDHS is a nation-wide representative survey of ever-married women aged 15-49 which contains wide range information about women's health and reproductive history. The first (1990-91) round covered 6,611 women from 7,193 households, the second (2006-07) round interviewed 10,023 women from 95,441 households while the third (2012-13) round covered 13,558 women from 12,943 households. Table A1 in the appendix gives a summary of the three rounds of the dataset..

We restrict our sample to women having completed their fertility i.e. those who either gave the answer "want no more children" in response to the question "Do you desire more children?", those who or whose spouse had undergone sterilization, and those who report to be infecund. Nulliparous women and those with multiple births were excluded from the dataset.

The dataset contains information about birth history, birth order and spacing in descending birth order (from youngest to oldest child). We analyse the data in ascending order by inversing the birth information.

Our outcome variable is duration (in months) between parity n and $n + 1$.

A number of indicators are taken to represent son preference. These correspond to the presence of at least one son at a given parity, total number of sons born, sex of the firstborn, presence of male children before the last birth, and the proportion of sons in total number of children. We control for individual factors (woman's age at marriage, age difference with the husband, current age, education, employment status, exposure to media), spouse factors (education) and household's demographic, economic and spatial information (family structure, household size, place of residence and household wealth).

Table 7 gives the definitions of the variables included in the study while Table 8 provides summary statistics of the variables.

54 percent of the women at parity 1 have a son in all the three subsets. The proportion of women with at least one son increases to 79 percent and 90 percent at the second and third parities respectively. Mean female age at marriage is low (17.9 in 1990-91 and 18.3 in 2012-13). Majority of women have no schooling (76 percent in 1990-91, 61 percent in 2012-13). A small proportion of women reports to be employed (16 percent in 1990-91, 28 percent in 2012-13).

An average household in the dataset is composed of eight members. Majority of the households are located in rural areas.

4.2 Methodology

Our analysis proceeds as follows:

In the first step, we explore the relationship between different son preference indicators and waiting time until the next birth. We limit the analysis to third parity, thereby focusing on the spacing effects of the second, third and fourth births. Respondents who did not experience subsequent birth were therefore censored. In addition to comparing birth intervals of women with and without a son at each parity, we look for the size effect of son preference by studying how the number of sons influences the spacing patterns of a woman's succeeding births up to the third parity. We also analyse average spacing effects of having a firstborn male child and the overall ratio of sons to total numbers of children born to a woman (son ratio). We calculate the ratio for women who have given birth to at least two living children. We also check the impact of having borne sons on the interval to the last birth. Finally, we estimate the impact of having one or more sons on the woman's reported contraceptive use.

We carry out the aforementioned set of estimations on the three PDHS datasets and gauge the change in the relationship occurring over time.

In the second step, we study to what extent does preference for male offspring contributes to short-spaced or risky births with spacing below 24 or 18 months.

Next, we determine the characteristics of women and their households that have shown significant spacing effects related to son preference. Characteristics examined include (I) household wealth, (II) family structure (nuclear or joint), (III) Consanguineous marriage, (IV) woman's age at marriage (V) woman's say in household decisions and (VI) location of residence (urban / rural).

We compare poor households with non-poor ones (those lying in the two bottom quintiles vs those in the upper three quintiles of the asset distribution) and wealthy households (those in the top quintile) with poor and middle-income ones (those in the second to fifth quintiles).

We examine the role of woman's age at marriage by dividing the sample into roughly equal groups of women who married early (before 18 years of age) and those who got married later.

Woman's say at home is measured using two binary indicators. The first measures whether the responding woman makes one of the following decisions by herself or conjointly with her husband: (I) healthcare, (II) family visits, (III) everyday consumption, and (IV) spending husband's income[7]. The second indicator reports whether a woman can decide about her healthcare independently or in conjunction with her husband.

Finally, we carry out a number of robustness and sensitivity checks to test the quality of our estimations.

4.3 Econometric Techniques

We employ a panoply of parametric, semi- and non-parametric duration model estimation techniques to examine the son preference – birth spacing relationship[8].

Duration analysis (also known as lifetime data analysis, reliability analysis, time

[7]The indicator is taken from Javed and Mughal (2018).

[8]Estimations relating to short birth intervals however are carried out using Probit models.

to event analysis or event history analysis) is used to examine data in which the outcome variable corresponds to time (t) to occurrence of the event of interest. In this study, the event of interest is the waiting period between a given parity and succeeding birth. A key advantage of duration models is that they enable us to censor individuals who do not experience the event of interest.

First, we estimated Cox proportional-hazard (PH) regression model (Cox, 1972) using appropriate sample weights. This semi-parametric model helps focus on the ordering of the event of interest and can be given by:

$$h(t \mid X) = h_o(t)\ exp(X^t\beta) \tag{1}$$

or in a precise form:

$$h(t \mid X) = h_o(t)\ exp(\beta_1 X_1 + \beta_2 X_2 ....\beta_k X_k) \tag{2}$$

where $h(t)$ is the hazard rate, $h_o(t)$ is the baseline hazard function, X is the vector of individual characteristics which influence the occurrence of the event, andβ is the regression coefficient. The hazard rate measures the effect of given co-variates on the occurrence of the event of interest. Taking a binary variable with $X = 0$ as the reference group (here women without a son) and $X = 1$ as the non-reference group (women with a son), the hazard rate between the two groups can be given as follows:

$$HR = \frac{h(t \mid X = 1)}{h(t \mid X = 0)} = exp(\beta) \tag{3}$$

If the value of $HR = 1$, then both groups have an equal chance of experiencing the event. In contrast, if the value of $HR > 1$, then individuals in the non-reference group have a greater probability of experiencing the event, whereas a value < 1

implies a higher probability for individuals of the reference group to experience the event.

We obtain survival curves using the Kaplan-Meier (KM) estimator. The KM cumulative survival curve is a non-parametric approach based on the survival function $S(t)$ which, for a randomly-selected individual from the population under study, specifies the probability of occurrence of an event after time t. In our case, the curve shows progression to the next birth and shows how quickly it happens.

Let $N(t)$ represent the occurrence of an event (e.g. subsequent birth) within the time span $[0, t]$. The time span could be divided into a number of short periods $0 = t_o < t_1 < .... < t_k = t$. Using the multiplication rule to denote the conditional probability

$$S(t) = \prod_{k=1}^{k} S(t_k \mid t_{k-1}) \tag{4}$$

and $S(v \mid u) = \frac{S(v)}{S(u)}$

Here $> u$, the conditional probability that the subsequent birth will occur later than v, given that it has not occurred by time u. We assume that the time of occurrence of the event is not tied. If no subsequent birth takes place within the time $(t_{k-1}, t_k]$ then estimates $S(t_k \mid t_{k-1})$.

If subsequent birth happens by the time $T_j \epsilon (t_{k-1}, t_k]$, then the natural estimate of $S(t_k \mid t_{k-1})$ is $1 - \frac{1}{Y(t_{k-1})} = 1 - \frac{1}{Y(T_j)}$.

Putting the above estimates into equation 4, we obtain the Kaplan–Meier estimator as follows:

$$\hat{S}(t) = \prod_{T_j \leq t} \{1 - \frac{1}{Y(T_j)}\} \tag{5}$$

We also employ Survival-time Regression Adjustment (RA). The RA estimator fits separate models for different treatment levels and uses the averages of predicted outcomes to obtain Average Treatment Effects (ATE) (StataCorp, 2017). Unlike the hazard rate obtained by Cox estimation which provides relative conditional probabilities cumbersome to interpret, RA's ATE is simply the population average of the difference between outcomes when everyone is subjected to the treatment (has a son in this case) and when no one is subjected to the treatment (does not have a son). The RA is estimated using the Weibull outcome model.

The logic of RA can be described as follows:

First, we estimate the parameters β_τ of a parametric model for the survival-time outcome t for each treatment level $\tau \epsilon \{0, 1\}$.

Here, $F(t|x, \tau, \beta_\tau)$ is the distribution of t conditional on covariates x and the treatment level τ. The estimate of β_τ can be denoted by $\hat{\beta}_{r\alpha,\tau}$.

Now we estimate the mean survival time conditional on x and treatment level τ for each observation of the sample. We get

$$\hat{E}(t_i \mid x_i, \tau, \hat{\beta}_{r\alpha,\tau}) \tag{6}$$

For the potential survival-time outcome t_τ corresponding to the treatment level,

$$E(t \mid x, \tau, \beta_\tau) = E(t_\tau \mid x, \beta_\tau) \tag{7}$$

Sample averages of $\hat{E}(t_i \mid x_i, \tau, \widehat{\beta_{ra,\tau}})$ consistently estimate the POM for treatment level τ. The mean can be written as POM_t.

5 Findings

5.1 Son Preference and Spacing

We begin by showing Kaplan-Meier curves for the three rounds (Figures 2 – 4). For all three datasets the lower (blue) survival curve for women with no sons is shorter and steeper than the upper (red) curve for women with one or more sons implying that women with no sons move on to the next birth earlier than do women with sons.

Next, we examine birth spacing with respect to a number of dimensions of differential gender preference. Table 9 reports results of Cox estimations of parity-wise spacing effects for the three rounds of PDHS. Results for each round are shown in three columns corresponding to intervals between first and second birth, second and third birth, and third and fourth birth as outcome variables respectively. We see that the hazard ratios are invariably below 1 reflecting a lower failure probability among women with male children compared with those without a son.

At parity 1, there is little evidence of variation in the relationship occurring over time as the hazard ratios are significantly different from one at the 1% level of significance for all the three rounds. The ratio is 10 - 13 % lower for women with a firstborn male child compared with women with no son.

In contrast, there is some evidence for change over time at parity 2. While the hazard ratio for subsequent birth spacing was not significantly different from one in 1990-91 regardless of the sex of the children, the ratio is found to be significant in later years. Women for whom one or both of the first two children are sons are significantly more likely to delay the following birth compared with women with no sons (15 % in 2006-07, 10 % in 2012-13). Results for parity 3 are insignificant for all the three rounds.

Table 10 shows Cox estimations for birth spacing effects for women with one, two and three children. As before, women with one or two sons at parities 1 and 2 show a significantly lower hazard ratio of proceeding to the next birth. While the hazard ratio for women with one son at parity 2 is not significantly different from one in the 1990-91 dataset, the ratio is significantly below one for women with two sons. A woman whose two children are both sons has a 13 – 17% lower hazard ratio during the period under study compared with mothers with only girls.

The trend of birth interval between the penultimate and the last child also varies according to the sex of existing children (Table 11). The hazard ratio for women with only male children is less than one for all three subsets and significant at the 1% level. All-son women in the three datasets are 14 – 18% more likely to delay their last birth compared with corresponding women having one or more daughters. In other words, women who only have boys till the penultimate birth are more likely to wait longer before the final birth than women with one or more girls.

Results obtained using Survival-time regression adjustment (shown in Table 12) add to the evidence in favour of a sizeable role of son preference in determining the length of overall birth intervals. At parity 1, women with just one female child proceed to the next birth 1.63 to 1.66 months or about seven weeks earlier than those who have a boy. The average subsequent birth interval for women with a son at parity 1, for example, is found to be 26.83 months in the 2012-13 dataset.

The difference between all-boy and all-girl mothers remains strong in the second and third parities. Women whose two existing children are both girls transit to a third birth 1.28 to 2.74 months (or between 5.5 and 11.9 weeks) earlier than their two-boy counterparts. The corresponding range of difference in waiting span for parity 3 is 1.59 to 2.79 months (6.9 to 12.1 weeks) respectively.

Next, we examine how overall birth spacing differs by the proportion of boys in the total number of children over a woman's reproductive history. Table 13 shows results of Cox regression for birth spacing by son ratio. The hazard ratios for women with a higher proportion of boys is substantially below one and significant at 1% (HR = 0.62 in 1990-91, 0.68 in 2006-07 and 0.74 in 2012-13). This again shows that women with fewer boys are significantly more likely to shorten birth intervals than those with no son. These results give a clearer picture of the evolution of the son preference – spacing relationship. The difference in birth spacing by sex of children seems to show a weakening trend over time.

Table 14 gives evidence for differential spacing effects of another aspect of son preference. Women whose first child was a son have hazard ratios < 1 throughout the period studied, suggesting that such women are more likely to postpone future pregnancies compared with women whose firstborn was a daughter.

Finally, we gauge women's birth spacing conditional on the sex of the preceding children by looking at their use of contraceptive measures. We expect contraceptive prevalence to be higher among women with one or more sons than those without a son. Table 15 reports Probit estimates for the likelihood of current contraceptive use among married women who have yet not completed their fertility. For all the three datasets, having one or more male child has a positive effect on the probability that the woman is currently using a contraceptive measure, significant at the 1% level. Marginal effects evaluated at the means show that the probability of higher contraceptive use ranged from 4% in 1990-91 to 8% in 2012-13. These results again point to significant gender-specific effects on women's fertility outcomes which shows signs of strengthening over time.

5.2 Son Preference and Short Birth Intervals

Now we examine the possibility that preference for sons influences the risk of short birth spacing (shorter than 24 or 18 months between two births).

Table 16 reports results of parity-wise Probit estimations on the likelihood that the subsequent birth will occur before 24 or 18 months. Having a son at parity 1 is significantly associated with the likelihood of longer spacing with a positive sign for the coefficient. Women with a male firstborn child are between 2.9 and 5.7 % more likely to have their next birth later than 18 or 24 months compared with women with a firstborn girl.

This likelihood for risky births is somewhat higher for births below 18 months (marginal effect at means = 0.057 in 1990-91, 0.029 in 2006-07 and 0.042 in 2012-13) than for those under 24 months from the previous birth (marginal effect = 0.037 in 1990-91, 0.031 in 2006-07 and 0.032 in 2012-13). The impact of son preference on short birth spacing is mostly insignificant at higher parities.

We find little change in the impact over time.

These results suggest an important role of son preference in the incidence of risky births. Given that half of the child births in Pakistan occur less than 24 months after the previous birth, this shortening of birth intervals among women having previously given birth to girls points to the possibility of a non-negligible increase in risk of child mortality resulting from disproportionate preference for male offspring.

5.3 Characteristics of Son-Preferring Households with Differential Spacing

Next we focus on household and individual characteristics observed in son preferring women with differential spacing behaviour. Below, we present results from Cox estimations on subsamples grouped by wealth status, family structure, geographical setting, type of marriage, marriage cohorts, and say in intra-household decisions[9]. Kaplan-Meier survival curves for these subsamples are given in the appendix.

Household wealth

Tables 17 and 18 show parity-wise estimations by wealth status of Pakistani households. The former set of estimations compares poor households (those lying in the fourth and fifth quintiles of wealth distribution) with non-poor households while the latter compares wealthy households (those in the first and second quintiles of wealth distribution) with the poor and middle-income households. Both sets of results depict a similar picture: Sex-specific modification in waiting time span is mainly observed among wealthier households, while little or no significant effect is observed among poorer households. The hazard ratio for non-poor households with a son is significantly below one for both parities (HR = 0.85). Corresponding HR values for wealthy households with a son are 0.84 for the first and 0.81 for the second parity. These results can be understood in light of the fact that contraceptive prevalence in Pakistan varies substantially by wealth from a low of 21% among the bottom-quintile households to 46% among the top-quintile households.

Family structure

The son preference – birth spacing relationship also varies by type of households. In Pakistan, joint household settings are common (especially in rural areas) whereas

[9] Results for only the 2012-13 dataset are shown.

nuclear families are mostly seen in urban areas. Unlike joint households, nuclear families with one or more sons at parity 1 and 2 have a higher probability of delaying subsequent birth than their no-son counterparts (Table 19). Interestingly, women living in joint families are found to show a strong likelihood of sex-related changes in spacing between the third and the fourth birth (HR = 0.71 significant at the 5% level), a feature not found elsewhere. To the extent this could be relied on the result leads to an interesting finding: the desire for a son drives women in nuclear families to begin shortening birth intervals from the birth of the first child, whereas women living in joint-family settings do not reduce the time span to subsequent births until parity3.

Consanguineous marriages

Marriages among cousins and relatives are not unusual in Pakistan. Table 20 reports results for subsamples of consanguineous and non-consanguineous marriages. While the hazard ratios for both groups of households are significant and similar at the first parity (HR = 0.88 significant at 5% vs 0.89 significant at 1%), the effect survives at parity 2 only among consanguineous couples), neither group of households shows a significant change in sex-related spacing behaviour at the third parity.

Place of residence

Table 21 reports another feature of households showing differential birth intervals related to sex of existing children. Households based in both rural and urban areas exhibit son preferring birth spacing behaviour at parity 1 (HR = 0.90 for rural households, 0.86 for urban households, both significantly different from one at the 1% level of significance). However, we find evidence for significant effects at parity 2 only among urban households.

Woman's age at marriage

The likelihood of shortening birth intervals at first and second parities among women who married young (before their 18th birthday) depends on whether one or both of the children born were boys (Table 22). The hazard ratio for women who married later is not significantly different from one.

Say in household affairs

One final factor found to influence the association between son preference and birth spacing is women's participation in household decisions. Evidence for the relationship is found among women who participate in one of the four types of household decisions namely healthcare, social, consumption, and financial. Women with a say at home having one son at parity 1 are 14% more likely to delay transition to parity 2 compared with those without a son, while those with one or two sons are 10% more likely to delay the third birth (Table 23).

No such significant effects are observed for women who do not have a say in intra-household decisions.

Likewise, as shown in Table 24, women who make decisions about their own health or jointly with their husbands are more likely to delay second and third births at parity 1 and 2 respectively, contingent on having a male child (HR = 0.856 significant at 1% at parity 1, 0.882 significant at 5% at parity 2). The corresponding hazard ratios for women without a say in healthcare decisions do not significantly differ from one.

The son preference – birth spacing relationship does not significantly differ by women's participation in household decisions beyond the third parity.

6 Robustness Measures

6.1 Definition of complete fertility

We carry out a number of robustness checks to account for potential selectivity concerns:

First, the duration model estimations were based on the sample of women whose fertility was considered to be complete, in part because they reported to not want any more children. We find a noteable difference in contraceptive use between women who report not wanting any more children (47.75%) and those who want a child within the next two years (7.5%). Given these low rates of contraceptive prevalence, it is possible that many women desiring no more children go on to have more children anyway. Since it is more likely that they will not want a child anymore if they already have more boys than girls, then we are selecting in our sample depending on the outcome we study. One way to tackle it is to estimate the duration models on the subsample of women who are 40 years or above and are nearing the end of their fertility window. Results of these estimations (Table 25) are highly similar to those of the baseline estimations.

6.2 Self selection by child mortality

The interval to subsequent birth may be influenced by the incidence of mortality among children who were born earlier. Women having suffered a child loss may proceed to next birth earlier than otherwise intended, particularly if the child who died was a boy. Women having faced the death of a male child may therefore self-select.

We account for this possibility by estimating Cox model on the subsample of women, none of whose previous children had died. As seen before, results for parity 1 remain significant (Table 26). The results are also significant at parity 2 for the 2006-07 and 2012-13 samples. The hazard ratios for the 2012-13 subsample of women with one or two sons at parity 1 and 2 are 0.89 and 0.92 respectively, both significantly different from one. Results for parity 3 are found to be insignificant just as with the full sample.

6.3 Matching Estimates

Another means of controlling for potential selection bias is by using a matching routine. We use Propensity Score Matching (PSM) to account for the possibility that households with sons at a given parity may differ from those without, in ways that could be considered non-random. Treated (with son) and non treated (without son) groups are matched by comparing the conditional probabilities of participating in the treatment group (having a son in this case) based on a set of observable characteristics. These probabilities are obtained by regressing the treatment variable on the vector of co-variates using Probit estimations and are used to construct a propensity score. After the PSM estimations, we checked the balancing of the treatment groups.

Table 27 reports Average Treatment Effects (ATE) for the three parities obtained using Propensity Score Matching (PSM). The ATE for all the parities is positive, suggesting a delaying effect of having one or more sons. As found with semi-parametric and parametric methods, the impact is found to be invariably significant at parity 1 and significant for the 2006-07 and 2012-13 samples at parity 2.

After carrying out the PSM estimations, the balancing of the treatment groups was checked by using Kernel density plots. Plots for the first set of estimations are given in the appendix. The covariates of the groups are found to be well balanced.

6.4 Alternative Parametric Estimations

Alternative parametric survival models are estimated to check the robustness of our findings. For this purpose, we employ the Exponential survival model. The density function and hazard rate for this parametric model with constant hazard can be given as follows:

$$f(t;v) = v\,exp\{-vt\} \quad and \quad \alpha(t;v) = v \qquad for\,t > 0 \tag{8}$$

Estimates using exponential survival regression are shown in Table 28. The results are analogous to those estimated using semi-parametric models previously presented, both in terms of significance as well as in magnitudes of the coefficients. At parity 1, the hazard ratios for all three rounds are found to be significantly different from one Women with a firstborn boy have a $6 - 8$ % lower probability of proceeding to subsequent birth at a given time compared to women with a firstborn girl. As before, the corresponding likelihood of moving to next birth is only observed among the women in the two recent samples while no significant effect is seen for transition from third to the fourth birth in any dataset.

6.5 Placebo Test

Given the non-experimental and cross-sectional nature of our dataset and the fact that our outcome and covariates of interest are mainly demographic indicators makes devising a placebo test a challenging task. We attempt to substitute the birth interval outcome variable with the month the respondent woman was interviewed, a variable which is plausibly independent of existing children's sex at any given parity. As expected, this variable appears to be independent of the sex of the existing children at any parity (Table 29).

7 Conclusion

In this study, we attempted to understand whether and to what extent the wont of preferring boys over girls influences birth spacing patterns among Pakistani women. Our analysis of data from three representative demographic and health surveys showed evidence for significant effects of son preference at the first two parities. Women with a firstborn girl for instance proceed to the second birth seven weeks earlier than women with a firstborn boy. These differential spacing effects dissipate beyond the second parity. The differential spacing behaviour resulting from son preference is more common among women who are married at an early age or living in wealthier, nuclear households. The association seems to have undergone little significant change over the past two decades. Rapid urbanization in Pakistan over the past two decades does not seem to have substantially modified differential fertility outcomes.

We found that women with a higher proportion of sons among their children have longer birth intervals. Women with one or more sons are also more likely to employ contraceptive methods than women without a son. Besides, women with no sons are significantly more likely to have a subsequent birth interval below 24 or 18 months. To sum up, there is conclusive evidence suggesting that Pakistani couples stay away from contraceptive methods and shorten time span between births in order to obtain the desired number of sons. This manifestation of son preference has important consequences at the national level. Connubial bliss may indeed require a son or two but the disproportionate preference for sons that it entails affects the country's demographic transition by hampering efforts to control rapid population growth, reduce high incidence of child and maternal mortality, and improve health outcomes. Pakistan has one of the highest child and maternal mortality rates in Asia. Mortality among girl children is especially high, and may in part result from the risky fertility behavior associated with excessive preference for boys. The country seeks to achieve the Sustainable Development Goal of bringing the incidence of maternal mortality to below 70 deaths per 100,000 live births and under-5 mortality to below 25 per 1,000 live births by the year 2030.

Measures and awareness campaigns that promote gender equality in the country can help lessen the occurrence of risky births, thereby not only lowering the risk to both mother and child's life but also improving their health outcomes. Tackling pervasive desire for sons can therefore be an important ingredient of any successful policy action targeting maternal and child health.

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Tables and Figures

Figure 1: Population sex ratios

Sources: Pakistan Bureau of Statistics. Population Association of Pakistan.

Table 1: Sex ratio by number of children and last birth

	PDHS 1990-91	PDHS 2006-07	PDHS 2012-13
Total number of children			
1	152.17	174.74	166.66
2	174.1	167.3	191.17
3	149.11	151.6	144.63
4	127.3	125.81	126.25
Last birth	117.46	137.61	133.38

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Table 2: Progression to subsequent parity

Parity	Son	N	N+1	Progressed to next parity (%)
1	0	2916	2869	98.39
	1	3432	3362	97.96
2	0	1283	1241	96.73
	1	3168	2862	90.34
	2	1779	1593	89.54
3	0	542	509	93.91
	1	2053	1799	87.63
	2	2320	1793	77.28
	3	777	649	83.53

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Table 3: Overview of Son preference

	1990-91		2006-07		2012-13	
	No son	At least one son	No son	At least one son	No son	At least one son
Overall	0.04	0.96	0.06	0.94	0.05	0.95
Education						
None	0.03	0.96	0.05	0.95	0.04	0.96
some schooling	0.05	0.94	0.06	0.94	0.05	0.95
Spouse Education						
None	0.03	0.96	0.05	0.95	0.04	0.96
some schooling	0.04	0.95	0.05	0.95	0.04	0.96
Women Employed						
No	0.04	0.96	0.05	0.95	0.04	0.95
Yes	0.03	0.96	0.05	0.95	0.03	0.96
Family Structure						
Joint	0.08	0.91	0.12	0.87	0.09	0.9
Nuclear	0.03	0.96	0.02	0.97	0.03	0.96
Place of Residence						
Rural	0.03	0.96	0.04	0.95	0.03	0.96
Urban	0.05	0.94	0.05	0.94	0.05	0.94
Economic Status						
Poor	0.04	0.95	0.05	0.94	0.04	0.96
Non-poor	0.03	0.96	0.04	0.95	0.04	0.96

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Table 4: Overview of Average Birth Spacing

	1990-91			2006-07			2012-13		
	1-2	2-3	3-4	1-2	2-3	3-4	1-2	2-3	3-4
Overall	26.21	27.13	28.21	27.51	29.11	29.15	27.33	29.2	29.5
Education									
None	26.91	26.98	27.99	27.81	28.6	28.41	27.2	28.4	28.39
some schooling	23.85	27.67	29.1	26.85	30.33	31.23	27.53	30.61	31.88
Spouse Education									
None	26.4	27.28	27.79	28.18	29	28.51	26.87	28.14	28.64
some schooling	25.96	26.94	28.7	27.12	29.16	29.58	27.58	29.82	30.07
Women Employed									
No	26.01	27.12	28	27.61	29.08	29.39	27.47	29.53	30.08
Yes	27.24	27.22	29.27	27.26	29.2	28.57	27.01	28.42	28.13
Family Structure									
Joint	24.94	28.58	28.98	27.04	28.52	30.86	27.39	29.32	30.5
Nuclear	26.44	26.9	28.11	27.63	29.24	28.82	27.31	29.17	29.33
Place of Residence									
Rural	26.77	27.23	28.81	28.06	28.83	28.89	27.53	28.74	28.89
Urban	25.34	26.97	27.21	26.55	29.59	29.65	26.95	30.08	30.81
Economic Status									
Poor	25.85	27.72	29.74	28.35	28.44	28.15	28.05	28.22	28.81
Non-poor	26.34	26.89	27.59	27.04	29.49	29.77	26.92	29.77	29.96

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Table 5: Proportion of risky birth spacing (below 24 and 18 months)

	1990-91		2006-07		2012-13	
	<24 Months	>=24 Months	<24 Months	>=24 Months	<24 Months	>=24 Months
Parity 1	0.491	0.509	0.480	0.520	0.486	0.514
Parity 2	0.481	0.519	0.441	0.559	0.422	0.578
Parity 3	0.453	0.547	0.440	0.560	0.424	0.576
	<18 Months	>=18 Months	<18 Months	>=18 Months	<18 Months	>=18 Months
Parity 1	0.274	0.726	0.266	0.734	0.272	0.728
Parity 2	0.276	0.724	0.241	0.759	0.218	0.782
Parity 3	0.244	0.756	0.244	0.756	0.220	0.780

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Table 6: Parity-wise spacing of succeeding births

Parity		Mean and Proportion birth spacing (months)											
		1990-91				2006-07				2012-13			
		Mean	Std. Dev.	<24(%)	>=24(%)	Mean	Std. Dev.	<24(%)	>=24(%)	Mean	Std. Dev.	<24(%)	>=24(%)
Parity 1	No Son	25.20	13.87	50.75	49.25	26.67	15.90	50	50	26.31	16.13	50.18	49.82
	At least one son	27.05	16.24	47.75	52.25	28.22	16.96	46.33	53.67	28.19	17.93	47.21	52.79
Parity 2	No Son	26.52	14.77	48.71	51.29	27.17	16.63	48.26	51.74	28.05	16.20	43.75	56.25
	At least one son	27.29	16.70	47.98	52.02	29.65	17.81	42.99	57.01	29.51	17.36	41.73	58.27
Parity 3	No Son	27.61	18.96	48.12	51.88	27.76	13.57	46.38	53.62	29.42	19.65	43.87	56.13
	At least one son	28.28	15.88	44.93	55.07	29.32	17.70	43.74	56.26	29.50	17.11	42.27	57.73

Source: Author's calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Table 7: Definition and measurement of variables

Variable	Description
Birth space	Succeeding birth space in months at given parity n
At least one son	Dummy variable, takes the value of 1 if the female have at least a son at given parity n in total number of children, 0 otherwise
Number of sons	Number of sons at given parity n in total number of children born to a woman
All sons	Dummy variable, takes the value of 1 if the woman only had sons till the penultimate birth, 0 otherwise
Son ratio	Proportion of boys in the total number of children
Age at marriage	Woman's age at marriage
Age difference	Age difference of husband with his wife in years
Age	Woman's age in completed years
Education	Dummy variable, takes the value of 1 if the woman at least has primary education, 0 otherwise
Spouse education	Dummy variable, takes the value of 1 if the husband at least has primary education, 0 otherwise
Women employed	Dummy variable, takes the value of 1 if the female is employed, 0 otherwise
Media exposure	Dummy variable (PDHS 1990-1991), takes the value of 1 if the woman listens radio or watches television every week, 0 otherwise. Dummy variable (PDHS 2006-2007 and 2012-2013), takes the value of 1 if the woman watches television occasionally or weekly or daily, 0 otherwise
Family structure	Dummy variable, takes the value of 1 if the family is nuclear, 0 otherwise
Household size	Total number of family members in the household
Place of residence	Dummy variable, takes the value of 1 if the household resides in urban area, 0 otherwise
Economic Status	Dummy variable, takes the value 1 if the household belongs to top three wealth quintiles, 0 otherwise

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

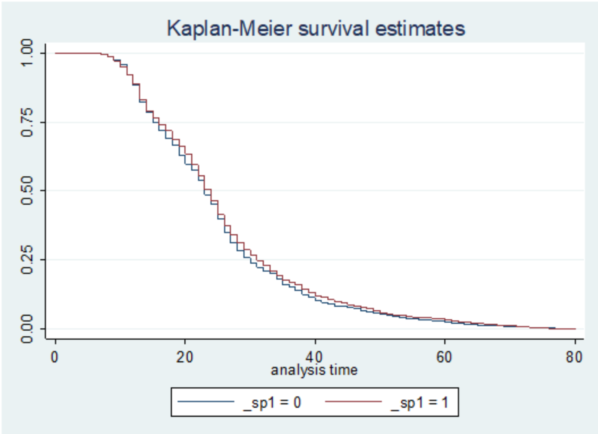
Table 8: Descriptive Statistics

Variable	1990-91		2006-07		2012-13	
	Proportion/Mean	Std. Dev.	Proportion/Mean	Std. Dev.	Proportion/Mean	Std. Dev.
At least one son at n parity in total number of children						
Parity 01						
No Son	0.45	0.49	0.45	0.49	0.45	0.49
At least one son	0.54		0.54		0.54	
Parity 02						
No Son	0.20	0.40	0.20	0.40	0.20	0.40
At least one son	0.79		0.79		0.79	
Parity 03						
No Son	0.09	0.29	0.10	0.30	0.10	0.29
At least one son	0.90		0.89		0.90	
Number of sons at n parity in total number of children						
Parity 01						
0 son	0.45	0.49	0.45	0.49	0.45	0.49
1 son	0.54		0.54		0.54	
Parity 02						
0 son	0.20	0.71	0.20	0.69	0.20	0.69
1 son	0.47		0.51		0.50	
2 sons	0.31		0.27		0.28	
Parity 03						
0 son	0.09	0.86	0.10	0.85	0.09	0.84
1 son	0.34		0.34		0.36	
2 sons	0.39		0.41		0.40	
3 sons	0.15		0.13		0.13	
All sons till penultimate birth						
No	0.86	0.33	0.86	0.34	0.84	0.36
Yes	0.13		0.13		0.15	
Son ratio	0.54	0.22	0.54	0.22	0.55	0.22
Age at Marriage	17.86	4.01	17.91	3.70	18.29	3.4
Age difference	7.07	6.16	6.09	5.73	5.71	5.64
Age	35.88	7.50	36.71	7.39	36.77	7.29
Education						
No	0.76	0.42	0.68	0.46	0.61	0.48
Yes	0.23		0.31		0.38	
Spouse education						
No	0.48	0.49	0.38	0.48	0.35	0.47
Yes	0.51		0.61		0.64	
Women employed						
No	0.83	0.36	0.72	0.44	0.71	0.45
Yes	0.16		0.27		0.28	
Media exposure						
No	0.54	0.49	0.29	0.45	0.31	0.46
Yes	0.45		0.70		0.68	
Family structure						
Joint	0.16	0.37	0.22	0.41	0.19	0.39
Nuclear	0.83		0.77		0.80	
Household size	8.41	3.5	8.77	4.51	8.33	4.24
Place of residence						
Rural	0.61	0.48	0.63	0.48	0.64	0.47
Urban	0.38		0.36		0.35	

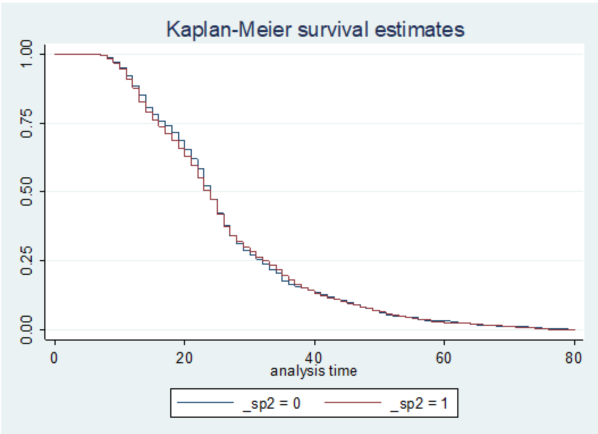
Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used.

Figure 2: Presence of at least one son at parity n and subsequent birth spacing (Kaplan-Meier cumulative survival graph: PDHS 1990-91)

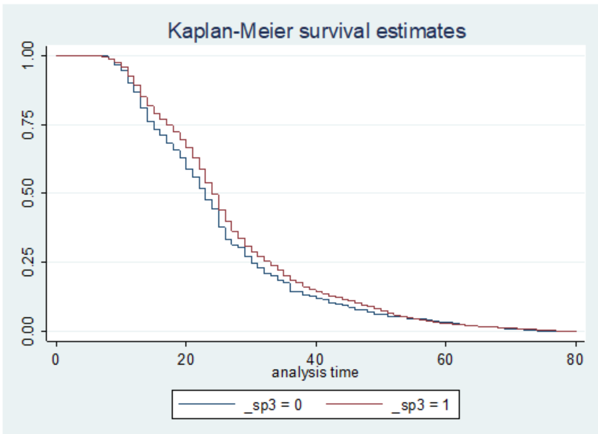
(a) Parity 01



(b) Parity 02



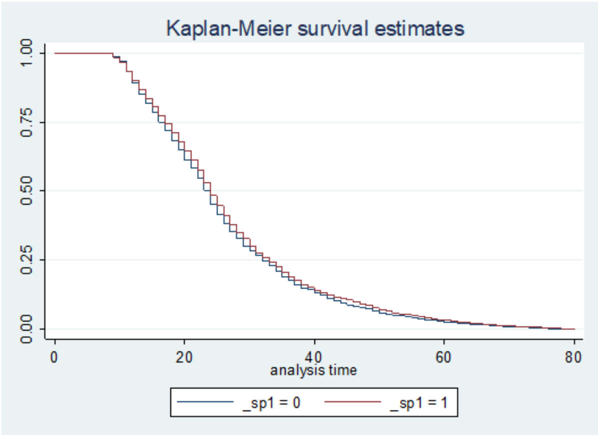
(c) Parity 03



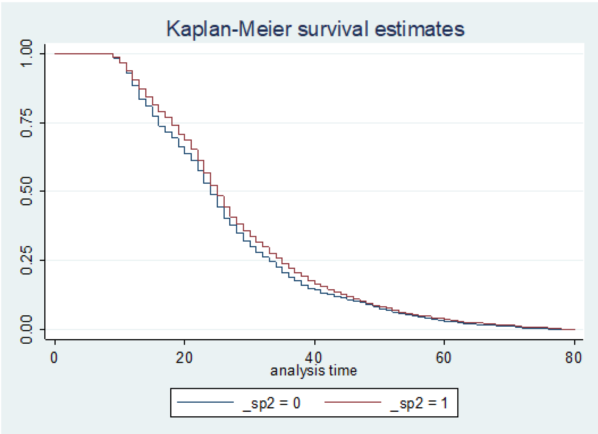
Source: Authors' calculations using PDHS 1990-91. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure 3: Presence of at least one son at parity n and subsequent birth spacing (Kaplan-Meier cumulative survival graph: PDHS 2006-07)

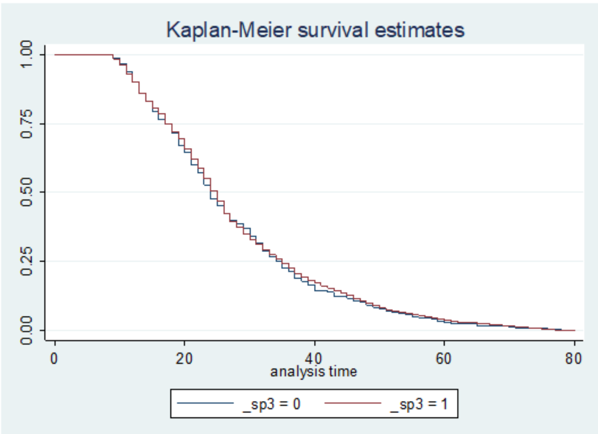
(a) Parity 01



(b) Parity 02



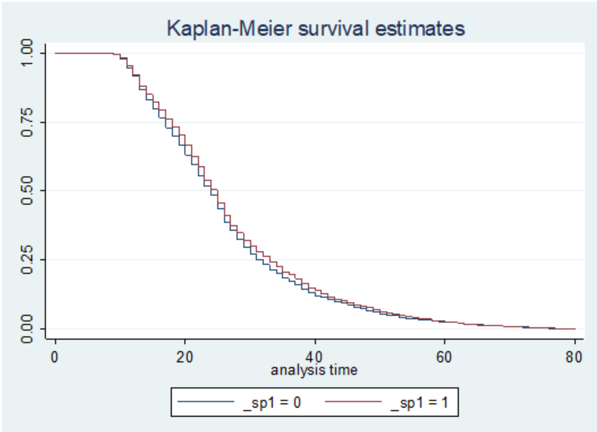
(c) Parity 03



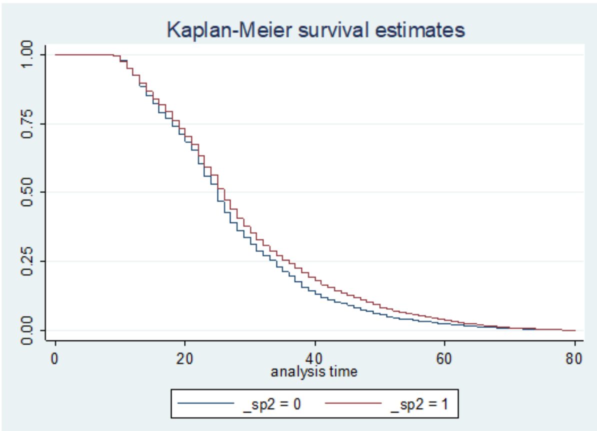
Source: Authors' calculations using PDHS 2006-07. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure 4: Presence of at least one son at parity n and subsequent birth spacing (Kaplan-Meier cumulative survival graph: PDHS 2012-13)

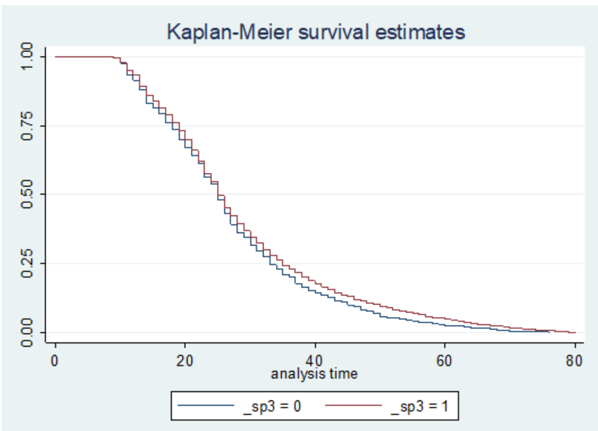
(a) Parity 01



(b) Parity 02



(c) Parity 03



Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Table 9: Presence of at least one son at parity n and subsequent birth spacing (Cox estimation)

Hazard ratio	PDHS 1990-91 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2006-07 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2012-13 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1									
One son (ref: no son)	0.875***			0.900***			0.889***		
	(0.042)			(0.029)			(0.030)		
Parity 2									
At least one son (ref: no son)		0.932			0.850***			0.903**	
		(0.059)			(0.037)			(0.040)	
Parity 3									
At least one son (ref: no son)			0.929			0.935			0.979
			(0.108)			(0.049)			(0.088)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2476	2316	2038	4586	4246	3672	6057	5535	4569

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 10: Number of sons at parity n and subsequent birth spacing (Cox estimation)

Hazard ratio	PDHS 1990-91 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2006-07 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2012-13 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1 (ref: 0)									
1	0.875***			0.900***			0.889***		
	(0.042)			(0.029)			(0.030)		
Parity 2 (ref: 0)									
1		0.968			0.856***			0.917**	
		(0.064)			(0.040)			(0.043)	
2		0.878*			0.839***			0.879***	
		(0.065)			(0.042)			(0.046)	
Parity 3 (ref: 0)									
1			0.898			0.986			1.023
			(0.112)			(0.058)			(0.0940
2			0.936			0.899*			0.950
			(0.114)			(0.051)			(0.089)
3			0.993			0.918			0.948
			(0.125)			(0.065)			(0.097)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2476	2316	2038	4586	4286	3672	6057	5535	4569

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 11: Son Preference and Last birth spacing (Cox estimation)

Hazard ratio	Last space PDHS 1990-91	PDHS 2006-07	PDHS 2012-13
All sons till penultimate birth (ref: at least one daughter)	0.825***	0.856***	0.819***
	(0.061)	(0.043)	(0.038)
Controls	Yes	Yes	Yes
Observations	2476	4586	6057

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 12: Presence of at least one son at parity n and subsequent birth spacing (Survival-time regression adjustment)

	PDHS 1990-91			PDHS 2006-07			PDHS 2012-13		
Survival-time regression adjustment	Duration 1-2	Duration 2-3	Duration 3-4	Duration 1-2	Duration 2-3	Duration 3-4	Duration 1-2	Duration 2-3	Duration 3-4
ATE	1.669**	1.281*	2.791**	1.667***	2.416***	1.598**	1.637***	2.741***	2.725***
At least one son(At least one son vs No son)	(0.685)	(0.799)	(1.122)	(0.509)	(0.681)	(0.791)	(0.450)	(0.520)	(0.792)
POmean									
At least one Son									
No son	25.319***	26.350***	25.522***	27.034***	27.388***	27.771***	26.838***	27.871***	28.388***
	(0.486)	(0.674)	(1.050)	(0.350)	(0.603)	(0.727)	(0.314)	(0.438)	(0.734)
Observations	2,476	2,316	2,038	4,586	4,246	3,672	6,057	5,535	4,569

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 13: Son to total children ratio and overall birth spacing (Cox estimation)

	PDHS 1990-91	PDHS 2006-07	PDHS 2012-13
	Overall birth space	Overall birth space	Overall birth space
Son ratio			
	0.625***	0.679***	0.742***
	(0.077)	(0.056)	(0.063)
Controls	Yes	Yes	Yes
Observations	2476	4586	6057

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 14: Sex of first child and overall birth spacing (Cox estimation)

	PDHS 1990-91	PDHS 2006-07	PDHS 2012-13
	Overall birth space	Overall birth space	Overall birth space
Parity 01			
Sex (ref: female)			
Male	0.890**	0.915***	0.863***
	(0.044)	(0.032)	(0.031)
Controls	Yes	Yes	Yes
Observations	2476	4586	6057

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 15: Presence of at least one son and current contraceptive use - probit estimation

	PDHS 1990-91	PDHS 2006-07	PDHS 2012-13
	Use of Contraceptive	Use of Contraceptive	Use of Contraceptive
At least one son (ref: no son)			
	0.719***	0.225***	0.298***
	(0.131)	(0.081)	(0.066)
Marginal effect	0.038***	0.052***	0.084***
	(0.007)	(0.017)	(0.018)
Controls	Yes	Yes	Yes
Constant	-2.827*** (0.341)	-1.661***(0.228)	-1.482***(0.206)
Observations	3525	3107	4564

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with incomplete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 16: Preference of at least one son and short birth spacing (Probit estimations)

Variable	18 months			24 months		
At least one son (ref: no son)	PDHS 1990-91	PDHS 2006-07	PDHS 2012-13	PDHS 1990-91	PDHS 2006-07	PDHS 2012-13
Duration 1 to 2	0.179***(0.070)	0.091**(0.046)	0.128***(0.047)	0.095(0.066)	0.080*(0.043)	0.085*(0.044)
Duration 2 to 3	-0.000(0.092)	0.185***(0.058)	0.054(0.061)	0.058(0.083)	0.127**(0.055)	0.060(0.057)
Duration 3 to 4	0.132(0.117)	-0.098(0.084)	0.070(0.095)	0.094(0.115)	0.026(0.077)	0.039(0.086)
Marginal effect						
Duration 1 to 2	0.057	0.029	0.042	0.037	0.031	0.032
Duration 2 to 3	-0.000	0.059	0.016	0.022	0.050	0.023
Duration 3 to 4	0.042	-0.029	0.021	0.037	0.010	0.015
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 17: Presence of at least one son at parity n and subsequent birth spacing – poor vs non-poor households (Cox estimation)

	Poor			Non-poor		
Hazard ratio	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.970			0.847***		
	(0.054)			(0.035)		
Parity 2						
At least one son (ref: no son)		0.978			0.851***	
		(0.075)			(0.045)	
Parity 3						
At least one son (ref: no son)			0.926			1.014
			(0.135)			(0.114)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2061	1956	1755	3996	3579	2814

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 18: Presence of at least one son at parity n and subsequent birth spacing - wealthy vs non-wealthy households (Cox estimation)

	Non wealthy			Wealthy		
Hazard ratio	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.905***			0.853**		
	(0.034)			(0.058)		
Parity 2						
At least one son (ref: no son)		0.924			0.814**	
		(0.047)			(0.067)	
Parity 3						
At least one son (ref: no son)			0.913			1.244
			(0.084)			(0.248)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4461	4168	3604	1596	1367	965

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 19: Presence of at least one son at parity n and subsequent birth spacing by family type (Cox estimation)

Hazard ratio	Joint			Nuclear		
	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.935			0.880***		
	(0.069)			(0.033)		
Parity 2						
At least one son (ref: no son)		0.995			0.887**	
		(0.090)			(0.045)	
Parity 3						
At least one son (ref: no son)			0.707**			1.020
			(0.119)			(0.096)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1195	999	708	4862	4536	3861

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 20: Presence of at least one son at parity n and subsequent birth spacing by consanguineous marriages (Cox estimation)

Hazard ratio	No- consanguineous marriage			Yes- consanguineous marriage		
	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.879**			0.887***		
	(0.048)			(0.036)		
Parity 2						
At least one son (ref: no son)		0.917			0.895**	
		(0.069)			(0.051)	
Parity 3						
At least one son (ref: no son)			1.098			0.901
			(0.152)			(0.099)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2387	2137	1728	3668	3396	2839

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 21: Presence of at least one son at parity n and subsequent birth space by place of residence (Cox estimation)

Hazard ratio	Rural			Urban		
	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.901***			0.862***		
	(0.039)			(0.045)		
Parity 2						
At least one son (ref: no son)		0.936			0.837***	
		(0.054)			(0.052)	
Parity 3						
At least one son (ref: no son)			0.926			1.085
			(0.097)			(0.181)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3075	2868	2482	2982	2667	2087

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 22: Presence of at least one son at parity n and subsequent birth spacing by woman's age at marriage (Cox estimation)

Hazard ratio	Early (<=18) Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Late (>18) Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.846***			0.967		
	(0.037)			(0.050)		
Parity 2						
At least one son (ref: no son)		0.910*			0.903	
		(0.052)			(0.066)	
Parity 3						
At least one son (ref: no son)			0.991			0.960
			(0.122)			(0.093)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3652	3482	3057	2526	2168	1618

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 23: Presence of at least one son at parity n and subsequent birth spacing by participation in household decisionmaking (Cox estimation)

Hazard ratio	No say Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Have a say Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.978			0.858***		
	(0.073)			(0.034)		
Parity 2						
At least one son (ref: no son)		0.844			0.897**	
		(0.094)			(0.047)	
Parity 3						
At least one son (ref: no son)			0.918			1.015
			(0.104)			(0.104)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1382	1297	1134	4074	3718	3042

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 24: Presence of at least one son at parity n and subsequent birth spacing by participation in healthcare decisions (Cox estimation)

Hazard ratio	No- say in self health decisions Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Yes- say in self health decisions Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1						
At least one son (ref: no son)	0.940			0.856***		
	(0.051)			(0.036)		
Parity 2						
At least one son (ref: no son)		0.940			0.882**	
		(0.068)			(0.050)	
Parity 3						
At least one son (ref: no son)			0.938			0.982
			(0.077)			(0.111)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2517	2313	1929	3515	3197	2618

Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 25: Presence of at least one son at parity n and subsequent birth spacing-Subsample of women who are 40 years or above

Hazard ratio	PDHS 2012-13		
	Duration1 to 2	Duration2 to 3	Duration3 to 4
Parity 1			
At least one son (ref: no son)	0.902*		
	-0.056		
Parity 2			
At least one son (ref: no son)		0.875**	
		-0.058	
Parity 3			
At least one son (ref: no son)			1.199
			-0.172
Controls	Yes	Yes	Yes
Observations	2231	2102	1856

Table 26: Presence of at least one son at parity n and subsequent birth spacing – Subsample with no child loss (Cox estimation)

Hazard ratio	PDHS 1990-91			PDHS 2006-07			PDHS 2012-13		
	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1									
At least one son (ref: no son)	0.899**			0.844***			0.892***		
	(0.049)			(0.032)			(0.033)		
Parity 2									
At least one son (ref: no son)		0.920			0.806***			0.922*	
		(0.062)			(0.039)			(0.046)	
Parity 3									
At least one son (ref: no son)			0.910			0.932			0.964
			(0.100)			(0.057)			(0.100)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1850	1695	1437	3707	3369	2828	4945	4428	3498

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 27: Presence of at least one son at parity n and subsequent birth spacing (Propensity score matching)

Propensity score match	PDHS 1990-91			PDHS 2006-07			PDHS 2012-13		
	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 01									
ATE	1.729**			1.425*			1.522***		
	(0.678)			(0.572)			(0.480)		
Parity 02									
ATE		1.182			2.565***			2.404***	
		(0.900)			(0.778)			(0.578)	
Parity 03									
ATE			2.030			0.754			1.437
			(1.284)			(0.967)			(0.997)
Observations	2483	2323	2044	4486	4246	3732	6057	5535	4569

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 28: Presence of at least one son at parity n and subsequent birth spacing (Parametric survival model)

Hazard ratio	PDHS 1990-91 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2006-07 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2012-13 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1									
At least one son (ref: no son)	0.925***			0.942***			0.931***		
	(0.024)			(0.018)			(0.030)		
Parity 2									
At least one son (ref: no son)		0.959			0.911***			0.947**	
		(0.034)			(0.023)			(0.024)	
Parity 3									
At least one son (ref: no son)			0.966			0.960			0.990
			(0.066)			(0.029)			(0.054)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2476	2316	2038	4586	4246	3672	6057	5535	4569

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 29: Placebo test – Month of interview as outcome (Cox estimation)

Hazard ratio	PDHS 1990-91 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2006-07 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4	PDHS 2012-13 Duration 1 to 2	Duration 2 to 3	Duration 3 to 4
Parity 1									
One son (ref: no son)	0.999			1.039			1.039		
	(0.035)			(0.027)			(0.024)		
Parity 2									
At least one son (ref: no son)		0.937			0.944			1.009	
		(0.039)			(0.032)			(0.028)	
Parity 3									
At least one son (ref: no son)			0.903			0.936			0.996
			(0.055)			(0.044)			(0.040)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2540	2476	2316	4666	4586	4246	6205	6057	5535

Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13. Sample is restricted to women with complete fertility. Sample weights are used. Linearized standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix

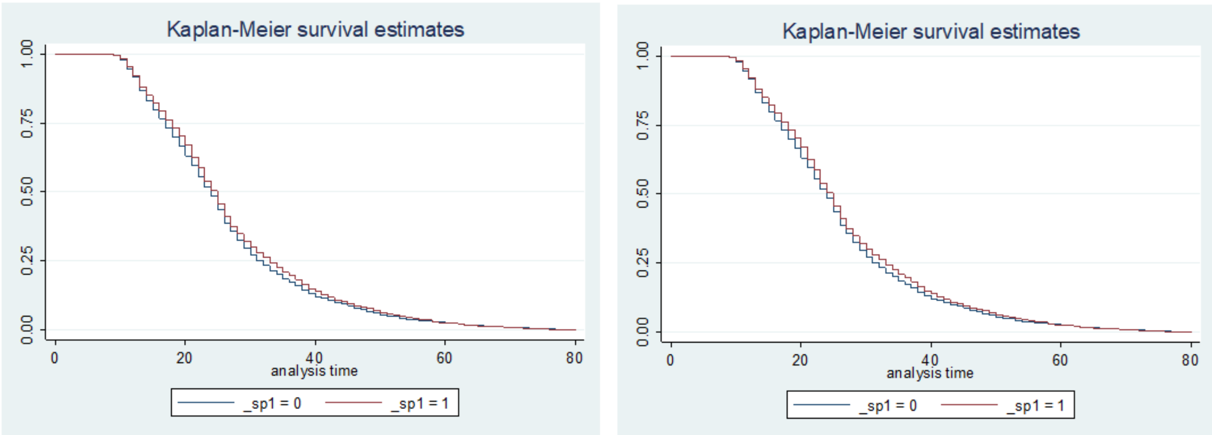
Table A1: Summary of datasets

	1990-91	2006-07	2012-13
Household sample size	7,193	95,441	12,943
Number of women (ever married, age 15 to 49)	6,611	10,023	13,558
Women with complete fertility	2,732	5,545	6,849
Number of men	1,354	No male respondents	3,134
Number of births	27,369	39,049	50,238
Total fertility rate	5.4	4.1	3.8
Sex ratio at birth	105.6	107.27	108.13

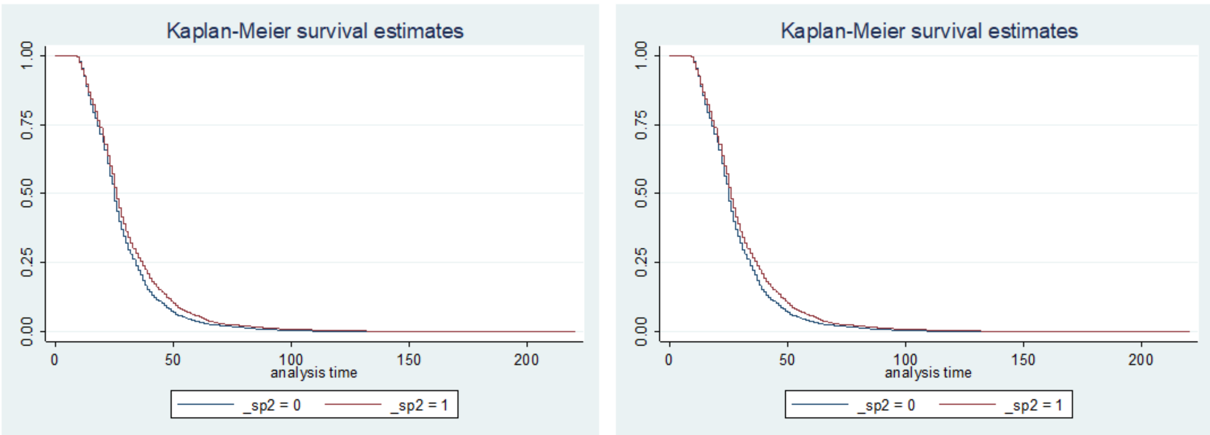
Source: Authors' calculations using PDHS 1990-91, 2006-07 & 2012-13.

Figure A1: Presence of at least one son at parity n and subsequent birth spacing – poor vs non-poor households (Kaplan-Meier cumulative survival graph)

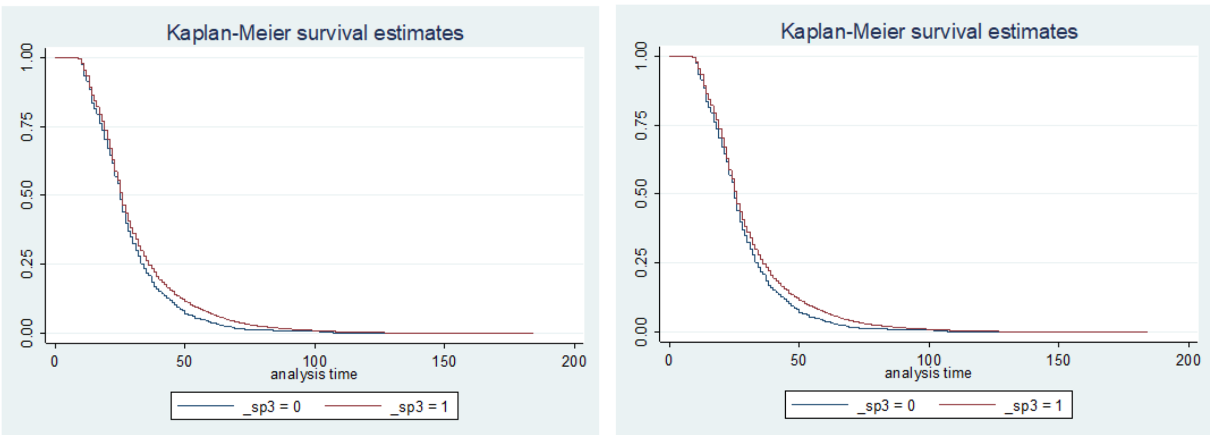
(a) Parity 01



(b) Parity 02



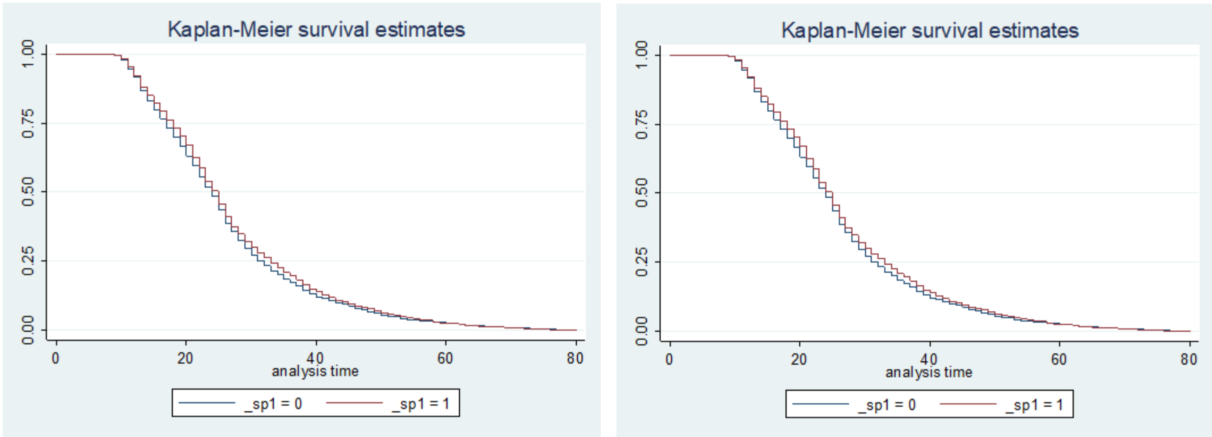
(c) Parity 3



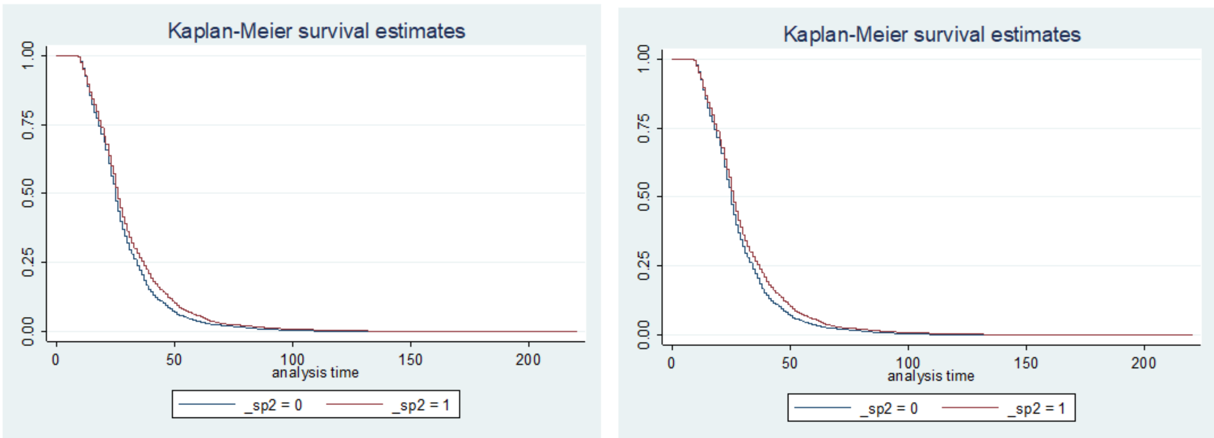
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A2: Presence of at least one son at parity n and subsequent birth spacing - wealthy vs non-wealthy households (Kaplan-Meier cumulative survival graph)

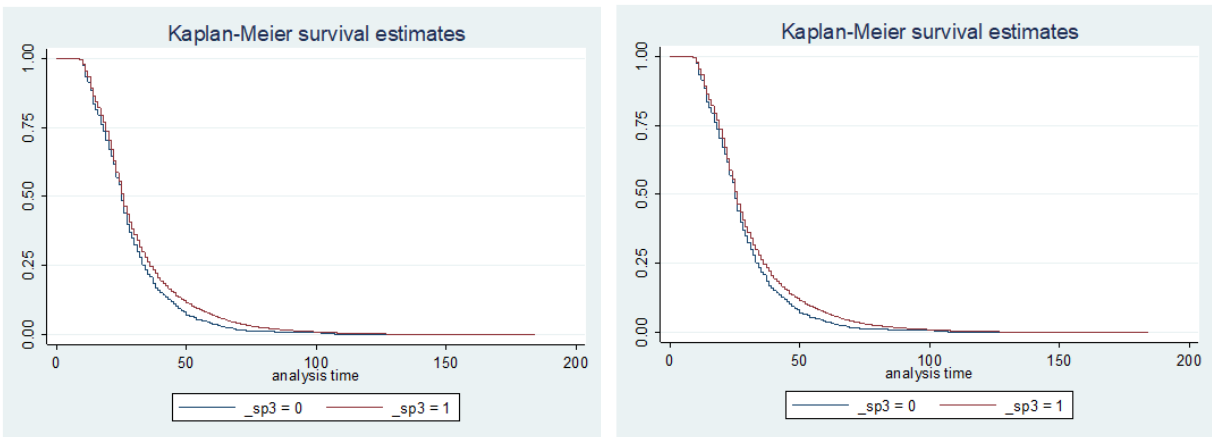
(a) Parity 01



(b) Parity 02



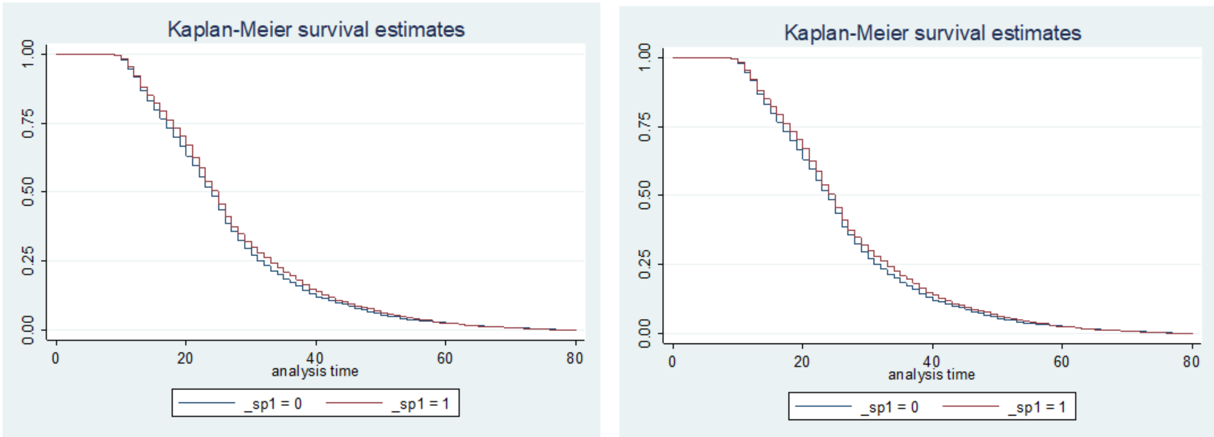
(c) Parity 3



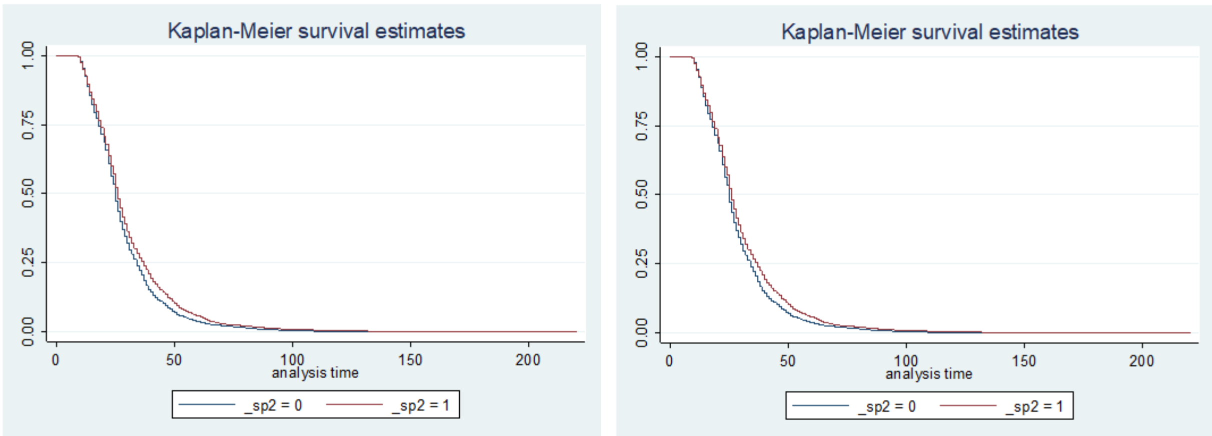
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A3: Presence of at least one son at parity n and subsequent birth spacing by family type (Kaplan-Meier cumulative survival graph)

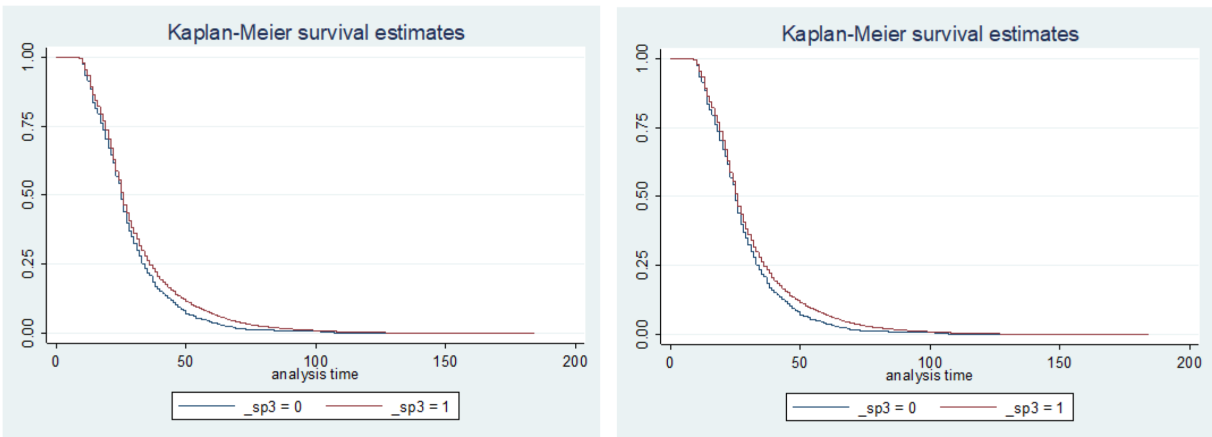
(a) Parity 01



(b) Parity 02



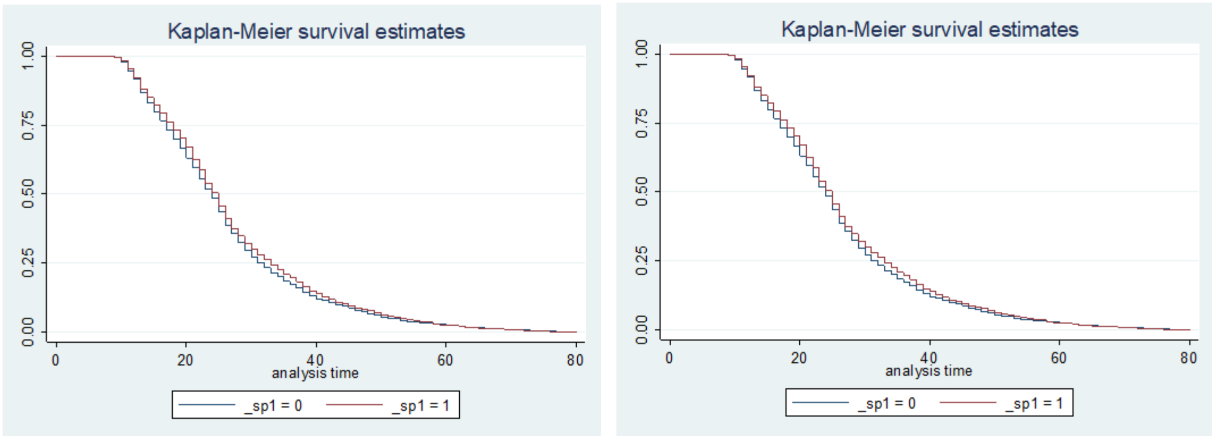
(c) Parity 3



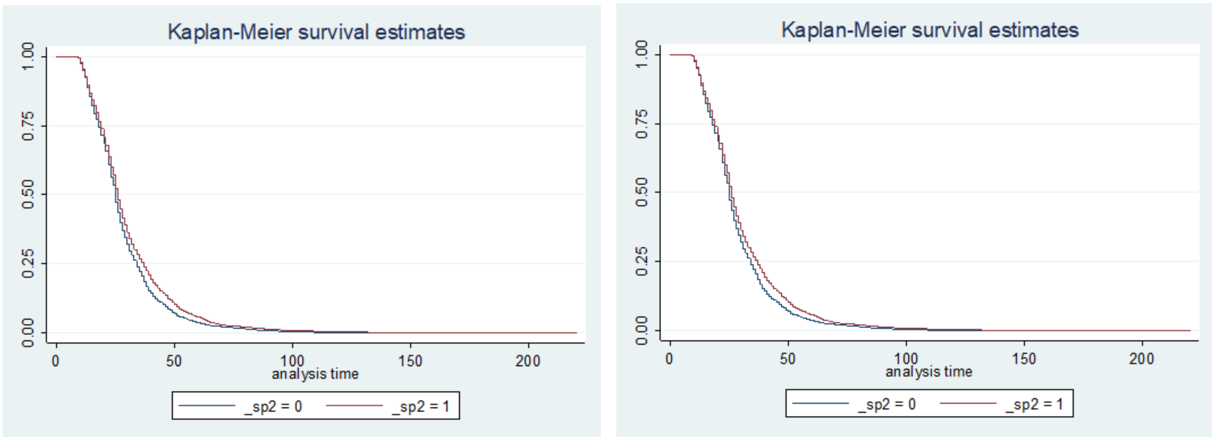
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A4: Presence of at least one son at parity n and subsequent birth spacing by consanguineous marriages (Kaplan-Meier cumulative survival graph)

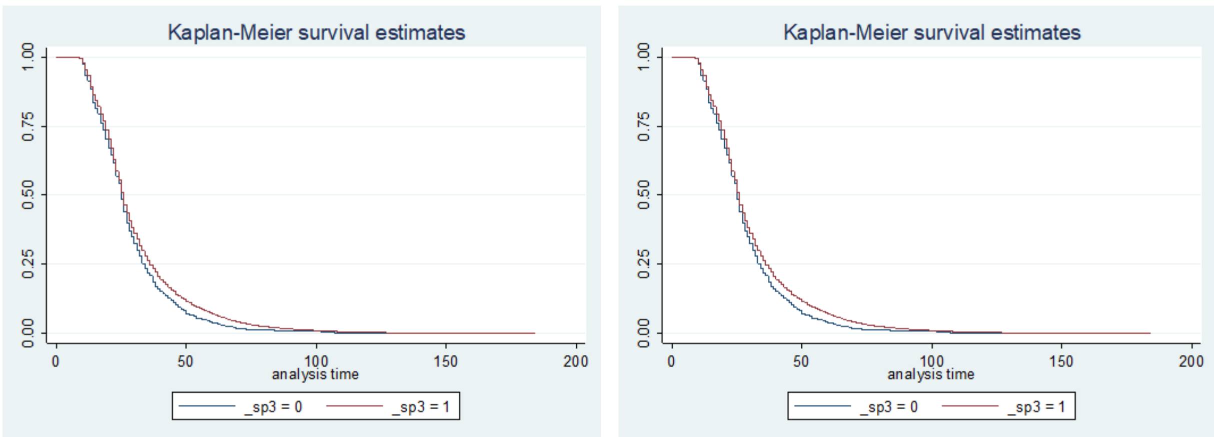
(a) Parity 01



(b) Parity 02



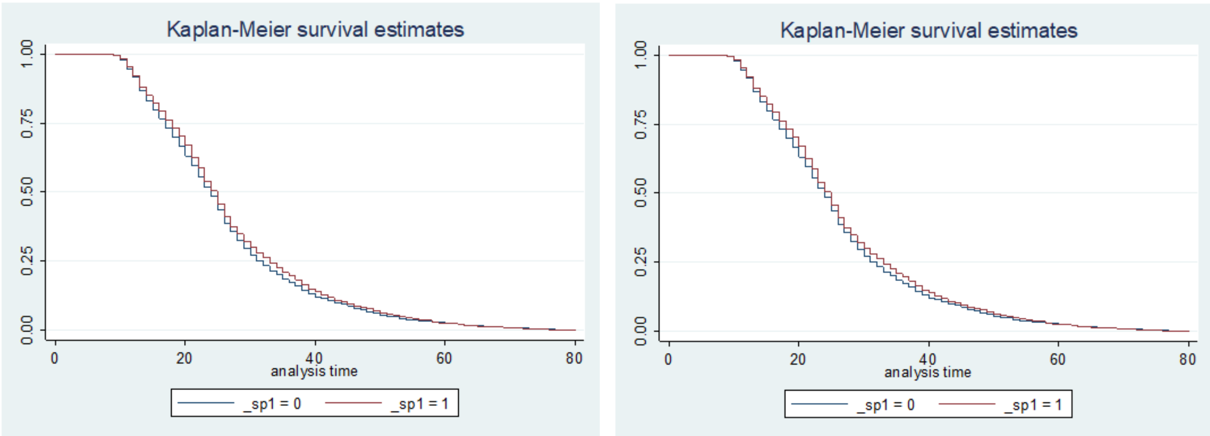
(c) Parity 3



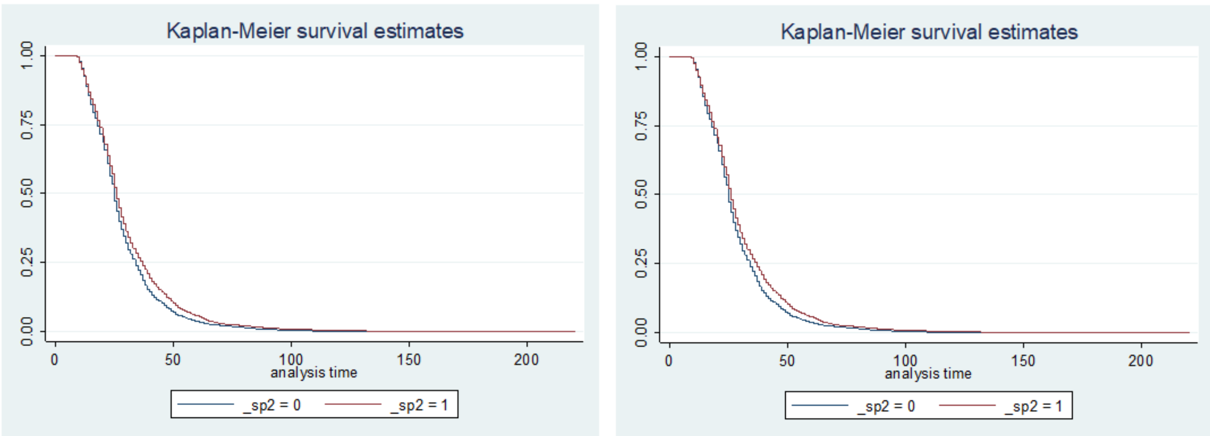
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A5: Presence of at least one son at parity n and subsequent birth space by place of residence (Kaplan-Meier cumulative survival graph)

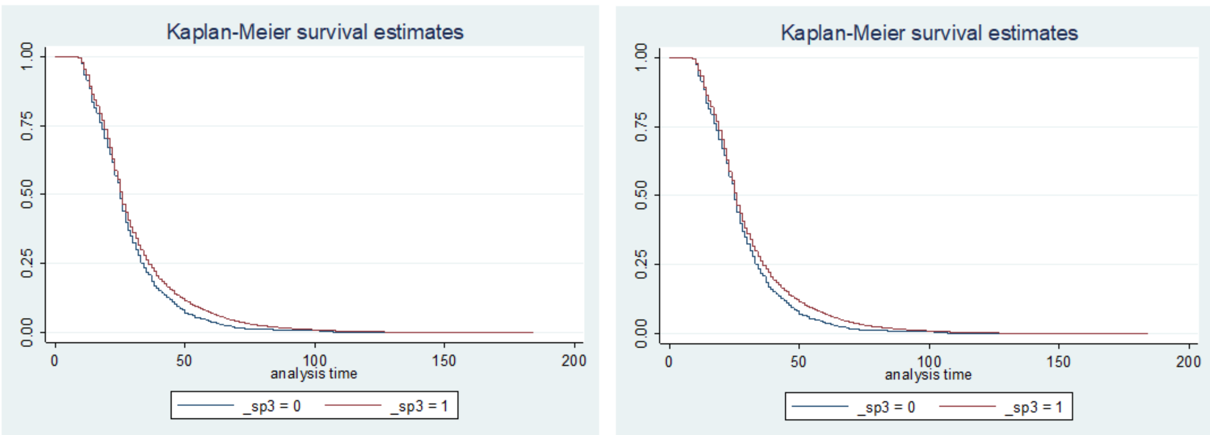
(a) Parity 01



(b) Parity 02



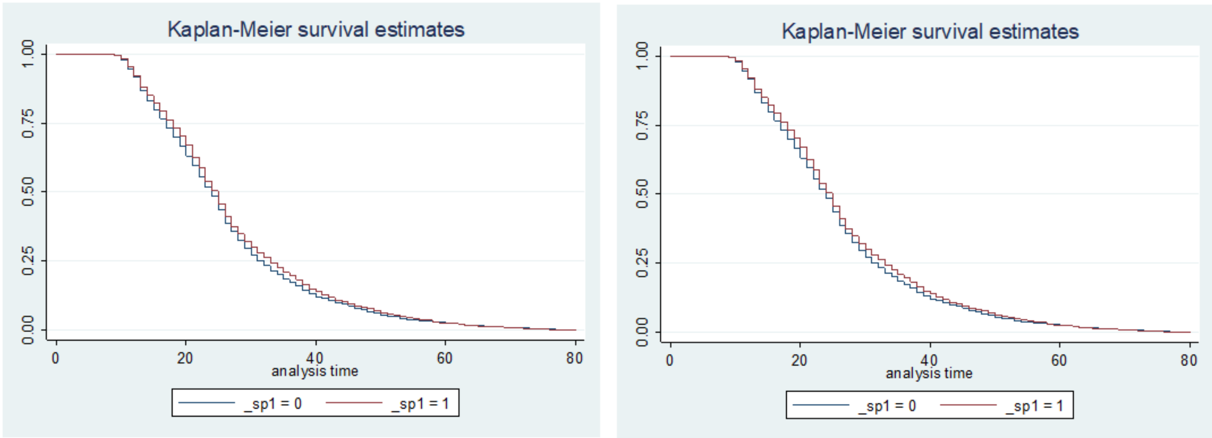
(c) Parity 3



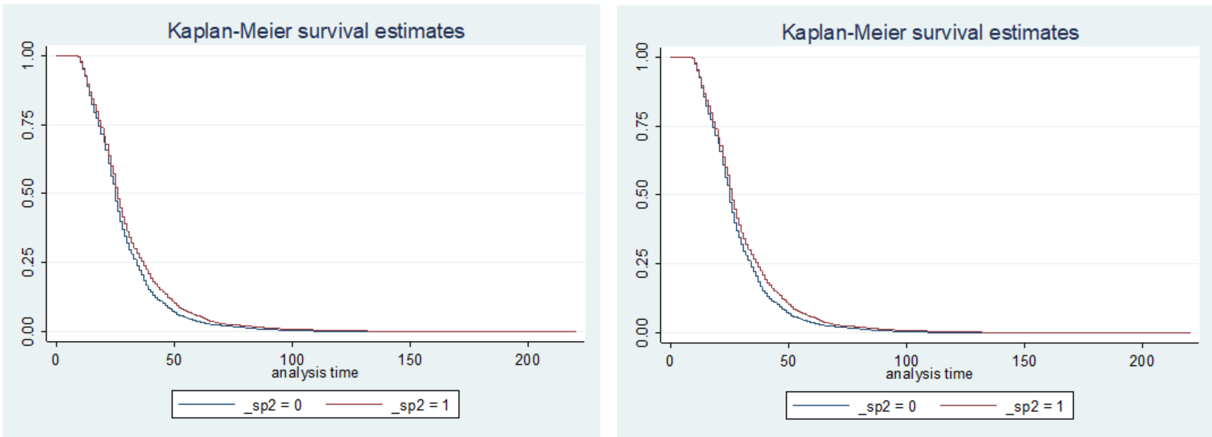
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A6: Presence of at least one son at parity n and subsequent birth spacing by age at marriage (Kaplan-Meier cumulative survival graph)

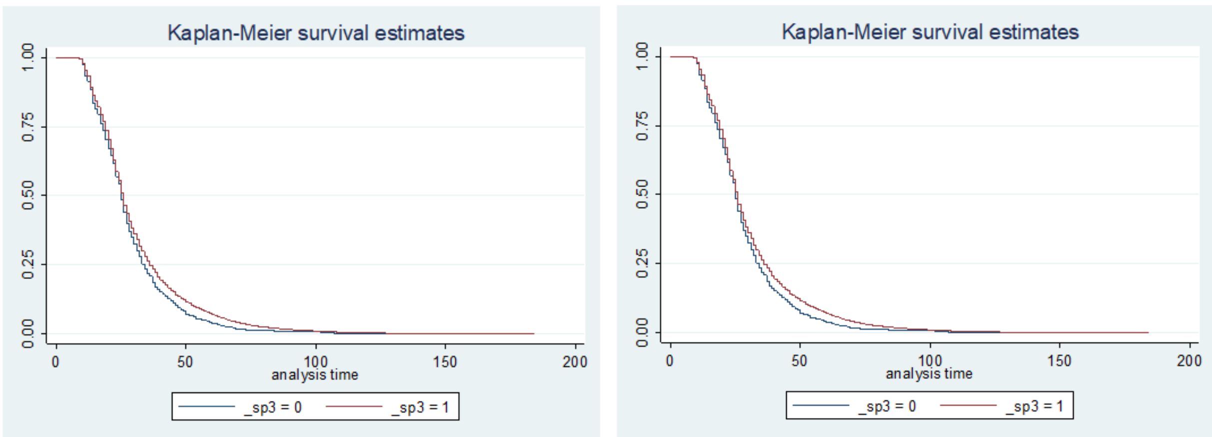
(a) Parity 01



(b) Parity 02



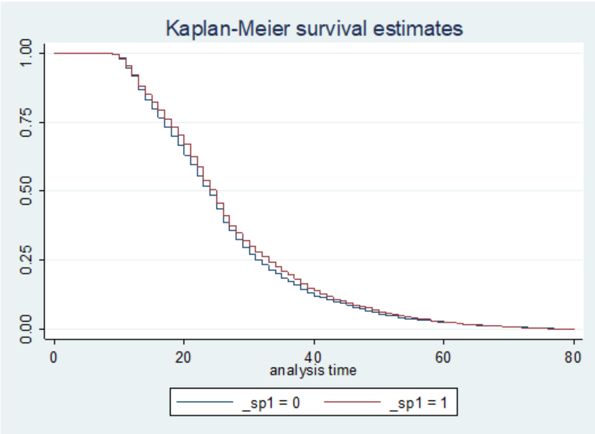
(c) Parity 3

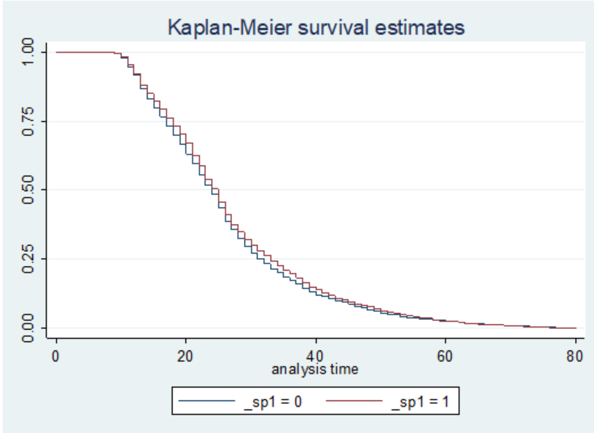


Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

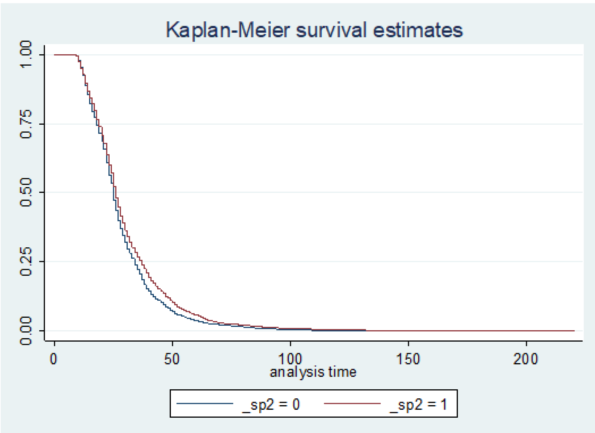
Figure A7: Presence of at least one son at parity n and subsequent birth spacing by participation in decisionmaking (Kaplan-Meier cumulative survival graph)

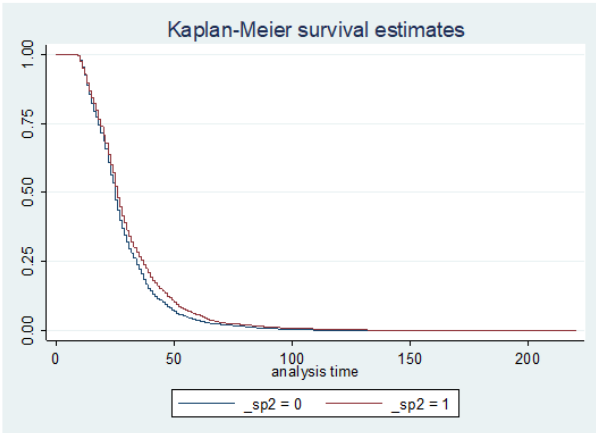
(a) Parity 01



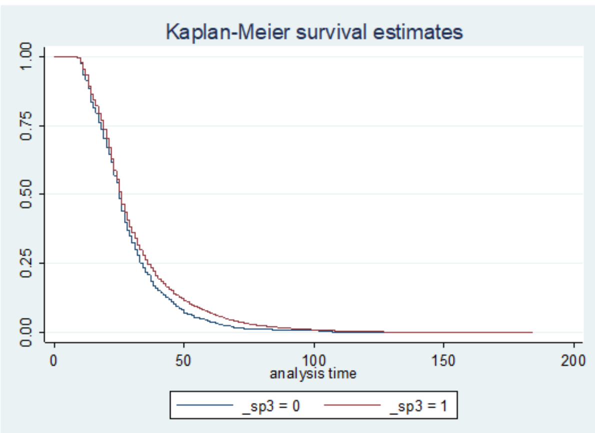


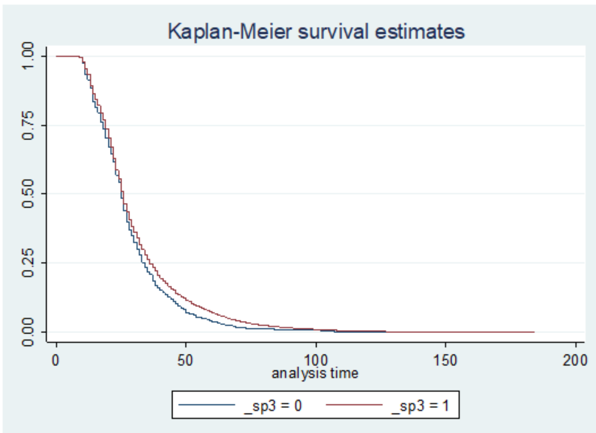
(b) Parity 02





(c) Parity 3

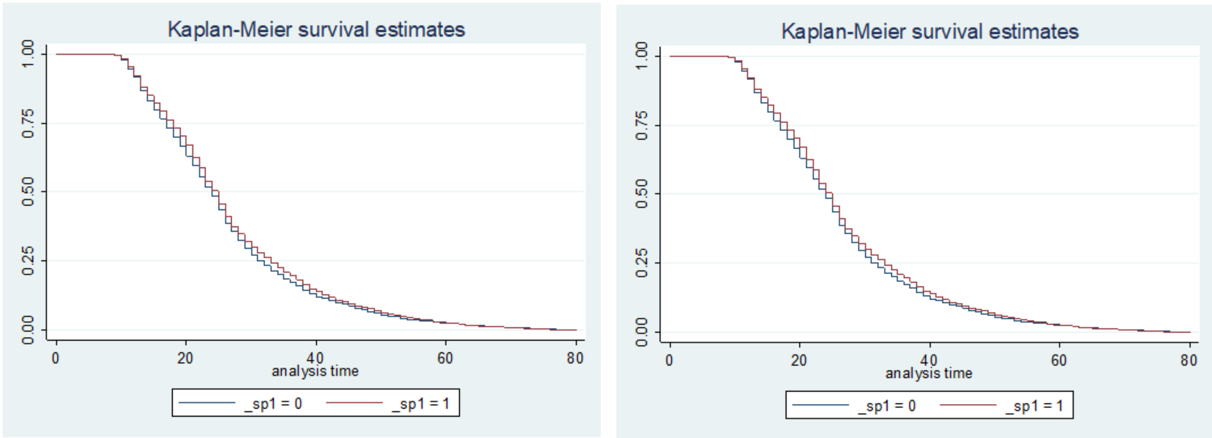




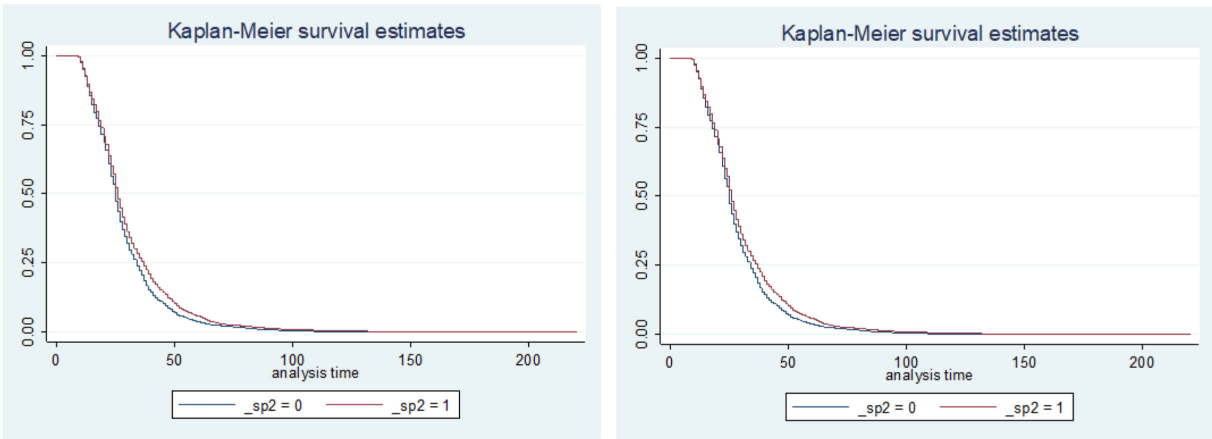
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A8: Presence of at least one son at parity n and subsequent birth spacing by participation in healthcare decisions (Kaplan-Meier cumulative survival graph)

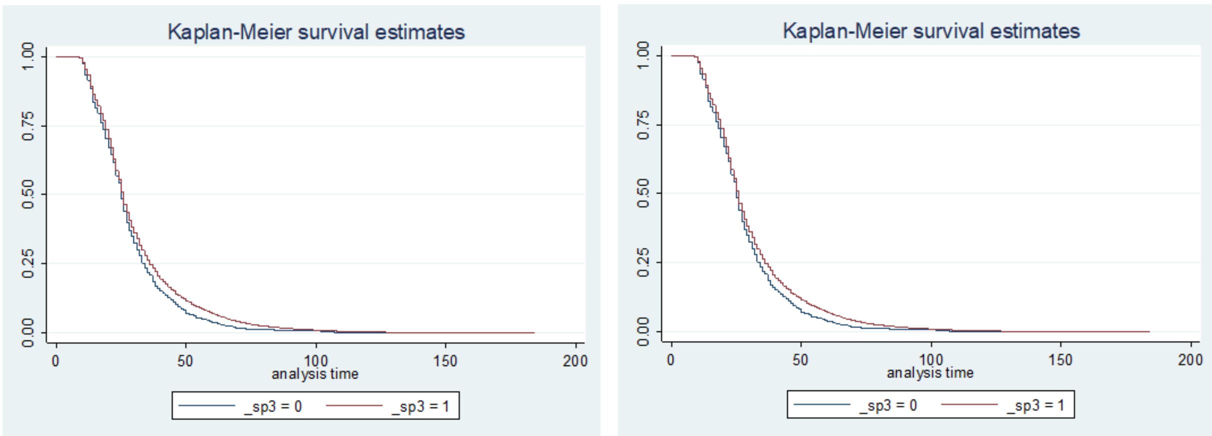
(a) Parity 01



(b) Parity 02



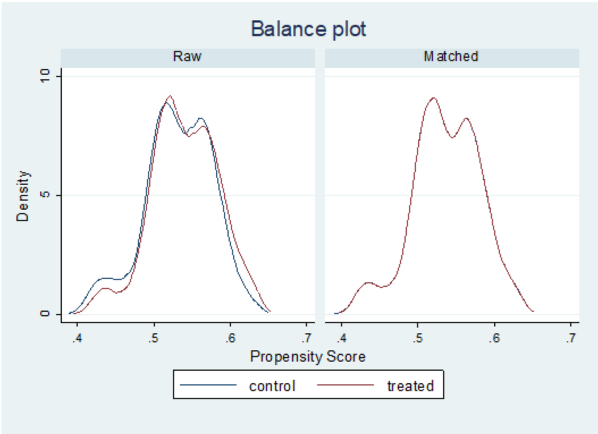
(c) Parity 3



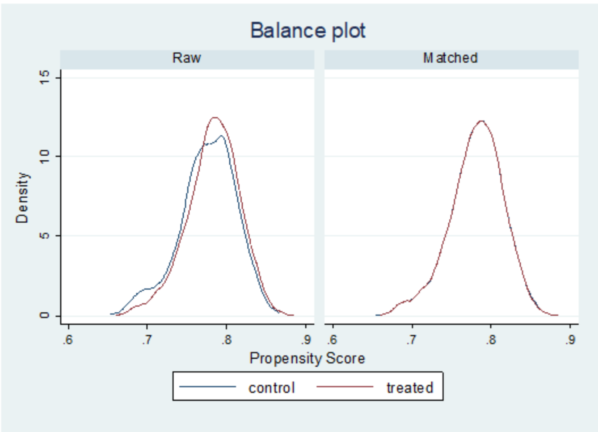
Source: Authors' calculations using PDHS 2012-13. Note: The 0 implies women with no son at parity n and 1 implies women with at least one son parity n. Sample is restricted to women with complete fertility.

Figure A9: Kernel density plots after Propensity score matching (PDHS 1990-91)

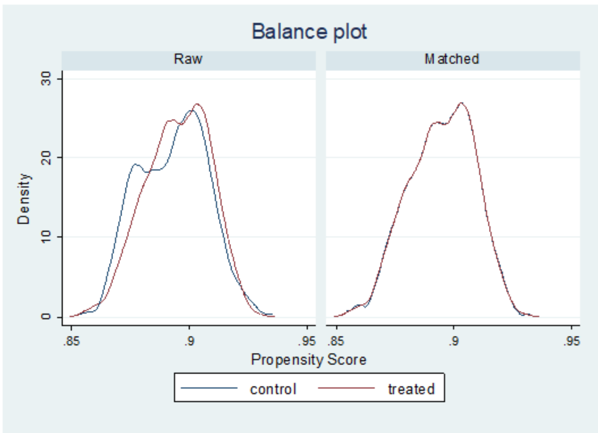
(a) Parity 01



(b) Parity 02



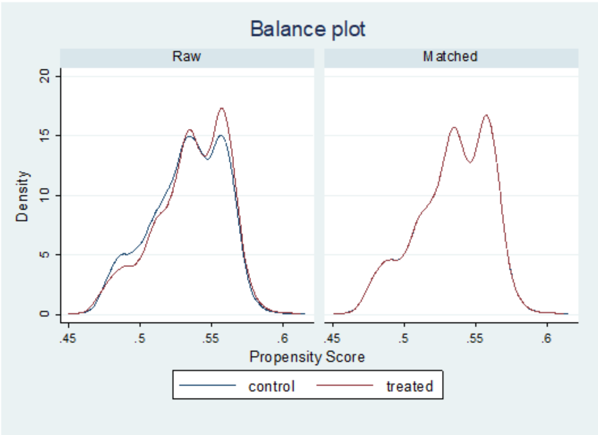
(c) Parity 03



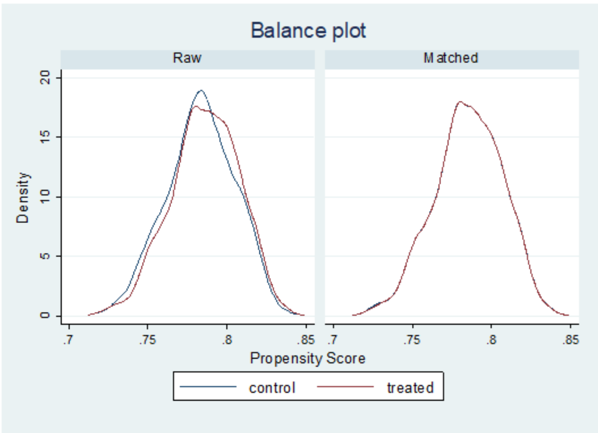
Source: Authors' calculations using PDHS 1990-91. Sample is restricted to women with complete fertility.

Figure A10: Kernel density plots after Propensity score matching (PDHS 2006-07)

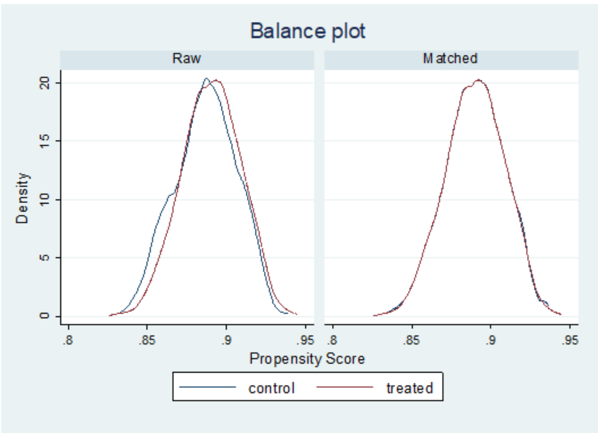
(a) Parity 01



(b) Parity 02



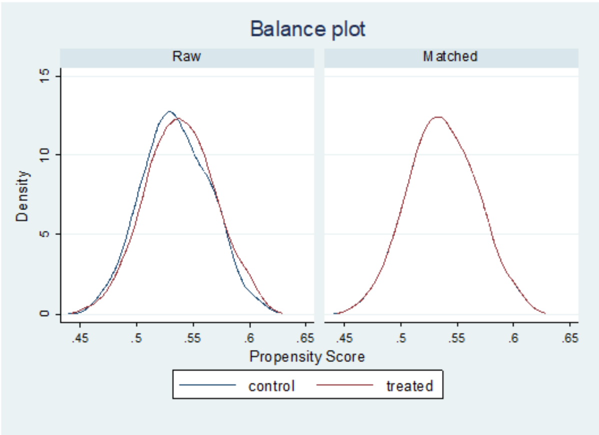
(c) Parity 03



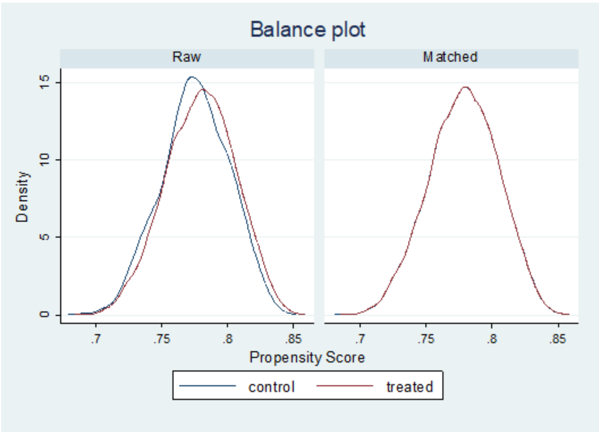
Source: Authors' calculations using PDHS 2006-07. Sample is restricted to women with complete fertility.

Figure A11: Kernel density plots after Propensity score matching (PDHS 2012-13)

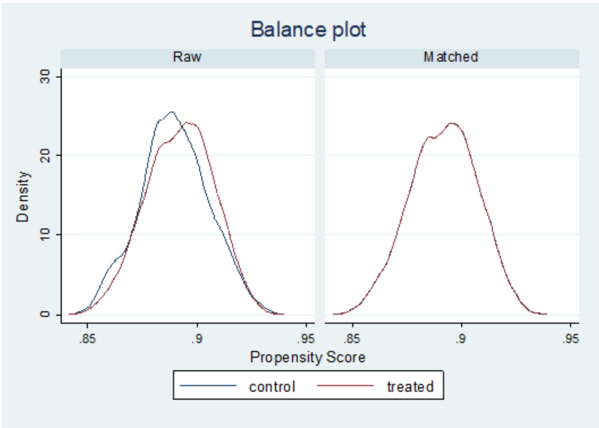
(a) Parity 01



(b) Parity 02



(c) Parity 03



Source: Authors' calculations using PDHS 2012-13. Sample is restricted to women with complete fertility.