Kazenin *Genus (2024)80:6*
https://doi.org/10.1186/s41118-024-00217-0

Genus

ORIGINAL ARTICLE Open Access

Gender composition of children and desires for the next child in "son preference" countries

Konstantin Kazenin[1*]

*Correspondence: konstantin.kazenin@sociology.su.se

[1] Stockholm University Demography Unit, Stockholm, Sweden

Abstract

This paper studies the role of gender preferences for children in formation of desires for the next child in nine countries of the Middle East and North Africa, South and Central Asia, the Caucasus and Balkans. For all countries selected for the study, effects of son preference have been detected in actual fertility during recent decades, but gender preferences in desires for the next child have been studied much less systematically. Using Demographic and Health Surveys conducted in these countries in 2010–2021, desires to stop fertility and to have a child within 2 years are considered separately for women with one and two living children. For women with one living child, the gender of that child has a significant effect on these desires only in South-Asian countries, where women who only have a daughter are more likely to want to have another child within 2 years and less likely to want to stop childbearing compared to women who only have a son. For women with two living children, in most of the considered countries, the desire to have another child within 2 years only shows a preference for having at least one son, whereas the desire to stop fertility shows effects of balanced gender preference in six out of the nine countries. The preference for a balanced gender composition of children observed for the desire to stop fertility actualizes the question of whether a son preference will remain unchallenged in actual fertility in these countries in the near future. In the final section, possible social correlates of son preference and balanced gender preference are discussed on the example of two countries, Bangladesh and Nepal.

Keywords: Fertility, Fertility desires, Gender preferences, Parity progressions, Developing countries

Introduction

At least since the work of Arnold (1997), gender preferences for children are known to be a strong predictor of fertility behavior. The preference for having at least one son or more sons than daughters is of special importance for parity progressions in countries of the Middle East and North Africa (MENA), Central and South Asia, South Caucasus and Balkans (Filmer et al., 2009; Guilmoto, 2015): For a large number of countries in these regions, it has been shown that the propensity to progress to certain parities is higher among women who have no sons or fewer sons than daughters. In some countries in these regions, a son preference is also manifested by induced sex-selective abortions undertaken when the fetus is female (Guilmoto, 2009). A son preference is commonly

considered to be a consequence of strict gender asymmetries that create higher value for sons (Bongaarts, 2013; Dubuc, 2018). These include family-level characteristics, such as the subordinate position of women in the family and the role of housewife typically assigned to women (see, e.g., Sathar et al., 1988; Dubuc, 2018). Among institutions found at the societal level, a son preference has been shown to be supported by patrilineal kinship and inheritance systems (Das Gupta et al., 2003) and the special responsibilities imposed on daughters' parents, such as paying a high dowry (Arnold et al., 2002). Another well-known correlate of a son preference is the low labor market perspectives of women, which force parents to mainly rely on the support of sons in their elderly years (Bongaarts, 2013).

Although this "sum of knowledge" on son preference is well established in the literature and certainly supported by rich empirical evidence, there is an important gap that makes our current knowledge of this phenomenon incomplete. This gap concerns the role of a son preference in shaping the desire to have one more child. Only for a rather limited number of countries where son preference has been found in actual fertility or in fertility ideals has it been shown that women's propensity to want one more child also depends on the number of sons already born (see "Background" section for a literature overview).

There are, however, at least two reasons to assume that more systematically studying desires for the next child can effectively complement current knowledge about the son preference.

First, regarding these desires, son preference effects can be observed in a less distorted way than they can be observed for actual parity progressions. It is well known that, in developing countries, despite serious advances in family planning during recent decades, the level of unwanted fertility remains high (Casterline & El-Zeini, 2022). On the other hand, unrealized desired fertility is also observed in many of these countries, as there are rather high proportions of women whose desires to have another child remain unfulfilled by the end of their reproductive careers (Casterline & Han, 2017). In this way, in developing countries, the role of a son preference in actual transitions to the next child can be obscured by mismatches between desires and actual births. Studying desires for the next child allows us to observe effects of son preference without these intervening factors.

Second, desires for the next child are expected to be more predictive of actual fertility than are reported fertility ideals. Desires to have one more child have been shown to be more closely connected to actual fertility decisions than ideals about the number or gender composition of children: Being shaped by ideals, these desires, in turn, shape intentions for the next birth (see Thomson, 2015 and references there; see also "Data and method" and "Discussion and conclusions" sections for some details).

The present paper undertakes a cross-country study of the relation between the gender composition of children already born and women's desire for the next child in nine countries of MENA, South and Central Asia, the Caucasus and Balkans, where a son preference has been detected in actual fertility. The central purpose of the study is to show, based on the example of these countries, that desires for the next child are frequently sensitive to the sex composition of existing children. This result invites researchers to more broadly use desire for the next child as an indicator in studies on gender

preferences for children, thus profiting from the above-mentioned advantages of studying these desires compared to studying gender composition ideals or actual fertility. Furthermore, it is shown that, in some countries demonstrating a son preference in actual fertility, desires for the next child show effects of a more balanced gender preference for children, where having at least one daughter among the offspring is also valued. This is in good accordance with the earlier observation made by Fuse (2010) that the ideal of having both boys and girls, or even an equal number of children of both genders, is frequently reported by both women and men in most of these countries. The question arises of whether, in the future, this preference is likely to penetrate into actual fertility as well.

It must be emphasized that the cross-country study reported on in the present paper cannot consider the entire range of social factors underlying different gender preferences for children detected in desires for the next child. However, for illustrative purposes, possible reasons underlying the difference in preferences between two countries of South Asia—Bangladesh and Nepal—are considered in the discussion. Although a son preference was reported to have shaped actual fertility in both of these countries during recent decades, in Bangladesh, but not in Nepal, effects of a preference for having at least one daughter are also seen in desires for the next child—a finding that can be related to certain social differences between the two countries.

The paper considers the effects of a son preference on two types of desires: the desire to stop vs. to continue fertility and the desire to have another child within a certain period of time. In this way, the desires concerning the fertility quantum (to have or not have one more child) and fertility timing (how soon to have one more child) are compared as potential indicators of a son preference. Addressing the desire about timing of the next child is additionally justified because during recent decades interbirth intervals have undergone major changes in developing countries, including countries with articulated preferences for sons (Casterline & Odden, 2016), and it is necessary to understand what conditions shape these intervals during the process of change.

Data from DHS surveys on the analyzed countries are used, where women are characterized based on their desire to stop or continue childbearing and on their desire to have a child within 2 years. Each of the two desires is considered separately regarding its relation to the gender composition of a woman's living children. Women with one and two living children are included in the study, and for each of these groups, the effect of having no son and the effect of having no daughter on desires concerning the next child are analyzed. Given that the distribution of gender preferences for children may change over time, the study aims to analyze as much up-to-date data as possible. Therefore, only DHS surveys conducted after 2010 are used.

Background

Gender preferences for children have been shown to have effects on (i) fertility ideals, (ii) actual fertility behavior, and (iii) desires concerning future children.

Gender preferences regarding *ideals* are most often measured in surveys as the relation between the reported ideal number of boys and girls. For countries in the regions considered in the present study, surveys have regularly shown that the proportion of women preferring to have more sons than daughters is close to the proportion of women

preferring an equal number of children of both sexes and is several times higher than the proportion of women preferring to have more daughters than sons (cf. Fuse, 2010, for a comparative study; Pande & Astone, 2007, for India; Channon, 2017, for Pakistan, among many others). Bongaarts (2013) draws a similar conclusion regarding the prevalence of the ideal of having more sons using Desired Sex Ratio at Births (DSRB), which he calculates based on DHS surveys conducted in the 1990s–2000s in several countries in the regions under study. However, for some countries in the considered regions, a decrease in son preference ideals during recent decades has been reported. Comparing surveys carried out in India in 1992–1993 and 2019–2021, Bhatnagar (2023) shows a decline in the proportion of women preferring to have more boys than girls (from 40% to 18%) and an increase in the proportion of women with gender-equitable preferences among most subpopulations of the country. Channon & Karki (2018) report that, in Nepal between 1996 and 2011, the DSRB, while consistently showing a preference for boys, nevertheless showed a considerable decrease in this preference (from 204 to 152 boys per 100 girls among women).

Parity transitions in actual fertility have been shown to be greatly influenced by a son preference in the regions studied here. A higher propensity toward transition to the next parity among women with no sons or with more daughters than sons has been shown for Bangladesh (Asadullah et al., 2021), Egypt (Vignoli, 2006), Nepal (Channon, 2015), and Pakistan (Javed & Mughal, 2021). Similarly, in India, as argued by Chaudhuri (2012), risks of transition to the third parity are 30% higher for women with a son and a daughter and 248% higher for women with only daughters compared to women with only sons. For Turkey, the one available study on gender preferences in transition to the third parity (Altindag, 2016), reporting a son preference, uses sex of the first born rather than sex composition of all children as the independent parameter. However, Ezdi and Baş (2020), studying Turkish immigrant women in Germany, show that women who have either a gender mix or two sons from their first and second birth parities display a lower likelihood of third births than do women who have two daughters. Because no dependency of this kind is detected for natives in Germany and because gender-equating conditions in that country are not likely to infer a son preference, this result probably indicates a son preference in the home country (given that selectivity of son-preferring couples into migration is also not probable). Lerch (2013) demonstrates a negative relation between the number of boys already born and the odds of next birth in Albania. For Tajikistan, Spoorenberg (2018) argues that the probability of discontinuing fertility after the birth of a boy is highest for women who have only had girls, which indicates a preference for having at least one son. For Armenia, a son preference has been shown to be manifested in the higher propensity to discontinue fertility when the most recent child is a boy and in sex-selective abortions (Duthé et al., 2012). Most of the abovementioned studies have looked at that probability of the next birth rather than at its timing. However, a small number of studies have focused on interbirth intervals as a function of the gender composition of existing children. These studies have also reported effects of a son preference rather than a "balanced" preference: women with no sons tend to have shorter interbirth intervals, but no statistically significant differences are found between women with only daughters and women with children of both genders [see Khan et al. (2016) for Bangladesh, Bashieri

and Hinde (2007) for Egypt]. None of the studies mentioned in this paragraph provide evidence for a son preference coexisting with any other preferences for children, e.g., with a preference to also have at least one daughter.

Desires concerning the next child were also shown to follow a son preference in several studies. Arnold (1997), using results from DHS for the 1980s–1990s, argues that, in Bangladesh, Egypt, India, Nepal, Pakistan, Tunisia and Turkey, having at least one son or having more sons than daughters lowers the probability that women will desire to continue fertility. In country-specific studies, similar results have been presented for Pakistan (Zaidi & Morgan, 2016), Morocco and Tunisia (Obermeyer, 1996).

Some studies, by contrast, have suggested that desires for an additional child are affected by the preference for having children of both sexes in the countries under study. According to Billingsley (2011), who considers women with two children in Armenia using DHS2005, both women who have two sons and women who have two daughters have a higher propensity to desire one more child compared to women who have a daughter and a son (although the odds ratio of this desire is only 1.68 for women with two sons and 5.80 for women with two daughters). Duthé et al. (2012), using the same survey, report similar results for women with 2+ children. For Bangladesh, Barkat-e-Khuda et al. (2018) argue, based on surveys undertaken in the 2000s–2010s, that the odds of wanting to continue fertility among women who have only sons are significantly higher than among women who have both sons and daughters, though lower than among women who only have daughters. Similar conclusions for Bangladesh are drawn by Asadullah et al. (2021), who consider not only the desire for one more child, but also the total number of children desired in addition to those already born. Spoorenberg (2018), analyzing surveys conducted in several post-Soviet countries of Central Asia in the 2000s, shows that the desire for the next child at that time was stronger among women with only sons or only daughters than among women with children of both genders. All in all, the tendency toward a balanced gender preference for children has been shown to shape desires for the next child in several countries where a son preference is observed in actual fertility. However, no systematic cross-country comparative study of this phenomenon has been undertaken thus far. Moreover, the available studies have concentrated on the desire to have another child vs. discontinuing fertility, but have not considered the desire to have another child within a specific period of time.

Research questions

In accordance with the "gaps" in the existing knowledge on son preferences mentioned in the introduction, the subsequent analysis addresses the following research questions:

Q1. Are women's desires for an additional child related to the gender composition of children already born?
Q2. If yes, what exactly are the gender preferences that shape these desires?
Q3. What types of desires for the next child are correlated with the gender composition of children already born: desires to have or to not have one more child or desires about the timing of the next child? If both, do the same gender composition preferences shape the two types of desires?

Table 1 Years of DHS, TFR levels and numbers of women with one or two living children by country

Country	Year(s) of DHS	TFR	Women with one living child		Women with two living children	
			N	Proportion among women aged 15–40, %	*N*	Proportion among women aged 15–40, %
Albania	2017–2018	1.49	1047	25.44	1789	43.46
Armenia	2015–2016	1.60	512	20,83	1317	53.58
Bangladesh	2017–2018	2.04	3530	28.16	4432	35.36
Egypt	2014	3.44	2223	17.22	3978	30.82
India	2019–2021	2.11	72,088	30.95	76,294	32.76
Nepal	2016	2.20	1779	30.09	1877	31.74
Pakistan	2017–18	3.62	1485	16.58	1808	20.19
Tajikistan	2017	3.29	653	14.74	1234	27.85
Turkey	2018	2.05	664	23.39	1069	37.65

TFRs for the first survey year of biannual or triannual surveys; numbers of women in their first union, neither sterilized nor declared infecund, not pregnant at the time of the survey

Data and method

Individual-level data on women from DHS surveys were used in the analysis. Countries were included for which DHS surveys had been administered between 2010 and 2020 (if more than one survey had been conducted within that period, the latest one was chosen) and for which existing studies have detected a son preference in actual fertility during recent decades. Nine countries were considered: Albania, Armenia, Bangladesh, Egypt, India, Nepal, Pakistan, Tajikistan, Turkey.[1] Table 1 shows years of DHS for each country and country-level TFRs for the year of the survey, which ranged between 1.49 and 3.62 children per women. It was assumed that, especially in the countries with lower TFRs, women with three or more children make up small proportions of their age groups and therefore may be subject to considerable selectivity on certain (possibly unobserved) characteristics. Therefore, the analysis was limited to women who had one or two living children at the time of the interview.[2] Those of them who ever had twins were excluded from the analysis. The numbers of women with one and two living children who were included in the analysis are also shown in Table 1, for each country.

The reason for categorizing women based on number of living children rather than on number of children ever born was based on the notion that, when making decisions about parity progressions, it is natural to take into account one's living children. Among women included in the analysis, the proportion with at least one dead child ranged from 1.2% for Albania to 13.1% for Pakistan. As a robustness check, models were estimated only for women from whom all of their children were alive (available from the author upon request). Their results did not differ considerably from those of the models presented below.

[1] Another country in the regions under study and for which a son preference in actual fertility has been reported was Kyrgyzstan. It was not considered, however, because of the small ($N<1000$) samples of women with one or two living children in DHS2012 who satisfied the criteria for inclusion in the analysis outlined below.

[2] One more country in the regions under study for which a son preference in actual fertility has been reported, Afghanistan, was not included in the analysis because a son preference there was shown to be observed mainly at parities higher than the second (Channon, 2015).

Only women in their first marriage or partnership were included in the analysis. This seemed justified for several reasons. First, it has been suggested in the literature that, in "son preference" countries, women with daughters at their first parities are more likely to be divorced afterwards, which also makes further parity transitions less probable (Noghanibehambari, 2023). Given this, a correlation was expected between gender composition of children and women's marital status at the time of the survey. Excluding divorced women allowed this problem to be avoided. Second, it is probable that women who are not in their first marriage or partnership only take into consideration the gender composition of children whose father is their current spouse. The DHS data sets, however, generally do not allow differentiation between children born to a woman and fathered by different spouses, which justified the exclusion of women in this category. Finally, childbearing among single women was very infrequent in the considered countries at the time of the survey, meaning that exclusion of such women was not expected to distort the results of the analysis.

Another condition for inclusion in the analysis was age: women above 40 were not included because, given low actual fertility at their age, their reported desires concerning the next child could be less indicative of their subsequent actual fertility behavior. Women who reported being pregnant at the time of the survey were also excluded, as well as women for whom the desire for the next child was not specified (according to DHS survey reports, most of women for whom that parameter was not specified were either sterilized or infecund). The number of women excluded from the analysis is shown in Tables 4 and 5 of Appendix 1, and the sizes of the final samples for each country and parity are presented in Table 1.

All women of reproductive age interviewed at DHS were asked the question about their desire to have a child in the future: "Would you like to have (a/another) child, or would you prefer not to have any (more) children?" Those who reported the desire to have another child were also asked about the preferred timing of the next birth: "How long would you like to wait from now before the birth of (a/another) child?" DHS data sets contain a variable calculated based on the women's answers to these two questions. It is assigned the following meanings: "wants within 2 years," "wants, after 2 years," "undecided," "wants, unsure timing," "wants no more".[3]

Two binary parameters were constructed based on women's answer to this question. The quantum-related parameter was assigned the meaning 1 if a woman did not want to have any more children and 0 otherwise. The timing-related parameter, which signals the desire for a "quick" birth, was 1 if a woman wanted to have a child within 2 years and 0 otherwise. Taking these parameters one by one as the dependents, linear probability models were estimated separately for women with one and with two living children in each country.[4]

[3] The analysis followed this categorization of desired timing of the next birth, including the opposition between women who wanted to have a child within 2 years and those who wanted a child at any time later. For the purposes of the present analysis, this was considered plausible because 2 years can be treated as rather "short"-term planning childbearing. The DHS data also included the "raw" variable showing actual desired time for the next child (years or months) reported by every woman. Based on that variable, models were also run for the desire to have a child within 3 years (available from the author). Their results did not differ in any meaningful way from the models for desire to have a child within 2 years regarding the relation of that desire to the gender composition of children.

[4] As a check, logit models (available from the author) were run in parallel to the linear models. Their results for the key independent parameter were very close to those of the linear models.

Different interpretations of the above DHS question are present in existing studies: some have treated it as asking about desires, others as asking about intentions to have another child. The conceptual distinction between desires and intentions is fundamental for current theoretical approaches to fertility. According to Thomson (2015), desires only suppose a positive attitude toward an additional child (in general or within a certain time period), whereas intentions reflect a decision to implement specific behaviors required for having one more child. In the traits–desires–intentions–behavior (T–D–I–B) framework suggested by Miller (2011) for human reproduction, fertility intentions precede and influence actual fertility behavior and are themselves preceded and influenced by fertility desires (this theoretical approach is based on the much more general Theory of Planned Behavior suggested by Ajzen (1991, 2005). In this way, desires and intentions for another child are two consequent mediators between ideals of cumulative fertility (number and gender composition of children) and actual reproductive behavior. The DHS question is interpreted as asking about intentions, e.g., by Bankole and Westoff (1998) and Zaidi and Morgan (2016), and as asking about desires, e.g., in Obermeyer (1996) and Samosir et al. (2018). Casterline and Han (2017:435) note that the answer concerning the desire to have one more child might be negative both in the event a woman actually does not want more children and in the event she does want more children, but considers an additional child practically infeasible for some reason(s). In this way, they actually show that answers to the question may be indicative either of desires or of intentions, depending on the context. Kodzi et al. (2010), noting the importance of distinguishing between intentions and desires in survey data on developing countries, conclude that formulation of the DHS questions still corresponds to desires more closely than to intentions. This interpretation is followed in the present paper, which uses the term 'desire' rather than 'intention,' keeping in mind that distinguishing between the two in survey answers may sometimes not be straightforward.

The central independent variable in the models indicated the gender composition of living children. It was calculated using birth histories of women in DHS data sets and was assigned three meanings: "the woman has both a daughter and a son," "the woman has only sons," "the woman has only daughters." For women who had two living children, the first meaning was the reference. For women with one living child, the first meaning was not available, and the second one was the reference.

Comparing the effects of different gender compositions of living children on the two desires was the instrument used to discover different preferences for children. For women with one living child, only son and daughter preferences could be detected in this way. Under a son preference, having only a daughter was expected to increase the probability of the desire to have another child within 2 years and to decrease the probability of the desire to stop fertility. Under a daughter preference, the opposite effects of having only a daughter on the two desires were expected. For women with two living children, gender preferences were distinguished by comparison with those who have a son and a daughter. If the desire to discontinue fertility was less probable only for women with two daughters, this signaled a son preference. If the desire to discontinue fertility was less probable only for women with two sons, this signaled a daughter preference. If both women with two sons and those with two daughters were less likely to want to stop fertility than women with a son and a daughter, this indicated a balanced preference for

children. Of course, the negative effects of having no boys and no girls on the desire to stop fertility could differ in their strength, as measured by coefficient sizes. The closer the coefficient sizes of having no sons and no daughters were, the more "complete" the balance was. In the same manner, effects of lack of sons and lack of daughters on the desire to have a child within 2 years were compared. The positive effects of only having no daughters and only having no sons signaled a daughter and a son preference, respectively, whereas positive effects of both indicated a balanced gender preference. Finally, if the gender composition of living children had no effect on desires concerning the next child, this was considered an indicator of the gender neutrality of these desires.

Woman's age and months passed since the birth of the previous child were included as control variables because they both effect woman's propensity to have one more child. Woman's type of residence at the time of the survey (urban vs. rural), woman's education (a binary parameter distinguishing women with and without tertiary education was constructed) and household's wealth quintile were also used as control variables. In today's developing countries, urban residence, higher education and higher wealth level are known to frequently correlate with lower fertility (Bongaarts & Hodgson, 2022), which also predicts lower probability of the desire to have another child (or two have it within a short period) among women in these categories.

One important assumption for the analysis is that the gender composition of children already born does not depend on the background sociodemographic characteristics of women indicated by the control variables. The check for this independency which was performed is reported in Appendix 2.

Descriptive results

Table 2 shows the distribution of the two dependent variables in the analyzed samples.

Among women with one living child, the proportions who want to have a child within 2 years were higher than the proportions who want to stop fertility in all studied countries (except Nepal). The proportions who wish to stop fertility and who have only one living child were especially low (less than 10%) in all three countries with TFR above three children per women (Egypt, Pakistan, Tajikistan). The low proportion of women wishing to stop fertility in Armenia (5.08%) was more surprising given the low fertility in that country.

Among women with two living children, the proportions wishing to stop fertility ranged from 21.39% in Pakistan to 86.63% in Nepal. Again, the proportion was generally higher in countries with lower fertility and lower in countries with higher fertility (only in Pakistan and Tajikistan was it less than 30%). The proportions of women who desire to have another child within 2 years among those with two living children, by contrast, grew with the fertility level of the country. The proportions of women who wished to stop fertility were regularly higher than the proportions of those who wanted to have a child within 2 years among women with two living children, in clear contrast to women with one living child.

Distribution of the key independent variable is shown in Table 3. Women with one living child had a higher proportion of boys at the time of the survey than the biological norm at birth (105–107 boys per 100 girls, which corresponds to 51–52% of boys among newborns) in more than half of the countries. In all countries, among women with two

Table 2 Proportion of women who desire to stop fertility and those who desire to have another child within 2 years, %. Source: DHS surveys indicated in Table 1

Country	Women with one living child		Women with two living children	
	Proportion of women wishing to stop fertility	Proportion of women wishing to have a child within 2 years	Proportion of women wishing to stop fertility	Proportion of women wishing to have a child within 2 years
Albania	12.32	28.56	65.40	6.60
Armenia	5.08	36.13	56.26	7.74
Bangladesh	10.88	22.15	76.69	6.16
Egypt	4.27	38.24	47.79	16.37
India	21.31	27.54	72.80	8.89
Nepal	31.03	18.66	86.63	5.33
Pakistan	4.04	51.65	21.39	31.19
Tajikistan	3.52	47.01	25.20	22.04
Turkey	20.03	32.38	62.68	10.38

Proportions among women in their first union, neither sterilized nor declared infecund, not pregnant at the time of the survey

Table 3 Proportions of women with different gender compositions of living children, %. Source: DHS surveys indicated in Table 1

Country	Women with one living child		Women with two living children		
	Boy	Girl	A boy and a girl	Two boys	Two girls
Albania	53.01	46.99	55.00	26.50	18.50
Armenia	51.37	48.73	57.40	28.17	14.43
Bangladesh	54.02	45.98	55.37	25.45	19.18
Egypt	55.47	44.53	51.52	29.30	19.18
India	56.08	43.92	56.38	24.78	18.84
Nepal	54.30	45.70	59.40	24.88	15.72
Pakistan	53.87	46.13	50.77	28.15	21.07
Tajikistan	48.24	51.76	54.21	28.20	17.59
Turkey	53.61	46.39	52.58	27.78	19.36

Proportions among women in their first union, neither sterilized nor declared infecund, not pregnant at the time of the survey

living children, the proportion with two girls was lower than expected in relation to the biological norms for women at the second parity (23–24%). In "Limitations" section, the possible effect of the "surplus" of boys on the results of the analysis is discussed.

The analysis

The effects of gender composition of children already born on the desire to stop fertility and to have another child within 2 years are plotted in Figs. 1, 2, 3, 4. For purposes of comparison, countries in the figures are ordered by regions: first the Balkans, MENA and the Caucasus, then Central and South Asia.

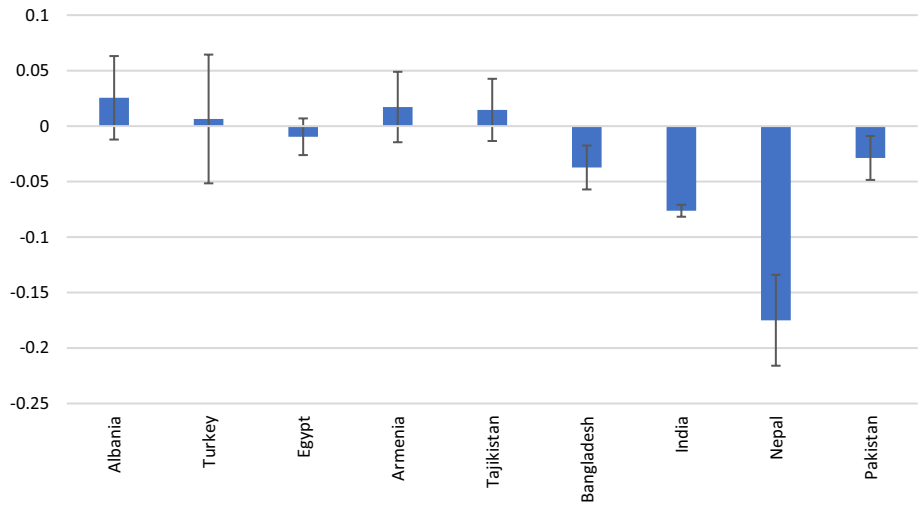

Fig. 1 Linear coefficients for the desire to stop fertility, women whose only living child is a girl, with 95% CIs (ref.: women whose only living child is a boy)

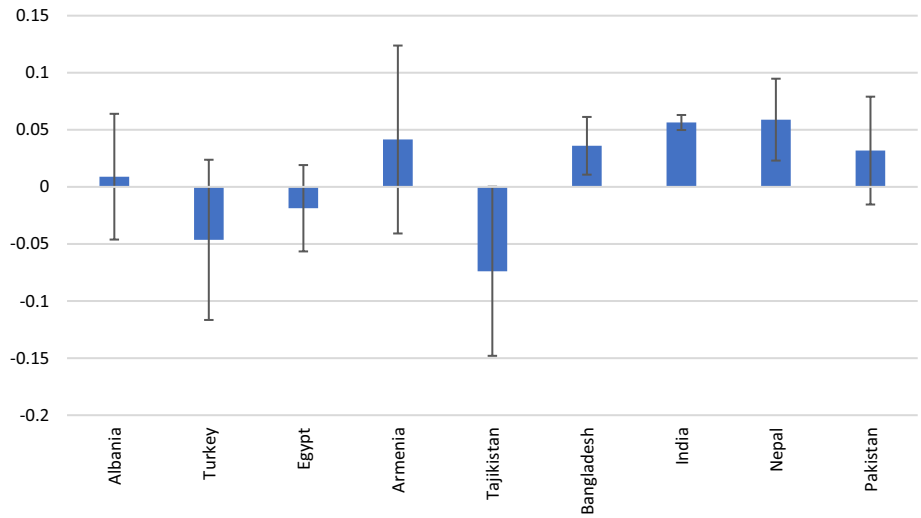

Fig. 2 Linear coefficients for the desire to have a child within 2 years, women whose only living child is a girl, with 95% CIs (ref.: women whose only living child is a boy)

Figure 1 compares the probability of desiring to stop fertility among women whose only living child was a son and among those whose only living child was a daughter (see also Table 6 in Appendix 2). In the four countries of South Asia (Bangladesh, India, Nepal, Pakistan) having a daughter made this desire significantly less probable. As the coefficient sizes show, the contrast between women with a son and women with a daughter was especially sharp in Nepal, and much more modest in Bangladesh and Pakistan. In the countries outside South Asia, no statistically significant difference was found between women with a son and those with a daughter concerning the desire to stop fertility. The probabilities of the desire to have a child within 2 years among women with only a boy and those with only a girl are compared in Fig. 2 (see

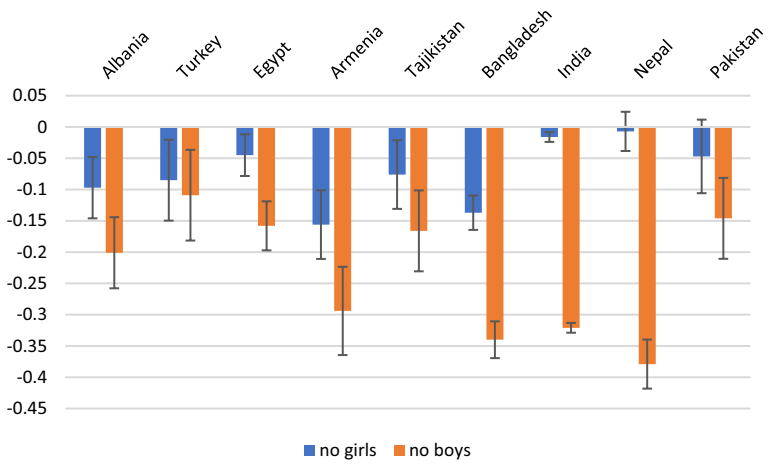

Fig. 3 Linear coefficients for the desire to stop fertility, women with two living children, with 95% CIs, by gender composition of living children (ref.: a boy and a girl)

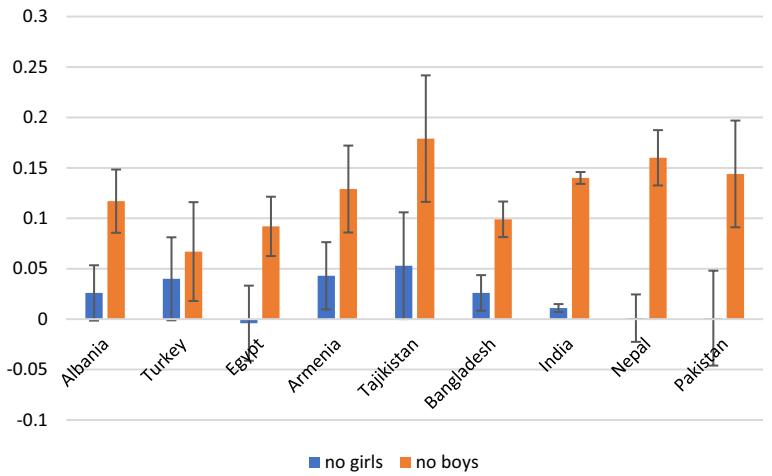

Fig. 4 Linear coefficients for the desire to have a child within 2 years, women with two living children, with 95% CIs, by gender composition of living children (ref.: a boy and a girl)

also Table 7). Here again, significant differences were observed only in the countries of South Asia (except Pakistan), where the probability of this desire among women with a girl was significantly higher at the 95% level. In this way, for women with one living child, a son preference shaped both of the desires in a geographically limited group of countries. In the other countries, no gender preferences were observed in the desires of this category of women.

For women with two living children, effects of gender composition of existing children on the desires were detected in all the countries except one. Figure 3 (see also Table 8) shows results for the desire to stop fertility. In seven countries (Albania, Armenia, Bangladesh, Egypt, India, Turkey and Tajikistan), the probability of this desire was significantly lower both for women with no sons and for women with no daughters compared to women who had both. In all these countries except Turkey, however, the coefficients

for having no girls were two or more times smaller than for having no boys, the difference being especially sizeable in India. This means that having no girls was a weaker, although existent, stimulus to continue fertility. In Nepal and Pakistan, only women with no sons, but not those with no daughters, had a significantly lower probability of desiring to stop fertility compared to women who had both.

For the desire to have a child within the next 2 years (Fig. 4, Table 9), the results were somewhat different. In six countries (Albania, Egypt, Nepal, Turkey, Pakistan and Tajikistan), the probability of this desire among women with a girl and a boy and among women with only boys did not differ at the 95% confidence level, but for women with only girls, the probability was higher, as expected under a son preference. In Armenia, Bangladesh and India, women with only boys or only girls showed a higher propensity to want to have another child within 2 years than did women with a boy and a girl. However, in these three countries, the coefficient sizes for women with no boys were at least twice as high as for those with no girls (as in the case with the desire to stop fertility, in India, the gap between the coefficients for women with no sons and women with no daughters was especially large).

It can be concluded that, for women with two living children, both the desire to stop fertility and the desire to have a child within 2 years are correlated with gender composition of children already born in all the considered countries. Effects of a son preference, however, were more regularly observed with regard to the desire to have a child within the next 2 years. There are two countries (Nepal, Pakistan) in which both desires adhered only to a son preference. In four more countries (Albania, Egypt, Turkey and Tajikistan), the effects of a balanced preference were observed only for the desire to stop fertility, whereas the desire to have a child within 2 years was shaped by a son preference. In India and Armenia, the effects of a balanced preference were confirmed for both desires. In most cases where having no daughters significantly affected any of the desires, its impact was weaker than the impact of having no sons, but countries differed in how sharp this contrast was. The largest contrast was observed in India, and the smallest one in Turkey.

(The effects of the control parameters on the desires are not discussed here, as they do not seem to be of great relevance to the goal of the analysis. Their effects can be observed in Tables 6, 7, 8, 9 of Appendix 2.)

Limitations

One limitation of the analysis outlined above derives from a possible social desirability bias in survey answers about fertility desires: women may be reluctant to report the desire to stop fertility because it does not fit the "familialistic" attitudes prevalent in their communities (see Kalamar & Hindin, 2015; Kazenin & Kozlov, 2020 on mismatches between preferences reported on surveys and actual fertility behavior in developing countries). Measuring the social desirability bias is very difficult, and the possibility of this bias must be acknowledged in any study on fertility ideals or desires.

Another limitation is related to country-internal heterogeneity. It has been shown that regions and ethnic groups in some of the countries under study differ rather considerably in fertility levels and/or family norms, meaning they may also be expected to differ in

gender preferences for children (cf. Dyson & Moore, 1983 for India; Yavuz, 2006 for Turkey, among others). These differences were not controlled for, because that would make sets of independent parameters in the models for different countries non-uniform and complicate comparison between the countries. It is assumed, however, that DHS sampling procedures partly accommodate this problem by proportional sampling of women from different regions of the countries.

Results of the analysis can also be distorted by selectivity of women into certain groups concerning the gender composition of children. Descriptive statistics have shown that, in most countries, it is less common to find women with only daughters than women with only sons ("Descriptive results" section), which may be due to sex-selective abortions or quicker parity transitions if lacking a son. This means that those women who were interviewed without having a son are more likely to not have a son preference than are the other categories of women. This sample selection bias can result in an underestimation of son preference effects on desires for the next child (cf. similar reasoning regarding Bangladesh in Asadullah et al., 2021).

Finally, restricting the analysis to women with one or two children, although justified in the comparative study ("Data and method" section), leaves beyond the scope gender preferences effects upon desires for transition to the fourth and subsequent children, which can be of interest especially in those of the considered countries where this transition is relatively frequent.

Conclusions and discussion

Desires for the next child are known to have a certain predictive capacity regarding reproductive behavior in developing countries. Many studies have argued that women's actual progression to the next child is regularly associated with the desire for an additional child reported by her on an earlier survey (cf. Bongaarts & Casterline, 2018, for an overview; Machiyama et al., 2019, for Kenya; da Vanzo et al., 2003, for Malaysia; Gibby & Luke, 2019, for Malawi; Hayford & Agadjanian, 2012, for Mozambique; Bankole & Westoff, 1998, for Morocco, among others)[5]. Based on surveys undertaken between 2010 and 2021, the present paper has proposed a systematic view of desirers of an additional next child among women in countries where a son preference in actual fertility has been detected during recent decades.

The mostly broad conclusion based on the analysis is that desires concerning the next child are related to the gender composition of living children in all of the studied countries, but that, across the countries, this relation is observed more regularly among women with two living children than among women who have only one living child. The less pronounced effects of gender composition on the desires of women with only one child are in accordance with the tendency observed by Channon (2015), which is that,

[5] The predictive power of the desire for the next child is limited in developing countries by the considerably high proportion of women reporting this desire in their late forties. As argued by Casterline and Han (2017), the proportion of such women is one of the measures of unrealized fertility. However, as the same authors have shown, in the regions studied in the present paper, the proportion of women aged 44–48 who have expressed the desire to have one more child was by far not the highest for developing countries: for the 19 surveys administered in South Asia that they include in their analysis, the median proportion of such women was 2.1%, and for 36 surveys of West Asia and North Africa, it was 6.4%. These figures are several times lower than in Sub-Saharan Africa, where unrealized fertility distorts the relation between fertility desires and actual fertility in a much more serious way than in the regions considered here.

at least in some Asian countries, gender composition effects are stronger at higher parities, the transition to which is normally less "unconditional." However, there is no clear explanation for the fact that gender composition affects the desires of women with one living child only in the countries of South Asia (Bangladesh, India, Nepal, Pakistan), as these countries were not generally characterized by lower fertility and, specifically, lower rates of transition to the second child compared to the other countries at the time of the surveys.

For women with only one living child, the analysis distinguished between the preference for sons and for daughters, and only the former has been detected in all the countries in which gender preferences were significant for the desires of these women. This result signals a difference from some European countries, where a higher propensity toward transition to the next parity was found in recent decades for one-child mothers with a boy compared to one-child mothers with a girl (Andersson et al., 2006). The lack of daughter preference effects in the countries under analysis does not come as a surprise, as, despite the social changes occurring there, gender asymmetries that would predict the higher value of daughters compared to sons were not characteristic of most of these countries during the period of the surveys (see Dubuc, 2018 for an overview).

For women with two living children, a son preference was not unrivaled, as clear effects of a balanced preference were found in six of the nine countries, where having only sons made the desire to have another child more probable than having a son and a daughter. Whenever a balanced preference is detected, it can reasonably be suggested that there are certain factors that support the value of daughters, in addition to factors that support the value of sons. Both these groups of factors, of course, may be quite variable across countries, reflecting the diversity of family settings and institutions, opportunities for women in education and labor market, commonly accepted values, etc. Defining the precise reasons for differences in gender preferences is beyond the scope of the statistical analysis undertaken here. A more thorough investigation into separate countries can reveal how differences in gender preferences for children, which shape desires for the next child, correlate with certain social characteristics of these countries. A comparison between Bangladesh and Nepal serves as an illustrative example for further studying this point. These two countries belong to the same world region and have close fertility levels. Despite this, in Nepal desires for the next child have shown a very high preference for sons, whereas in Bangladesh a clear tendency toward a balanced preference was detected in these desires. Seeking possible reasons for this asymmetry, it is necessary to stress that both countries' populations are characterized by considerable economic, cultural and (more in the case of Nepal) religious heterogeneity. Nevertheless, certain country-level tendencies reported in the literature suggest that Bangladesh and Nepal differ on central factors that shape gender preferences for children.

In Bangladesh, rapid economic changes during the final quarter of the twentieth—beginning of the twenty-first centuries resulted in higher labor market participance among women (Adnan, 1998; Huq et al., 2012; Simmons, 1996). Their dependence on parents (before marriage) and in-laws began decreasing during that period, at the same time as daughters came to be of higher value to their parents as a source of material support, even after marriage. Adnan (1998) claims that, in the 1980s, these changes were observed in a relatively small proportion of households, whereas Huq et al. (2012)

show that the value of daughters has increased in wider social strata during more recent decades, mainly due to the economic factors just mentioned. The later study by Asadullah et al. (2021) provides evidence that, in the 2010s, a preference for a balanced gender composition was stronger in areas close to garment factories than in the rest of the country, as such factories offer good labor opportunities for women.

Nepal could hardly move along this path toward more balanced gender preferences for children due its much lower level of industrial development compared to Bangladesh. At the same time, non-economic factors have been found for Nepal that give special support to a son preference, making this preference stronger in that country than in most other countries of South Asia (Channon & Karki, 2018). First, the Hindu religion, adhered to by about 80% of the country's population, requires that only one's own son can perform death and post-death rituals, which is thought to ensure that "the gate of heaven" will be opened for parents. This cult-life belief makes having sons crucial (Karki, 1988). Second, during recent decades, Nepal has still been characterized by a strictly patrilineal heritage system, under which not having a son has meant not ensuring family continuity (Brunson, 2010).

Importantly, actual fertility in both countries showed effects of a son preference rather than a balanced preference during the 2010s, as well as during the preceding decades (Ahmed, 1981; Hoq, 2019; Asadullah et al., 2021, for Bangladesh; Karki, 1988; Leone et al., 2003; Channon, 2015, for Nepal). Moreover, the two countries did not differ greatly in gender composition ideals: both in Nepal (Channon & Karki, 2018) and in Bangladesh (Barkat-e-Khuda et al., 2018) the ideal gender composition of children included both boys and girls, with a higher proportion of the former. It is only in desires for the next child that a clear contrast is observed between the two countries. As shown above, this contrast can be explained by their socioeconomic and cultural specificities. This confirms that desires for the next son deserve separate attention in studies of gender preferences for children, and it raises two important questions for future research: (1) why, despite the differences in the gender composition preferences detected in desires for the next child, are the two countries similar in their preferences as detected in actual fertility? (2) can it be expected that a balanced preference in desires for the next child will gradually penetrate to actual fertility? These questions are relevant to the other countries considered in the present paper as well, owing to the variability in preferences that shape desires for the next child compared to the more uniform son preference seen in actual fertility.

A result of the analysis that needs a separate explanation is that a balanced preference is stronger evidenced for the desire to stop fertility than for the desire to have a child within 2 years, which appeared to be more "son oriented." One of the possible explanations for the observed asymmetry may be that, compared to the desire to stop fertility, the desire for an additional child "soon" is more likely to appear under pressure from the woman's partner, relatives, community members, etc. This pressure can cause a woman to have another child without delay if this can eliminate the reason for tense relations with "meaningful others." Available anthropological studies on some of the countries included in the analysis have shown that women in these countries are often under pressure from family or community members who insist that they should have at least one son (Brunson, 2010 for Nepal; Harris, 2004 for Tajikistan). By

contrast, the situation of women being under pressure to achieve a balanced composition of children has not been described for the countries under study. To be sure, in each country where the gender preferences shaping the two desires differed, the possible sources of this difference can only become clear if they are studied specifically. However, whatever these sources are, methodologically this difference confirms the need to consider desires regarding fertility quantum and fertility timing separately.

All in all, the present paper has attempted to contribute to the current research on gender preferences for children in several ways. Using data on nine geographically dispersed countries for which a son preference in actual fertility has been reported, it has proposed a systematic view on desires for the next child in these countries. The analysis has shown that these desires are commonly related to the gender composition of living children. Moreover, it has turned out that, in several countries, the desire to stop fertility and the desire to have another child within 2 years are shaped by different gender composition preferences. It has also been shown that, in several countries where a son preference is crucial to actual fertility, effects of balanced ideals concerning the gender composition of children can be observed for desires for the next child. This actualizes the question of whether a son preference will remain unchallenged in the actual fertility of these countries in the near future.

Appendices

Appendix 1

See Tables 4, 5.

Table 4 Number of women with one living child in the country samples, by categories included and not included in the analysis

	All women with one living child between 15 and 40	Women in first marriage or partnership between 15 and 40	Pregnant at the time of the survey	Desire for the next child unspecified	Resulting number of women
Albania	1279	1193	114	32	1047
Armenia	753	636	72	52	512
Bangladesh	4382	3938	368	40	3530
Egypt	3091	2823	587	13	2223
India	92,479	86,591	9145	5358	72,088
Nepal	2043	1969	149	41	1779
Pakistan	2017	1885	379	21	1485
Tajikistan	1154	941	216	72	653
Turkey	855	757	87	6	664

Number of women included in the analysis is equal to number women in first marriage or partnership between 15 and 40, without women pregnant at the time of the survey and those for whom the desire for the next child was not specified

Only women not ever having twins are included in all the categories

Table 5 Number of women with two living children in the country samples, by categories included and not included in the analysis

	All women with two living children between 15 and 40	Women in first marriage or partnership between 15 and 40	Pregnant at the time of the survey	Desire for the next child unspecified	Resulting number of women
Albania	1972	1867	37	41	1789
Armenia	1508	1403	26	60	1317
Bangladesh	5270	4822	176	214	4432
Egypt	4838	4465	457	30	3978
India	148,481	139,935	4093	59,548	76,294
Nepal	2534	2395	76	442	1877
Pakistan	2284	2132	273	51	1808
Tajikistan	1647	1468	146	88	1234
Turkey	1271	1177	63	45	1069

Number of women included in the analysis is equal to number of women in first marriage or partnership between 15 and 40, without women pregnant at the time of the survey and those for whom the desire for the next child was not specified

Only women not ever having twins are included in all the categories

Appendix 2

See Tables 6, 7, 8, 9

Table 6 Linear probability models for the desire to stop fertility, women with one living child

	(1) Albania	(2) Armenia	(3) Bangladesh	(4) Egypt	(5) India	(6) Nepal	(7) Pakistan	(8) Tajikistan	(9) Turkey
The living child is a girl	0.0255 (0.0192)	0.0172 (0.0162)	−0.0373*** (0.0101)	−0.00960 (0.00843)	−0.0763*** (0.00275)	−0.175*** (0.0209)	−0.0287** (0.0101)	0.0146 (0.0143)	0.00643 (0.0296)
Respondent's current age	0.0332 (0.0189)	−0.000445 (0.0168)	0.0152*** (0.00376)	0.00785 (0.00477)	0.0199*** (0.00146)	0.0312** (0.0101)	0.00221 (0.00415)	0.0342*** (0.00946)	0.0280 (0.0256)
Months since the previous birth	−0.000281 (0.00160)	0.00301** (0.00140)	0.000525 (0.000332)	0.000750† (0.000435)	0.00185*** (0.000125)	−0.000270 (0.000880)	0.000529 (0.000373)	−0.00188** (0.000832)	0.000236 (0.00217)
Rural	−0.0103 (0.0234)	0.00317 (0.0223)	−0.0284** (0.0116)	0.00191 (0.0137)	0.00988** (0.00345)	−0.0433† (0.0234)	−0.0164 (0.0118)	−0.0358† (0.0212)	0.000834 (0.0431)
Wealth quintile (ref.: poorest)									
Poorer	−0.0362 (0.0275)	0.0228 (0.0273)	0.00366 (0.0180)	−0.0110 (0.0159)	0.0208*** (0.00449)	0.0100 (0.0353)	0.0151 (0.0167)	0.0104 (0.0260)	−0.0675 (0.0585)
Middle	−0.0758** (0.0311)	0.0223 (0.0294)	0.0178 (0.0172)	−0.00689 (0.0147)	0.0199*** (0.00456)	0.00580 (0.0351)	−0.00531 (0.0176)	0.0281 (0.0248)	−0.0546 (0.0579)
Richer	−0.0578† (0.0331)	−0.0333 (0.0315)	−0.0318† (0.0173)	0.00447 (0.0152)	0.0192*** (0.00474)	−0.0105 (0.0352)	−0.0136 (0.0179)	0.0196 (0.0244)	0.0106 (0.0631)
Richest	−0.0479 (0.0379)	−0.00541 (0.0331)	−0.0304 (0.0185)	0.0211 (0.0189)	0.0569*** (0.00518)	0.0187 (0.0396)	0.0131 (0.0190)	0.0168 (0.0286)	0.0169 (0.0646)
Higher education	−0.0204 (0.0239)	−0.00120 (0.0177)	−0.0141 (0.0130)	0.00387 (0.0111)	0.00224 (0.00364)	−0.0385 (0.0267)	0.0172 (0.0139)	−0.0133 (0.0170)	0.0823** (0.0371)
Age of respondent at 1st birth	−0.0244 (0.0188)	0.00301 (0.0166)	−0.00464 (0.00401)	−0.00472 (0.00483)	−0.0136*** (0.00147)	−0.0144 (0.0103)	−0.00426 (0.00423)	−0.0335*** (0.00958)	−0.0275 (0.0256)
Constant	−0.163** (0.0705)	−0.137** (0.0645)	−0.137*** (0.0345)	−0.0648** (0.0296)	−0.101*** (0.00968)	−0.0415 (0.0694)	0.0788** (0.0309)	−0.00357 (0.0549)	0.0404 (0.0997)
Observations	1047	510	3530	2223	71,714	1779	1485	653	664
R^2	0.135	0.339	0.094	0.054	0.215	0.112	0.035	0.053	0.127

Standard errors in parentheses

† $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$

Table 7 Linear probability models for the desire to have a child within 2 years, women with one living child

	(1) Albania	(2) Armenia	(3) Bangladesh	(4) Egypt	(5) India	(6) Nepal	(7) Pakistan	(8) Tajikistan	(9) Turkey
The living child is a girl	0.00893 (0.0281)	0.0415 (0.0420)	0.0360** (0.0129)	−0.0187 (0.0193)	0.0564*** (0.00336)	0.0589** (0.0183)	0.0318 (0.0241)	−0.0739† (0.0378)	−0.0464 (0.0358)
Respondent's current age	0.0111 (0.0277)	−0.0363 (0.0437)	0.0187*** (0.00484)	0.0172 (0.0109)	0.0132*** (0.00178)	0.00261 (0.00885)	0.0338*** (0.00984)	−0.0122 (0.0251)	−0.0200 (0.0310)
Months since the previous birth	0.000256 (0.00234)	0.00532 (0.00365)	0.00184*** (0.000427)	0.00448*** (0.000996)	−0.000404** (0.000152)	0.00142† (0.000771)	0.00166† (0.000885)	0.00507** (0.00221)	0.00299 (0.00262)
Rural	0.0362 (0.0344)	0.0401 (0.0580)	0.0507*** (0.0149)	0.00192 (0.0313)	0.00527 (0.00422)	0.0266 (0.0205)	0.0416 (0.0280)	0.0344 (0.0563)	−0.0617 (0.0522)
Wealth quintile (ref.: poorest)									
Poorer	0.00702 (0.0403)	−0.0589 (0.0711)	0.0303 (0.0231)	−0.0547 (0.0364)	−0.0267*** (0.00550)	0.0234 (0.0309)	0.00388 (0.0396)	0.132† (0.0690)	−0.0359 (0.0708)
Middle	−0.00203 (0.0455)	−0.0949 (0.0765)	0.0333 (0.0221)	−0.0657† (0.0337)	−0.0120** (0.00559)	0.0639* (0.0307)	−0.00558 (0.0417)	0.0239 (0.0657)	−0.0663 (0.0701)
Richer	−0.00810 (0.0484)	0.0524 (0.0818)	0.0234 (0.0223)	−0.132*** (0.0349)	−0.00211 (0.00580)	0.0776** (0.0308)	0.00147 (0.0425)	−0.0143 (0.0648)	−0.158** (0.0764)
Richest	−0.0688 (0.0556)	−0.141 (0.0862)	0.0622** (0.0237)	−0.148*** (0.0434)	−0.0299*** (0.00635)	−0.0149 (0.0347)	−0.0975** (0.0451)	−0.0400 (0.0758)	−0.129† (0.0782)
Higher education	0.0464 (0.0350)	−0.0253 (0.0461)	−0.0252 (0.0167)	−0.0306 (0.0253)	−0.0142** (0.00446)	0.00736 (0.0234)	−0.0476 (0.0330)	−0.0817† (0.0451)	−0.157*** (0.0450)
Age of respondent at 1st birth	−0.00576 (0.0276)	0.0487 (0.0432)	−0.0109** (0.00516)	−0.00854 (0.0111)	−0.0111*** (0.00180)	−0.000475 (0.00902)	−0.0164 (0.0100)	0.0258 (0.0254)	0.0375 (0.0310)
Constant	0.0776 (0.103)	0.0124 (0.168)	−0.172*** (0.0443)	0.150** (0.0677)	0.181*** (0.0118)	0.00374 (0.0608)	−0.0284 (0.0733)	0.104 (0.146)	0.0142 (0.121)
Observations	1047	510	3530	2223	71,714	1779	1485	653	664
R^2	0.017	0.065	0.158	0.141	0.011	0.041	0.157	0.091	0.063

Standard errors in parentheses

† $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$

Table 8 Linear probability models for the desire to stop fertility, women with two living children

	(1) Albania	(2) Armenia	(3) Bangladesh	(4) Egypt	(5) India	(6) Nepal	(7) Pakistan	(8) Tajikistan	(9) Turkey
Gender composition of living children (ref.: a boy and a girl)									
Only boys	−0.0976*** (0.0253)	−0.156*** (0.0277)	−0.137*** (0.0140)	−0.0449** (0.0171)	−0.0160*** (0.00357)	−0.00695 (0.0166)	−0.00196 (0.0218)	−0.0764** (0.0277)	−0.0850** (0.0326)
Only girls	−0.201*** (0.0290)	−0.294*** (0.0358)	−0.339*** (0.0156)	−0.158*** (0.0198)	−0.321*** (0.00397)	−0.379*** (0.0198)	−0.135*** (0.0241)	−0.166*** (0.0330)	−0.109** (0.0371)
Respondent's current age	0.0285*** (0.00525)	0.0269*** (0.00675)	0.0226*** (0.00221)	0.0210*** (0.00464)	0.0193*** (0.000694)	0.0119*** (0.00310)	0.00473 (0.00449)	0.0127 (0.00735)	0.0335*** (0.00550)
Months since the previous birth	−0.000140 (0.000446)	0.00137** (0.000554)	−0.000517** (0.000193)	0.00160*** (0.000432)	0.000270*** (0.0000613)	−0.0000179 (0.000268)	0.00169*** (0.000465)	0.00149* (0.000702)	−0.000860 (0.000522)
Rural	0.0503† (0.0264)	−0.0376 (0.0352)	−0.0624*** (0.0137)	−0.0123 (0.0248)	0.00384 (0.00382)	−0.0310** (0.0156)	−0.0315 (0.0219)	0.0418 (0.0359)	0.105** (0.0385)
Wealth quintile (ref.: poorest)									
Poorer	0.0467 (0.0305)	0.00194 (0.0397)	−0.00446 (0.0195)	0.0534† (0.0285)	0.0407*** (0.00471)	0.0131 (0.0231)	0.00434 (0.0325)	0.0308 (0.0420)	0.0856† (0.0482)
Middle	0.0773** (0.0355)	0.0133 (0.0438)	−0.0297 (0.0196)	0.143*** (0.0275)	0.0568*** (0.00485)	−0.0537** (0.0231)	0.0543 (0.0326)	0.0577 (0.0424)	0.191*** (0.0511)

Table 8 (continued)

	(1) Albania	(2) Armenia	(3) Bangladesh	(4) Egypt	(5) India	(6) Nepal	(7) Pakistan	(8) Tajikistan	(9) Turkey
Richer	0.0914** (0.0382)	−0.0111 (0.0477)	−0.0137 (0.0198)	0.180*** (0.0301)	0.0774*** (0.00503)	−0.00212 (0.0232)	0.0387 (0.0346)	0.0841** (0.0418)	0.232*** (0.0536)
Richest	0.0736† (0.0444)	−0.0206 (0.0490)	−0.0293 (0.0213)	0.176*** (0.0350)	0.127*** (0.00553)	0.0246 (0.0247)	0.0574 (0.0369)	0.0525 (0.0482)	0.248*** (0.0571)
Higher education	0.0151 (0.0328)	0.000344 (0.0260)	−0.0165 (0.0195)	−0.0425** (0.0205)	0.0583*** (0.00466)	0.0723*** (0.0216)	0.103*** (0.0253)	−0.0751** (0.0293)	0.0835† (0.0459)
Age of respondent at 1st birth	−0.0134** (0.00572)	−0.0104 (0.00734)	−0.0177*** (0.00285)	−0.00867† (0.00495)	−0.0198*** (0.000783)	−0.00695† (0.00376)	−0.00353 (0.00490)	−0.00569 (0.00871)	−0.0193** (0.00647)
Constant	0.0145 (0.0974)	−0.0811 (0.114)	0.617*** (0.0476)	−0.0787 (0.0606)	0.537*** (0.0119)	0.720*** (0.0548)	0.0875 (0.0624)	−0.0304 (0.109)	−0.113 (0.108)
Observations	1789	1316	4432	3978	74,903	1877	1805	1234	1069
R^2	0.105	0.237	0.154	0.135	0.173	0.231	0.088	0.086	0.135

Standard errors in parentheses

† $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$

Table 9 Linear probability models for the desire to have a child within 2 years, women with two living children

	(1) Albania	(2) Armenia	(3) Bangladesh	(4) Egypt	(5) India	(6) Nepal	(7) Pakistan	(8) Tajikistan	(9) Turkey
Gender composition of living children (ref.: a boy and a girl)									
Only boys	0.0263† (0.0137)	0.0434** (0.0167)	0.0266** (0.00855)	−0.000726 (0.0133)	0.0109*** (0.00245)	0.000714 (0.0119)	0.000896 (0.0244)	0.0529† (0.0272)	0.0401† (0.0217)
Only girls	0.117*** (0.0157)	0.129*** (0.0216)	0.0993*** (0.00950)	0.0925*** (0.0155)	0.140*** (0.00273)	0.160*** (0.0143)	0.144*** (0.0270)	0.179*** (0.0325)	0.0671** (0.0247)
Respondent's current age	−0.00441 (0.00284)	−0.00648 (0.00407)	−0.00245 (0.00134)	0.00130 (0.00363)	−0.00531*** (0.000476)	0.000502 (0.00223)	0.00597 (0.00504)	−0.00595 (0.00723)	−0.00604 (0.00367)
Months since the previous birth	0.000254 (0.000242)	0.000423 (0.000334)	0.000523*** (0.000118)	0.000542 (0.000338)	0.000158*** (0.0000421)	−0.000102 (0.000193)	0.00248*** (0.000521)	0.000822 (0.000691)	0.00113** (0.000348)
Rural	0.0220 (0.0143)	0.0558** (0.0212)	0.0182** (0.00836)	−0.00126 (0.0194)	0.00268 (0.00263)	0.000482 (0.0112)	0.0478† (0.0246)	−0.0471 (0.0353)	−0.0479† (0.0257)
Wealth quintile (ref.: poorest)									
Poorer	0.00470 (0.0165)	−0.0478** (0.0240)	−0.0156 (0.0119)	−0.0383† (0.0223)	−0.0126*** (0.00323)	−0.0394** (0.0166)	−0.0876** (0.0365)	−0.00330 (0.0413)	−0.00949 (0.0321)
Middle	0.000723 (0.0192)	−0.00517 (0.0264)	−0.000423 (0.0119)	−0.0868*** (0.0215)	−0.0142*** (0.00333)	0.0139 (0.0166)	−0.126*** (0.0366)	0.0100 (0.0417)	−0.0385 (0.0340)
Richer	−0.00913 (0.0207)	0.0197 (0.0288)	−0.0156 (0.0120)	−0.156*** (0.0235)	−0.0178*** (0.00346)	0.00269 (0.0167)	−0.0959** (0.0389)	−0.0114 (0.0411)	−0.0884** (0.0357)
Richest	0.0154 (0.0240)	0.0117 (0.0296)	−0.00145 (0.0129)	−0.157*** (0.0274)	−0.0349*** (0.00380)	−0.0381** (0.0178)	−0.148*** (0.0414)	−0.0742 (0.0474)	−0.0753** (0.0380)
Higher education	−0.00532 (0.0178)	−0.00436 (0.0157)	0.00852 (0.0118)	−0.0135 (0.0160)	−0.0265*** (0.00320)	−0.0373** (0.0155)	−0.129*** (0.0284)	−0.0117 (0.0289)	−0.0480 (0.0306)
Age of respondent at 1st birth	0.00330 (0.00310)	0.0105** (0.00443)	0.00283 (0.00174)	0.00104 (0.00387)	0.00577*** (0.000538)	−0.000563 (0.00270)	0.00131 (0.00550)	0.00826 (0.00857)	0.0123** (0.00431)
Constant	0.0758 (0.0528)	−0.0273 (0.0688)	0.0127 (0.0290)	0.171*** (0.0473)	0.106*** (0.00818)	0.0488 (0.0395)	0.108 (0.0701)	0.182† (0.107)	−0.00885 (0.0718)
Observations	1789	1316	4432	3978	74,903	1877	1805	1234	1069
R^2	0.035	0.044	0.031	0.038	0.047	0.084	0.100	0.029	0.034

Standard errors in parentheses

† $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$

Table 10 Presence of at least one son and desires for the next child – propensity score matching

Country	ATE, desire to stop fertility	ATE, desire to have a child within 2 years
Albania	0.128*** (0.035)	− 0.091*** (0.026)
Armenia	0.234*** (0.042)	− 0.069** (0.026)
Bangladesh	0.287*** (0.021)	− 0.081*** (0.013)
Egypt	0.133*** (0.023)	− 0.100*** (0.021)
India	0.339*** (0.005)	− 0.156*** (0.004)
Nepal	0.362*** (0.035)	− 0.150*** (0.029)
Pakistan	0.137*** (0.022)	− 0.152*** (0.031)
Tajikistan	0.136** (0.039)	− 0.203*** (0.044)
Turkey	0.067* (0.036)	− 0.023 (0.026)

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$

Appendix 3: Robustness checks

An important premise of the analysis is that women with different gender compositions of children are distributed randomly. However, the selectivity of women into different gender compositions of children may be expected primarily because sex-selection abortions (SSA) are common in some of the analyzed countries (see Guilmoto, 2015, for a comprehensive cross-country overview). Another possible mechanism of selectivity is quicker transition to the next parity by women who are unsatisfied with their current gender composition of children. SSA have been shown to result in a higher number of boys in the countries under analysis where this practice has been widespread (Albania and Armenia; see Duthé et al., 2012). A quicker transition to the 3rd parity was mainly observed for women with no sons before it ("Data and method" section). For these reasons, selectivity of women having vs. not having at least one son was the main concern.

For estimating this selectivity, propensity score matching (PSM) tests were used. These tests matched each woman who had a son with a woman who had no sons, but who was similar to the former woman on the sociodemographic parameters included in the models (matching was performed on the basis of probabilities estimated from a logistic regression with having/not having a son as the dependent parameter). Then, using binary parameters for each of the desires, the average difference of outcomes (average treatment effect—ATE) between women with and without a son in the matched pairs was calculated. If the ATE was statistically significant and had the expected "sign," it was improbable that the difference between women with and without sons in the desire for the next child was the result of selectivity of the two groups of women on the control variables. The Stata17 *teffects psmatch* command was used with the default 1:1 Nearest Neighbor method, with all the control variables of the models used in the matching process (see Javed & Mughal, 2021, who use the same test in their study on son preference in Pakistan). The samples of women on which the test was run coincided with the samples of the models represented in "The analysis" section. Table 8 shows the results of the test for both desires. Except for Turkey, comparison of the matched pairs of women shows the positive average effect of having a son on the desire to stop fertility and its negative effect on the desire to have a child within 2 years within the matched couples. In this way, the tests results do not indicate selectivity bias, at least on the control parameters used in the models (Table 10).

Acknowledgements
The author is thankful to colleagues who gave valuable comments and recommendations on earlier versions of this paper: Gunnar Andersson, Sunnee Billingsley, Martin Kolk, and Eleonora Mussino. All remaining errors are only the author's responsibility.

Author contributions
Konstantin Kazenin—100%.

Funding
Open access funding provided by Stockholm University. The research was not supported by special funding.

Availability of data and materials
All the data from the DHS surveys used in the study are available on permission at www.dhsprogram.com.

Declarations

Competing interests
The author declares that he has no competing interests.

Received: 9 November 2023 Accepted: 22 April 2024
Published online: 09 May 2024

References

Adnan, S. (1998). Fertility decline under absolute poverty: Paradoxical aspects of demographic change in Bangladesh. *Economic and Political Weekly, 33*(22), 1337–1348.
Ahmed, N. (1981). Family size and sex preferences among women in rural Bangladesh. *Studies in Family Planning, 12*(3), 100–109.
Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179–211.
Ajzen, I. (2005). *Attitudes, personality, and behaviour* (2nd ed.). Open University.
Altindag, O. (2016). Son preference, fertility decline, and the non-missing girls of Turkey. *Demography, 53*(2), 541–566. https://doi.org/10.1007/s13524-016-0455-0
Andersson, G., Hank, K., Rønsen, M., & Vikat, A. (2006). Gendering family composition: Sex preferences for children and childbearing behavior in the Nordic countries. *Demography, 43*(2), 255–267. https://doi.org/10.1353/dem.2006.0010
Arnold, F. (1997). Gender preferences for children. *DHS Comparative studies 23*. Macro International.
Arnold, F., Choe, M., & Roy, T. (2002). Son preferences, the family building process and child mortality in India. *Population Studies, 52*, 301–315. https://doi.org/10.1080/0032472031000150486
Asadullah, N. S., Mansoor, N., Randazzo, T., & Wahhaj, Z. (2021). Is son preference disappearing in Bangladesh? *World Development*. https://doi.org/10.1016/j.worlddev.2020.105353
Bankole, A., & Westoff, C. F. (1998). The consistency and validity of reproductive attitudes: Evidence from Marocco. *Journal of Biosociological Science, 30*, 439–455.
Barkhat-e-Khuda, M. R. H., Hasan, M. S., Alam, N., & Barkat, S. (2018). Fertility preferences in Bangladesh. In S. Gietel-Basten, J. Casterline, & M. K. Choe (Eds.), *Family demography in Asia: A comparative analysis of fertility preferences* (pp. 30–51). Edward Elgar Publishing Ltd.
Bashieri, A., & Hinde, A. (2007). The proximate determinants of fertility and birth intervals in Egypt: An application of calendar data. *Demographic Research, 16*, 3. https://doi.org/10.4054/DemRes.2007.16.3
Bhatnagar, I. (2023). A Girl and a Boy, Are a Bundle of Joy: A Rise in Gender-Equitable Fertility Preferences in India. *Studies in Family Planning, 54*(2), 329–353. https://doi.org/10.1111/sifp.12236
Billingsley, S. (2011). Second and Third Births in Armenia and Moldova: An economic perspective of recent behaviour and current preferences. *European Journal of Population, 27*(2), 125–155. https://doi.org/10.1007/s10680-011-9229-y
Bongaarts, J. (2013). The implementation of preference for male offspring. *Population and Development Review, 39*(2), 185–208. https://doi.org/10.1111/j.1728-4457.2013.00588.x
Bongaarts, J., & Casterline, J. B. (2018). From fertility preferences to reproductive outcomes in the developing world. *Population and Development Review, 44*(4), 793–809.
Bongaarts, J., & Hodgson, D. (2022). *Fertility Transition in the Developing World*. Springer.
Brunson, J. (2010). Son preference in the context of fertility decline: Limits to new constructions of gender and kinship in Nepal. *Studies in Family Planning, 41*(2), 89–98. https://doi.org/10.1111/j.1728-4465.2010.00229.x
Casterline, J. B., & El-Zeini, L. O. (2022). Multiple perspectives on recent trends in unwanted fertility in low-and middle-income countries. *Demography, 59*(1), 371–388. https://doi.org/10.1215/00703370-9644472
Casterline, J., & Han, S. (2017). Unrealized fertility: Fertility desires at the end of the reproductive career. *Demographic Research, 35*, 427–454. https://doi.org/10.4054/DemRes.2017.36.14
Casterline, J., & Odden, C. (2016). Trends in inter-birth intervals in developing countries 1965–2014. *Population and Development Review, 42*, 173–194. https://doi.org/10.1111/j.1728-4457.2016.00134.x
Channon, M. D. (2015). Son preferen6ce, parity progression and contraceptive use in South Asia. *Population Horizons, 12*(1), 24–35. https://doi.org/10.1515/pophzn-2015-0004
Channon, M. D. (2017). Son preference and family limitation in Pakistan: A parity- and contraceptive method-specific analysis. *International Perspectives on Sexual and Reproductive Health, 43*(3), 99–110. https://doi.org/10.1363/43e4317
Channon, M. D., & Karki, Y. (2018). Fertility preferences in Nepal. In S. Gietel-Basten, J. Casterline, & M. K. Choe (Eds.), *Family demography in Asia: A comparative analysis of fertility preferences* (pp. 224–246). Edward Elgar Publishing Ltd.

Chaudhuri, S. (2012). The desire for sons and excess fertility: A household-level analysis of parity progression in India. *International Perspectives on Sexual and Reproductive Health, 38*(4), 178–186. https://doi.org/10.1363/3817812
Da Vanzo, J., Peterson, C. E., & Jones, N. R. (2003). How well do desired fertility measures for wives and husbands predict subsequent fertility? Evidence from Malaysia. *Asia-Pacific Population Journal, 18*(4), 5–24.
Das Gupta, M., Zhenghua, J., Bohua, Li., Zhenming, X., Chung, W., & Hwa-Ok, B. (2003). Why is son preference so persistent in East and South Asia? A cross-country study of China, India and the Republic of Korea. *The Journal of Development Studies, 40*(2), 153–187.
Dubuc, S. (2018). Son preference and fertility: an overview. In S. Gietel-Basten, J. Casterline, & M. K. Choe (Eds.), *Family demography in Asia: A comparative analysis of fertility preferences* (pp. 15–29). Edward Elgar Publishing Ltd.
Duthé, G., Meslé, F., Vallin, J., Badurashvili, I., & Kuyumjyan, K. (2012). High sex ratios at birth in the Caucasus: Modern technology to satisfy old desires. *Population and Development Review, 38*(487), 501. https://doi.org/10.1111/j.1728-4457.2012.00513.x
Dyson, T., & Moore, M. (1983). On kinship structure, female autonomy and demographic behavior in India. *Population and Development Review, 9*, 35–60.
Ezdi, S., & Baş, A. M. (2020). Gender preferences and fertility: Investigating the case of Turkish immigrants in Germany. *Demographic Research, 43*, 59–96. https://doi.org/10.4054/DemRes.2020.43.3
Filmer, D., Friedman, J., & Schady, N. (2009). Development, modernization, and child bearing: The role of family sex composition. *The World Bank Economic Review, 23*(3), 371–398.
Fuse, K. (2010). Variations of attitudinal gender preferences for children across 50 less-developed countries. *Demographic Research, 23*, 1031–1048. https://doi.org/10.4054/DemRes.2010.23.36
Gibby, A. L., & Luke, N. (2019). Exploring multiple dimensions of young women's fertility preferences in Malawi. *Maternal and Child Health Journal, 23*, 1508–1515. https://doi.org/10.1007/s10995-019-02778-5
Guilmoto, Ch. Z. (2009). The sex ratio transition in Asia. *Population and Development Review, 35*(3), 519–549. https://doi.org/10.1111/j.1728-4457.2009.00295.x
Guilmoto, C. Z. (2015). The masculinization of births: Overview and current knowledge. *Population (English Edition 2002-), 70*(2), 201–264. https://doi.org/10.3917/popu.1502.0201
Harris, C. (2004). *Control and subversion: Gender relations in Tajikistan*. Pluto Press.
Hayford, S., & Agadjanian, V. (2012). From desires to behavior: Moderating factors in a fertility transition. *Demographic Research, 26*, 511–542. https://doi.org/10.4054/DemRes.2012.26.20
Hoq, M. N. (2019). Effects of son preference on fertility: A parity progression analysis. *Corvinus Journal of Sociology and Social Policy, 10*(1), 27–45. https://doi.org/10.14267/CJSSP.2019.1.2
Huq, L., Kabeer, N., & Mahmood S. (2012). Diverging Stories of Son Preference in South Asia: a Comparison between India and Bangladesh. *BRAC Development Institute, Working Paper No. 7*.
Javed, R., & Mughal, M. (2021). Changing patterns of son preference and fertility in Pakistan. *Journal of International Development, 34*, 1086–1109. https://doi.org/10.1002/jid.3618
Kalamar, A., & Hindin M. J. (2015). The complexity of measuring fertility preferences: evidence from DHS data. Paper presented at the population association of America 2015 Annual meeting, San Diego, CA.
Karki, Y. (1988). Sex preference and the value of sons and daughters in Nepal. *Studies in Family Planning, 19*(3), 169–178. https://doi.org/10.2307/1966752
Karki, Y. (2018). Sex preference and the value of sons and daughters in Nepal. *Studies in Family Planning, 19*(3), 169–178.
Kazenin, K., & Kozlov, V. (2020). Survey responses on desired fertility in patriarchal societies: Community norms vs. individual views. *Comparative Population Studies, 45*, 201–228. https://doi.org/10.12765/CPoS-2020-15
Khan, J. R., Bari, W., & Mahbub Latif, A. H. M. (2016). Trend of determinants of birth interval dynamics in Bangladesh. *BMC Public Health, 16*, 934. https://doi.org/10.1186/s12889-016-3577-9
Kodzi, I. A., Johnson, D. R., & Casterline, J. B. (2010). Examining the predictive value of fertility preferences among Ghanaian women. *Demographic Research, 22*, 965–984. https://doi.org/10.4054/DemRes.2010.22.30
Leone, T., Matthews, Z., & Zuanna, G. L. (2003). Impact and determinants of sex preference in Nepal. *International Family Planning Perspectives, 29*(2), 69–75.
Lerch, M. (2013). Patriarchy and fertility in Albania. *Demographic Research, 29*, 133–166. https://doi.org/10.4054/DemRes.2013.29.6
Machiyama, K., Mumah, J. N., Mutua, M., & Cleland, J. (2019). Childbearing desires and behaviour: a prospective assessment in Nairobi slums. *BMC Pregnancy and Childbirth*. https://doi.org/10.1186/s12884-019-2245-3
Miller, W. B. (2011). Differences between fertility desires and intentions: Implications for theory, research and policy. *Vienna Yearbook for Population Research, 9*, 75–98.
Noghanibehambari, H. (2023). The role of child's age in fertility and family structure: Evidence across countries and centuries. *Population Review, 62*(1), 20–71. https://doi.org/10.1353/prv.2023.0001
Obermeyer, C. M. (1996). Fertility norms and son preference in Morocco and Tunisia: Does women's status matter? *Journal of Biosocial Science, 28*(1), 57–72.
Pande, P. R., & Astone, M. R. (2007). Explaining son preference in rural India: The independent role of structural versus individual factors. *Population Research and Policy Review, 26*, 1–29. https://doi.org/10.1007/s11113-006-9017-2.
Samosir, O. B., McDonald, P., Utomo, A., Hull, T., Herartri, R., Fadila, W., Masdar, S., & Rachmad, S. H. (2018). Fertility preferences in Indonesia. In S. Gietel-Basten, J. Casterline, & M. K. Choe (Eds.), *Family demography in Asia: A comparative analysis of fertility preferences* (pp. 138–152). Edward Elgar Publishing Ltd.
Sathar, Z. B., Crook, N., Callum, C., & Kazi, Sh. (1988). Women's status and fertility change in Pakistan. *Population and Development Review, 14*(3), 415–432. https://doi.org/10.2307/1972196
Simmons, R. (1996). Women's lives in transition: A qualitative analysis of the fertility decline in Bangladesh. *Studies in Family Planning, 27*(5), 251–268.
Spoorenberg, T. (2018). Fertility preferences in Central Asia. In S. Gietel-Basten, J. Casterline, & M. K. Choe (Eds.), *Family demography in Asia: A comparative analysis of fertility preferences* (pp. 88–108). Edward Elgar Publishing Ltd.
Thomson, E. (2015). Family size preferences. *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 8). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.31064-9

Vignoli, D. (2006). Fertility change in Egypt: From second to third birth. *Demographic Research, 15*, 499–516. https://doi.org/10.4054/DemRes.2006.15.18
Yavuz, S. (2006). Completing the fertility transition: Third birth developments by language groups in Turkey. *Demographic Research, 15*, 435–460. https://doi.org/10.4054/DemRes.2006.15.15
Zaidi, B., & Morgan, P. (2016). In the pursuit of sons: Additional births or sex-selective abortions in Pakistan? *Population and Development Review, 42*(4), 693–710. https://doi.org/10.1111/padr.12002

Publisher's Note