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# Development, Modernization, and Son Preference in Fertility Decisions

*Deon Filmer*
*Jed Friedman*
*Norbert Schady*

The World Bank
Development Research Group
Human Development and Public Services Team & Poverty Team
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## Abstract

A family preference for sons over daughters may manifest itself in different ways, including higher mortality, worse health status, or lower educational attainment among girls. This study focuses on one measure of son preference in the developing world, namely the likelihood of continued childbearing given the gender composition of existing children in the family. The authors use an unusually large data set, covering 65 countries and approximately 5 million births. The analysis shows that son preference is apparent in many regions of the developing world and is particularly large in South Asia and in the Eastern Europe and Central Asia region. Modernization does not appear to reduce son preference. For example, in South Asia son preference is larger for women with more education and is increasing over time. The explanation for these patterns appears to be that latent son preference in childbearing is more likely to manifest itself when fertility levels are low. As a result of son preference, girls tend to grow up with significantly more siblings than boys do, which may have implications for their wellbeing if there are quantity-quality trade-offs that result in fewer material and emotional resources allocated to children in larger families.


This paper—a product of the Human Development and Public Services Team & Poverty Team, Development Research Group—is part of a larger effort in the department to understand the causes and consequences of fertility behavior and of the determinants of investments in child health and education. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at dfilmer@worldbank.org, jfriedman@worldbank.org, or nschady@worldbank.org.

# Development, Modernization, and Son Preference in Fertility Decisions[♦]

Deon Filmer
Jed Friedman
Norbert Schady

Development Research Group
The World Bank

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## I. Introduction

A family preference for sons over daughters may manifest itself in a variety of ways. An especially stark dimension is the excess mortality among girls which has been documented in several Asian countries (see for example Zeng et al 1993 for China; Muhiri and Preston 1991 for Bangladesh; and Das Gupta 1987 for India). A similar phenomenon has also been documented in the Middle East (Yount 2001). Son preference can also manifest itself through lower investments in the human capital of girls. Pande (2003) documents lower nutrition and lower immunization rates among girls in India. School enrollment among girls lags behind that of boys in many South Asian, Middle Eastern and North African countries (Filmer 2005).[1]

This study focuses on one particular definition of "preference" for sons, namely different propensities for continued childbearing given the gender composition of existing children in the family. Such behavior could be the result of taste-based gender discrimination, or economic factors such as differences in the costs of investing in girls versus boys, or differences in the pecuniary return to investments in girls versus boys. The paper does not, therefore, use the term "preference" only in the sense of inherent tastes but in the looser sense of gender-related differences in behavior—regardless of the cause of those differences.

There are numerous possible reasons for observing son preference in the developing world. Typically, these derive from conditions found in many traditional rural societies such as inheritance systems which pass assets to sons, inter-generational insurance systems in which sons care for parents in old-age, or production systems with low pecuniary returns to women's work (and to investments in women's human capital). General development processes and modernization, including urbanization, the dissolution of traditional rural communities, and

[1] A more general discussion of differences between boys and girls in inputs and outcomes can be found in World Bank (2001).

increasing female education and labor force participation are expected to work against these pressures for son preference in settings where it exists (see for example Chung and Das Gupta 2007). We explore whether there is such a son preference in fertility decisions in the developing world; how it varies across countries and regions; whether it is associated with measures of modernization such as urbanization, female education, and wealth; and the potential consequences of son preference in fertility decisions for household demographic composition and the investment in girls' human capital.

A handful of empirical studies have investigated how gender preferences in fertility decisions vary during the development process. Hank and Kohler (2000) focus on European countries. Using Fertility and Family Surveys from 17 countries, they find substantial heterogeneity across Europe, with a tendency towards a mild preference for a mixed sex composition. Their data suggest a girl preference in the Czech Republic, Lithuania, and Portugal. Andersson et al. (2006) use historical data from Denmark, Finland, Norway and Sweden to show no effect of gender on fertility for second births, a desire for gender balance at third births and heterogeneity across countries at fourth births (son preference in Finland and daughter preference in the other three countries).

In developing countries, most of the literature has focused on individual Asian countries with a prevalence of discrimination against women.[2] An important exception to these country-specific studies is Arnold (1992, 1997), who considers the impact of sex-ratios on subsequent fertility behavior across many developing countries. Arnold (1992) shows that the most typical

[2] For example, Park (1983), Arnold (1985), Bairagi (1987) and Larsen, Chung, and Das Gupta (1998) show the strong impact of son-preference on future fertility in Korea; Arnold, Choe and Roy (1998), Dreze and Murthi (2001) and Jensen (2007) find evidence that son-preference affects demographic behavior in India; Haughton and Haughton (1998) show a similar pattern in Vietnam; while Pong (1994) and Leung (1998) document the pattern among the ethnic Chinese population in Malaysia. One study addresses the issue in Egypt, with a similar finding of son-preference having impacts on fertility behavior (Yount, Langsten and Hill 2000).

pattern in the 26 countries he studies is of a preference for at least one son and one daughter. He finds some weak evidence for son preference in North Africa and Sri Lanka. Arnold (1997) analyzes data from 44 countries, but largely focuses on the effect of sex ratios on *stated* fertility preferences and on some fertility behaviors such as current pregnancy status and average birth spacing. He finds regional variation in the extent of an association between sex ratios and the outcomes he analyzes, with the strongest results suggesting son-preference for the Asian and North African countries.

In this paper, we use information on 5 million births from 1.3 million mothers in 65 countries to analyze how the gender mix of children already born affects fertility decisions in the developing world. We extend the literature in a number of important ways. Our analysis includes a large number of developing countries from disparate regions. We document not only regional patterns in son-preferred differential stopping behavior, but also within-country differences by location (urban versus rural), education (women who have completed primary school versus those with less schooling), wealth levels (above and below the median of a composite measure of assets), and over time (by comparing different birth cohorts of mothers). We analyze the extent to which observed patterns in son-preferred differential stopping behavior strengthen or weaken as the total number of children decreases. And, finally, we link these results to the wider literature on gender composition and resource dissolution in larger families.

## II. Methods and data

*Estimating the impact of gender balance on fertility behavior*

We begin our analysis by estimating the impact of gender balance of children on the probability of subsequent births. The basic model estimates:

$$B_{wn+1} = a + b_{mn} M_{wn} + b_{fn} F_{wn} + u_{wn} \qquad \text{for } n=2,\ldots,\infty \qquad (1)$$

where $B_{wn+1}$ is a zero/one outcome variable indicating a birth at a pre-existing number of children $n$ for woman $w$; $M_{wn1}$ is a variable equal to one if the woman $w$ had no male children at family size $n$ and $F_{wn}$ is a variable equal to one if the woman $w$ had no female children at $n$; the term $o_{wn}$ is a random error. We run this regression separately by parity.

The omitted category in the regression is women who have at least one son and one daughter. The coefficients $b_{mn}$ and $b_{fn}$ can therefore be understood as probabilities of additional childbearing for women who have children of only one gender, relative to those who have children of both genders. If these coefficients are positive, we conclude there is evidence of preferences for a gender mix of children, relative to children of one gender only. In addition, we can test whether the coefficients $b_{mn}$ and $b_{fn}$ are significantly different from each other. A significantly positive difference ($b_{mn}$ - $b_{fn} >0$) indicates that a woman is more likely to have another birth if she has no sons than if she has no daughters. As in much of the literature (see Keyfitz (1968) and Repetto (1972) for early examples), we refer to this as son-preferred differential stopping behavior (or DSB). For shorthand, we often refer to this as “son preference”, although it should be clear that we refer exclusively to fertility decisions, as described above, rather than to other possible manifestations of differential behavior toward sons and daughters post-birth, as might be evident in (for example) differences in mortality, nutritional status or school enrollment by gender. A negative difference ($b_m$ - $b_f <0$) indicates daughter preference.

Although we calculate separate estimates for each pre-existing family size, this tends to produce a large number of coefficients for $b_{mn}$ and $b_{fn}$. For most results, we therefore focus on averages across different family sizes—for individual countries or regions and, as discussed below, for specific groups (by education, location, wealth, or birth cohort). For this purpose, we calculate the mean across the existing numbers of children:

$$b_m = \sum_{n=2}^{\infty} w_{mn} b_{mn} \tag{2a}$$

where $w_{mn}$ is the relative weight for family size $n$ (and the weights sum to one); assuming independence across parities, we can also calculate the corresponding standard error of $b_m$:

$$s_m = sqrt[\sum_{n=2}^{\infty} w_{mn}^2 v_{bmn}] \tag{2b}$$

where $v_{bmn}$ is the square of the estimated standard error of $b_{mn}$. Comparable calculations yield $b_f$ and $s_f$.

We are concerned that the inclusion in this analysis of women who have not yet completed fertility may bias our results if women who enter childbearing at later ages have different preferences than those who begin childbearing earlier, or if birth spacing is partly a function of the existing gender mix of children. To overcome this problem, we generally limit the sample to women aged 40 and over at the time of the survey, on the assumption that these women have completed their lifetime fertility. At certain points we contrast results based on the entire sample with those for women 40-49 to highlight the largely consistent estimates obtained with either approach.

An important part of this analysis is the exploration of heterogeneity. In addition to heterogeneity by family size, we explore differences based on location, education, and wealth. In each case we run a regression of the following form:

$$B_{wn+1} = a + X_w + b_{mn} XM_{wn} + b_{fn} XF_{wn} + c_{mn} YM_{wn} + c_{fn} YF_{wn} + u_{wn} \text{ for } p=2,\ldots,\infty \tag{3}$$

where the $X_w$ corresponds to a main effect—for example, women in rural areas; $XM_{wn}$ and $XF_{wn}$ correspond to women in rural areas who have had no boys and girls, respectively; and $YM_{wn}$ and

$YF_{wn}$ correspond to women in urban areas who have had no boys and girls, respectively. We report the coefficients $b_m$, $b_f$, $c_m$ and $c_f$ and test for significant differences between them. Note also that this set-up allows us to test whether any observed boy (or girl) preference is different in rural and in urban areas, by testing whether $(b_m - b_f) = (c_m - c_f)$, a test of the "differences in differences". A similar logic obviously applies to differences by education levels, and wealth.

To test for differences between women in urban and rural areas, we use a woman's reported current residential location. To test for differences by education, we divide the sample of women into those that have completed fewer than six years of schooling and those that have completed six or more. (Six years of schooling corresponds to completed primary school in most of the countries in our sample.)[3] The analysis by household wealth is based on a composite measure of household durable goods—see Filmer and Pritchett (2001).[4] In each country the sample is divided by whether the household falls above or below the median household wealth scale.

We next focus on changes in differential stopping behavior across birth cohorts of women to investigate whether the DSB increases or decreases over time. To do this, within each country, we calculate the DSB for every one-year birth cohort—for example, women in India born in 1945—and then calculate the corresponding regional averages in each year—for example, the DSB for women in South Asia in 1945. We first graph these regional averages. As a more formal test of changes in DSB, we also run separate regressions, by region, of DSB on a

[3] We also used a different approach, calculating the median years of education among women in each country and dividing the sample into those above and those below the median. These results were very similar to those that divide the sample into incomplete primary education or lower, and complete primary education or higher. We therefore do not report these results, but they are available upon request.

[4] One drawback with this measure is that it only reflects household wealth at the time of interview whereas we utilize the full fertility history of each mother – a history that can stretch back over 20 years or more. Hence, the wealth index is clearly not an entirely accurate measure of resources available to mothers at the time of decisions about fertility continuation, although there is a positive correlation between current and previous levels of wealth. Given the interpretive difficulties with this measure, we do not stress the results based on wealth.

set of 5-year birth cohort dummies, and test for differences in these dummies. One concern with these estimates is that any observed changes in DSB across birth cohorts could be driven by changes in the countries that form part of the regional averages—some countries only have surveys in earlier years, and therefore enter into the calculations of regional averages for early birth cohorts, while other countries only have surveys in later years, and only enter into the calculation of regional averages for the later cohorts. We therefore also presents estimates that keep fixed the countries in each regional sample, and keep fixed the weight that is given to each country to calculate the regional average.

In the concluding section of the analysis, we adopt a multivariate framework based on location-education-cohort cells. We do this primarily because, as we show, prevailing fertility rates have a significant effect on estimated DSB, and are correlated with other observable factors. The basic regression is then:

$$(b_m - b_f)_{rht} = \beta_r D_r + \beta_h D_h + \beta_t D_t + \beta_F F_{rht} + u_{rht} \qquad (4)$$

where $(b_m\text{-}b_f)_{rht}$ is our measure of DSB, as before; $D_r$ and $D_h$ correspond to dummies for women in rural areas and high-education women, respectively; $D_t$ is a measure of a woman's birth cohort. (In practice, birth cohorts in this part of the analysis are aggregated over three years, to keep the sample sizes reasonable;) and the measure $F_{rht}$ corresponds to the average number of children born to women in a given location-education-birth cohort cell.[5] The resulting sample includes 3,478 observations from 65 countries. Each country-year contributes four observations corresponding to the 4 urban/education groups for women born in that year. When estimating (4), we weight observations by N, the number of women in each cell. This gives greater weight to cells with larger sample sizes, and more precisely estimated values of DSB.

[5] We do not include household wealth in this analysis due to its limitations discussed earlier; however, results are largely unchanged if wealth is also included in the regression analysis.

*Data*

We use data from 159 Demographic and Health Surveys (DHS) from the 65 countries listed in Table 1. The DHS are particularly useful datasets for us as they cover a very large number of countries with a consistent questionnaire and survey methodology. Table 1 gives the years, sample sizes, and country of each survey. Our data contain the complete retrospective fertility histories of 1.3 million women in the 65 countries as well as relevant socio-economic information such as educational attainment, ownership of durable goods, and household location.

Frequently, we focus on the similarity or difference of patterns across geographic regions in the developing world. For this purpose, we construct regions as defined by the World Bank: Sub-Saharan Africa (AFR), Latin America and the Caribbean (LAC), South Asia (SA), East Asia and the Pacific (EAP), Europe and Central Asia (ECA), and Middle East and North Africa (MENA).[6] Note that the countries observed in the EAP region, namely Cambodia, Indonesia, Philippines, Thailand, and Vietnam, only comprise the smaller region traditionally referred to as Southeast Asia. In addition, the majority of countries we observe in ECA are located in Central Asia and relatively few in Eastern Europe. The countries in this group comprise: Armenia, Kazakhstan, Kyrgyz Republic, Moldova, Turkey, and Uzbekistan.

In general, we weight observations in each survey by their expansion factors, which reflect differences in the probability that households are sampled in the DHS.[7] When

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[6] In Latin America and the Caribbean, the list of countries is Bolivia, Brazil, Colombia, Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Paraguay, Peru, and Trinidad and Tobago; for Middle East and North Africa, Egypt, Morocco, Tunisia, and Yemen; for South Asia, Bangladesh, India, Nepal, Pakistan, and Sri Lanka; and for Sub-Saharan Africa, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Cote d'Ivoire, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Namibia, Nigeria, Niger, Rwanda, Senegal, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

[7] When there is more than one survey for a country, we first pool all surveys and adjust the sampling weights such that each survey is equally weighted. For example, DHS surveys were administered in Cambodia in 2000 and 2005.

constructing regional averages, we further re-weight observations so that each country contributes its relative population share to the regional sample; for this purpose, we use population estimates for the year 2000.[8] We present a series of robustness tests that show that our findings are largely similar regardless of whether we present the weighted or unweighted regional averages.

## III. Effect of child gender composition on fertility behavior

*Region and country differential stopping behavior*: Table 2 presents the first set of results, by region. The first column reports the coefficient on $b_{mn}$ from Equation (1), while the second column reports the coefficient on $b_{fn}$. The third column reports the difference between these two values, while the fourth column reports the p-value of this difference. The last two columns, finally, report the mean number of children and the mean of the ratio of the ideal number of male to female children, as reported by mothers to the survey enumerators.[9] For each region, the top row presents the averages across family sizes, while the next five rows present the individual coefficients for family sizes 2-5 (where, as before, a family size of 2 corresponds to women who have already had 2 children). Although the results from all family sizes are included in the averages, we only report the size-specific coefficients for sizes 2-5 because the results for higher numbers of children are very noisy, and represent less than 5 percent of the total number of births. The sample is limited to women age 40+, who are most likely to have completed their fertility.

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In order to derive a Cambodia database, we pool the data from the two survey years and adjust the survey weights such that each survey contributes half of the weighted observations to the analysis. Pooling data across surveys allows us to increase the number of observations for each country and therefore increase the precision of our estimates.

[8] In other words, if one country has twice the population of another in the same region, it will contribute twice the weighted observations to the analysis.

[9] DHS surveys routinely ask mothers for their “ideal” number of children, separately for boys and girls. This subjective measure is often taken in the literature as an expression of son preference.

The table presents clear evidence that many families in every region in the developing world have a preference for a mixed gender composition of children. This can be seen because all of the regional averages of $b_m$ and $b_f$ are positive, and many are significant: relative to families with boys and girls, who are the omitted category in the regressions, families that only have boys or girls are more likely to have another birth.

In addition, Table 2 shows that there is son preference, in the sense described above, in many regions in the developing world. This can be seen in the third column of the table, with the heading DSB, and the corresponding p-value in the fourth column. The largest effects correspond to the ECA region, where families are 9.4 percentage points more likely to have an additional child if they have had no sons than if they have had no daughters, and South Asia, where the corresponding difference is 7.8 percentage points. A significant, but smaller degree of son preference is also apparent in the Middle East and North Africa region (5.8 percentage points), and in East Asia and the Pacific (3.7 percentage points). There is no clear evidence of son-preferred DSB either for Sub-Saharan Africa or Latin America and the Caribbean.[10]

We next turn to the parity-specific results. Because it is hard to take in all of the coefficients at a glance, we summarize the parity-specific results in Figure 1. The figure shows that son preference appears to grow with parity in the two regions where it is most pronounced, South Asia and ECA. For example, families who have already had 4 or 5 children in South Asia are approximately 14 percentage points more likely to have an additional child if all of the children up to this point are girls rather than boys. This increase in DSB by parity is perhaps not surprising: the mean number of children in ECA is 4.1, and in South Asia it is 4.9. The average family therefore expects to have a reasonably large number of children. In this context, the

[10] We also run country specific analysis (results available upon request). Within the two regions where we find the clearest evidence of son-preferred DSB, ECA and SAR, these results hold equally for all countries in those regions except the Kyrgyz Republic. For the other regions there is more variability in the country level results.

gender of lower-parity children does not matter as much in determining future fertility because parents expect to have more children regardless. At higher parities, however, parents are closer to achieving their total desired number of children. At this point, the gender composition of children already born becomes an important determinant of future childbearing. The parity-specific patterns in MENA, Southeast Asia, and Latin America are less apparent, in line with the much smaller degree of son preference in these regions.

In addition to making apparent differences across cohorts in these basic patterns, Table 2 is informative about the extent to which the mother-reported "ideal" balance between the number of boys and girls is a good indication of actual fertility behavior. This can be seen by comparing the last two columns in the table. A clear subjective preference for sons is apparent in South Asia and MENA, as is a clear behavioral preference for sons. However, another region that exhibits a significant pattern of son-preferred stopping behavior, ECA, reports a subjective preference for the near equality of sons and daughters. In contrast, mothers in Sub-Saharan Africa report a subjective preference for sons, but families do not exhibit son preference in actual fertility behavior. In Latin America and the Caribbean, mothers express a slight preference for daughters, but actual fertility behavior exhibits no distinct pattern. Clearly, subjectively stated preferences over the gender composition of children more accurately predict actual fertility behavior in some regions than in others.

Table 3 presents a series of robustness tests to these basic findings, focusing on the aggregate effects averaged across all parities. The first panel shows that results are very similar if we do not give greater weight to countries with larger populations (but continue to use the expansion factors in the surveys). The only difference is that now son preference in South Asia is a bit more muted – the difference between $b_m$ and $b_f$ is here 4.6 percentage points compared with

7.8 percentage points in Table 2. The second panel shows that results are largely similar even if we disregard these survey weights, so that each observation in each region is given the same weight. If anything, these results suggest an even greater degree of son preference in ECA and South Asia than those in Table 2. The third panel, finally, includes all women 15-49 at the time of the survey, not just women who are most likely to have completed their fertility.[11] When we use this (much larger) sample, son preference continues to be apparent in the three regions where it is most pronounced in Table 2—MENA, ECA, and South Asia.

*Differential stopping behavior by mothers' characteristics*: Given the strong son preference exhibited in some regions, we turn to now to an investigation of how these behaviors vary across oft-used measures of "modernization". Table 4 explores heterogeneity in DSB by place of residence, education, and wealth.

Although we report results for all regions, we focus our discussion primarily on ECA and South Asia, where son preference is largest in the aggregate results. The results in Table 4 suggest somewhat of a different pattern in these two regions. In both South Asia and ECA, there is son preference in urban and rural regions, among more and less educated women, and among households with more or less wealth. (These results can be seen in the third and seventh columns, labeled DSB.) However, the difference-in-difference results in the last column of the table suggest that in South Asia son preference is *higher* in urban than in rural areas (although not significantly so), *higher* among women with more education levels, and *higher* in households with more wealth. Some of these differences are quite large: For example, women with six or more years of schooling are 19 percentage points more likely to have an additional child if they do not have boys than if they do not have girls; the comparable number for women with less than

[11] Of course since this panel includes all women, not just those who have completed their fertility, the total number of children is lower in all regions.

six years of schooling suggest a much smaller difference, 7 percentage points.[12] In ECA, on the other hand, the picture is more mixed: Son preference is higher in urban than in rural areas (but not significantly so, like in South Asia), but higher among women with low levels of education than among those who have completed at least primary school (unlike South Asia). Further, there is no significant difference among households in ECA at different wealth levels.

It is often believed that, as societies and economies develop, the traditional social practices that may enforce or perpetuate a preference for sons will weaken. This could happen, for example, as women gain greater autonomy and control a greater share of the economic resources of the household (see, for example, the discussions in Haddad et al. (1997)). Under this scenario, we might expect to see greater son preference in rural than in urban areas, among women with less education, and among poorer women. Table 4 makes clear that this is generally not so, in particular in those regions in which overall son preference is most pronounced.

*Differential stopping behavior by mothers' birth cohort*: We next inspect changes across birth cohorts. For this purpose, we simply calculate DSB for each regional cohort cell as described above. Figure 2 summarizes this by presenting the five-year moving average of DSB, by region. In most regions, there is no systematic pattern. In South Asia, however, DSB appears to increase across birth cohorts, and is almost 15 percentage points higher for the latest birth cohorts as for the earliest ones. The other region with a high degree of son preference, ECA, presents first an increase and then a decrease in son-preference although the absolute levels remain high throughout.

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[12] Women who are educated or live in urban areas potentially have greater access to technologies that allow them to select the sex of a child. This might affect a small number of the women in our sample (those in the latest cohorts in some countries). However, the effect on estimated DSB is not clear since DSB is by definition a behavior conditional on the existing gender mix of children, regardless of whether the gender mix arose through natural means or with the assistance of sex-selective technology.

As a first pass to testing whether these changes across birth cohorts are significant, we regress DSB on a linear cohort trend, separately by region. Each observation is weighted by the number of women in that cohort-year cell, which gives greater weight to the more precisely calculated cell averages. The coefficient on the cohort trend in this regression for South Asia is highly significant (0.007, with a standard error of 0.002), which suggests that DSB has been increasing by about 0.7 percentage points for each successive cohort. The corresponding coefficient for Southeast Asia is also significant (0.005, with a standard error of 0.02). None of the other coefficients is close to standard levels of significance.

Figure 2, and the corresponding regression analysis described above, has two potential problems. The first of these is that a linear cohort trend may not do justice to the data; this is particularly apparent for the ECA due to its inverted U-shaped pattern. To address this concern we next turn to a regression of DSB on 5-year birth cohort dummies, again separately by region. The results from these calculations are presented in the top panel of Table 5 where these coefficients are the regression analogue of the pattern observed in Figure 2. Once again, the clearest pattern is apparent for South Asia, where DSB rises monotonically across five-year birth cohorts. The increase in DSB is almost tenfold, from 0.018 (for the cohort born in 1941-45) to 0.170 (for the cohort born in 1961-65).

The second, more difficult problem is that the regional averages for different birth cohorts may be driven by different countries, depending on the years in which they conducted DHS. For example, the data from Sri Lanka, where the only DHS was carried out in 1987, enters the average for South Asia for the early birth cohorts, but not the later ones, while Nepal, where DHS were carried out in 1996, 2001, and 2006 enters the regional averages for the later birth cohorts, but not earlier ones. In an attempt to address this concern, we limit the sample to countries that have a DHS both in 1995 or earlier and in 2000 or later. This substantially reduces the number of countries, from 65 to 27. However, for these countries we are able to calculate cohort-specific measures of DSB for women born in every year between 1945 and 1960. (The sample is limited to women age 40+, as before.) We can therefore calculate regional averages that keep the weights given to each country fixed across birth cohorts.

In the bottom panel of Table 5, the sample of countries is kept fixed as is the weight that each country receives in the regional average. It still appears that DSB increases across birth cohorts in South Asia, although the pattern is much less dramatic, and the difference across cohorts is no longer significant. In other regions, the patterns are less clear and are generally not significant. What is clear is that there is no decline in son preference in any region where it exists over yet another standard measure of modernization – the passage of time.

*A simple multivariate framework*: The socio-demographic characteristics explored in Table 4—mother's education, urban location, and household wealth—are of course correlated with one another and, in addition, they generally increase over time. Thus it is quite possible that the association between DSB and each of these characteristics is really driven by one main social indicator. Furthermore, prevailing fertility levels may have an effect on DSB since fewer families in a high-fertility environment are faced with differential stopping decisions due to the greater likelihood of a mixed gender composition at higher family sizes. We therefore next move to the multivariate framework given by Equation 4.

Table 6 presents the results from regressions using this data set. In bivariate regressions, urban residence and higher educational attainment are both associated with higher DSB (although not significantly so). These results are in the first two columns of the table, and they are consistent with the results in Table 4. In addition, however, column 3 shows that there is a significant negative association between the average number of children and DSB—the point estimate implies that a decrease of one child in family size more than offsets a switch from rural to urban location and almost offsets a switch from low to high schooling levels.

The main results in the table can be found in columns 4 and 5, which include the measures of location, education, and the mean number of children for a given country, year, location and education cell. Once the average number of children is included in the model, the association between DSB and urban residence, and between DSB and education, becomes negative (column 4 of table 6). This reverses the earlier (bivariate) findings and suggests that the higher son preference in urban areas and among more educated mothers can be "explained" by differences in overall fertility levels.[13] Including global dummy variables for each birth year, as a way of flexibly controlling for any secular changes over time, barely affects the results for these three indicators (column 5 of table 6).

In sum, the cell-level results suggest that the number of children women expect to have over their lifetimes is an important determinant of DSB. When fertility levels are high, the absence of boys in earlier births is not an important driver of childbearing decisions—at all but the highest parity levels, most couples expect to have more children, no matter what the sex composition of earlier births. However, as family size decreases, a higher fraction of couples find themselves having to choose whether to have an additional child at a point when they are close to their desired family size and all the children they have had to date are of the same gender. At this point, the gender composition of earlier children—in particular, whether there is at least one boy—appears to play an important role in their decision.

[13] This finding is in character with Das Gupta and Bhat (1997) who argue that fertility decline may lead to an intensification of discrimination against girls if the total number of children that couples desire falls more rapidly than the total number of desired sons.

*Gender differences in number of siblings*: If families are more likely to have an additional child when they have no sons than when they have no daughters, girls may grow up in households with more siblings than will boys. Of course, the number of siblings that boys or girls have will also be determined by mortality—which may vary with family size and by gender.

We explore differences in the mean number of siblings for girls and boys between the ages of 0 and 15 years, by region, in Table 7. The left panel focuses on children of women aged 40 and older at the time of the survey, as in most of our analysis, and the right panel focuses on children of all women in the surveys. The table makes clear that the mean number of siblings for girls is higher than it is for boys in regions where there is son-preferred DSB. For example, girls in South Asia have about .13 more siblings than boys, on average; in ECA, the comparable number is 0.10. By contrast, in Sub-Saharan Africa, boys and girls on average have the same number of siblings. Moreover, note that if after birth girls are discriminated against relative to boys in regions where there is son-preferred DSB, like South Asia and ECA, and therefore suffer from excess mortality,[14] then the figures in Table 7 will generally be *underestimates* of the differences in sibship size by gender that result from son-preferred DSB.

There is a very large literature which documents associations between larger family size and poorer outcomes for children in developed and developing countries (see, for example, Behrman and Wolfe 1982; Horton 1986; Conley and Glauber 2006, and the references therein). More siblings may result in dilution of household and parental resources, and to "quantity-quality" tradeoffs. Estimating the causal effect of the number of siblings on child outcomes is difficult because of the likelihood of omitted family characteristics that may bias results. Nevertheless, insofar as some of the association between the number of children and poor outcomes is causal, it suggests that son preference, as manifested in gender-specific differential

[14] On India, see for example Das Gupta (1987), Behrman and Deolalikar (1990) and Rose (1999).

stopping behavior (DSB) may have adverse implications for the outcomes of girls, who will tend to grow up in larger families. Moreover, as Table 7 shows, the differences in family size by child gender are largest in those areas where girls are most likely to suffer from discrimination in other ways, in particular in South Asia.

## IV. Conclusion

In this paper we investigate the fertility response to the gender composition of children using data from 159 Demographic and Health Surveys carried out in 65 countries. Gender composition of earlier births is a significant determinant of subsequent fertility in many developing countries. We find fertility behavior consistent with son-preference in many regions of the developing world, with the clearest patterns apparent in South Asia and ECA. Specifically, the absence of sons increases the probability of an additional birth by significantly more than the absence of daughters. We refer to this phenomenon as son-preferred differential stopping behavior (DSB).

When we explore heterogeneity, we find that widely used measures of “modernization,” including urbanization, higher education levels, and household wealth, are associated with an *increase* in son-preference, as captured in the DSB. The presumption that this manifestation of son preference will dissipate over time is also not supported by the data. The results from regressions using a simple multivariate framework suggest that this may be a result of reductions in family size. While it is possible that greater urbanization, female education and household wealth all reduce a latent son preference, the reductions in fertility that accompany modernization also make it more likely that a latent son-preference can be detected in behavior.

We conclude by showing that one implication of these patterns is that girls tend to have more siblings than boys. In and of itself, this is an important finding, as it likely has implications for the development of boys and girls in infancy, childhood, and adolescence. Moreover, insofar as there are “quantity-quality” tradeoffs that result in fewer material and emotional resources allocated to children in larger families, son preference in fertility decisions may have important indirect implications for investments and for the wellbeing of girls, relative to boys.

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**Figure 1. DSB by region and parity**

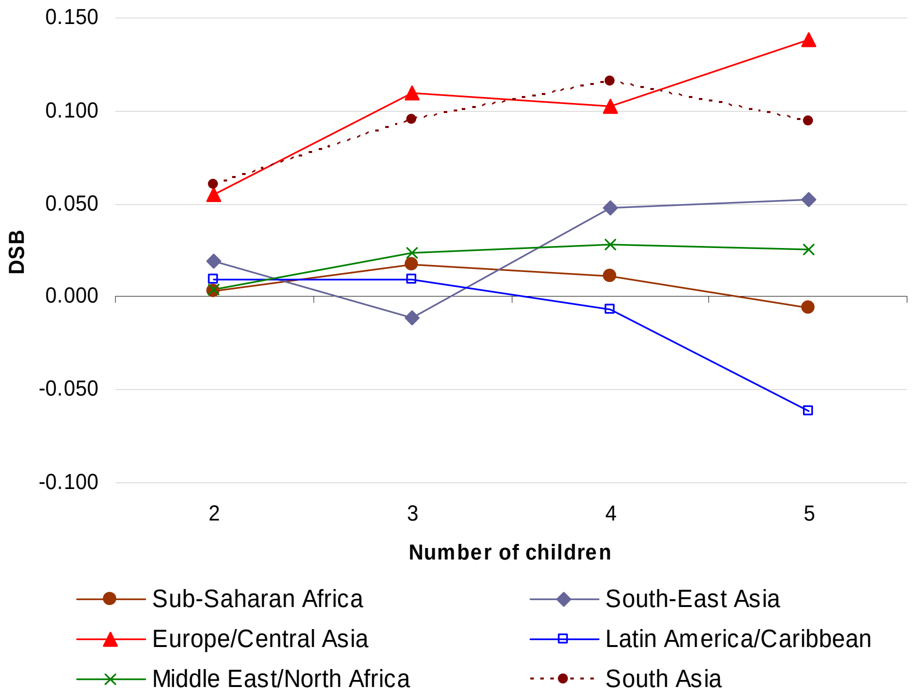
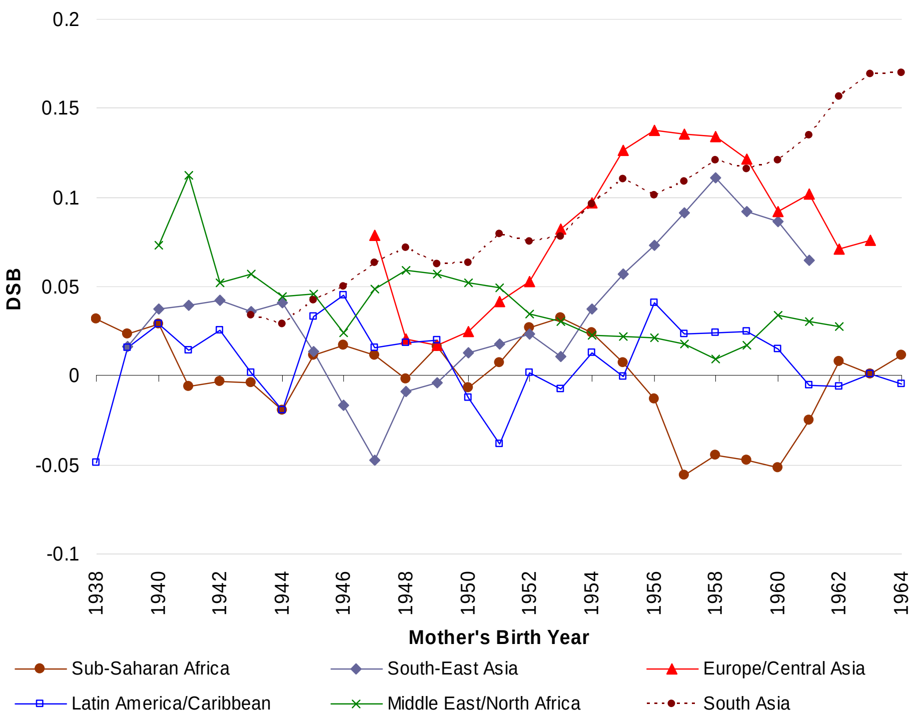



**Figure 2. DSB by region and mother's year of birth**




Note: Graph shows 5-year moving average

**Table 1.** DHS Surveys and Mother/Birth Numbers

| Country | Year(s) of Study | Total Mothers Observed | Total Births Observed |
|---|---|---|---|
| Armenia | 2000, 2005 | 8648 | 21583 |
| Bangladesh | 1993-1994, 1996-1997, 1999-2000, 2004 | 36169 | 127486 |
| Benin | 1996, 2001, 2006 | 22688 | 95989 |
| Bolivia | 1989, 1993-1994, 1998, 2003-2004 | 31431 | 121101 |
| Brazil | 1986, 1991-1992, 1996 | 12050 | 37871 |
| Burkina Faso | 1992-1993, 1998-1999, 2003 | 19168 | 84320 |
| Burundi | 1987 | 2777 | 11886 |
| Cambodia | 2000, 2005 | 20721 | 81447 |
| Cameroon | 1991, 1998, 2004 | 14243 | 56254 |
| Central African Republic | 1994-1995 | 4388 | 16936 |
| Chad | 1996-1997, 2004 | 10508 | 47187 |
| Colombia | 1986, 1990, 1995, 2000, 2005 | 50573 | 141967 |
| Comoros | 1996 | 1695 | 7913 |
| Congo (Brazzaville) | 2005 | 5152 | 16687 |
| Dominican Republic | 1986, 1991, 1996, 1999, 2002 | 33677 | 113636 |
| Ecuador | 1987 | 3117 | 11835 |
| Egypt | 1988, 1992-1993, 1995-1996, 2000, 2003, 2005 | 70394 | 276509 |
| Ethiopia | 2000, 2005 | 19482 | 84055 |
| Gabon | 2000-2001 | 4499 | 16878 |
| Ghana | 1988, 1993-1994, 1998-1999, 2003 | 14449 | 55788 |
| Guatemala | 1987, 1995, 1998-1999 | 16804 | 72032 |
| Guinea | 1999, 2005 | 11672 | 50058 |
| Haiti | 1994-1995, 2000, 2005 | 16294 | 63814 |
| Honduras | 2005 | 13991 | 50093 |
| India | 1992-1993, 1998-2000, 2005-2006 | 244831 | 800833 |
| Indonesia | 1987, 1991, 1994, 1997, 2002-2003 | 111864 | 370441 |
| Ivory Coast | 1994, 1998-1999, 2005 | 11895 | 45803 |
| Kazakhstan | 1995, 1999 | 6013 | 14972 |
| Kenya | 1988-1989, 1993, 1998, 2003 | 22504 | 94497 |
| Kyrgyzstan | 1997 | 2776 | 8781 |
| Lesotho | 2004 | 4832 | 14708 |
| Liberia | 1986 | 4231 | 17264 |
| Madagascar | 1992, 1997, 2003-2004 | 15447 | 61383 |
| Malawi | 1992, 2000, 2004 | 23353 | 92634 |
| Mali | 1987, 1995-1996, 2001 | 21004 | 98580 |
| Mexico | 1987 | 5776 | 22676 |
| Moldova | 2005 | 4948 | 9903 |
| Morocco | 1987, 1992, 2003-2004 | 18970 | 80669 |
| Mozambique | 1997, 2003 | 16530 | 63195 |
| Namibia | 1992, 2000 | 8490 | 28318 |
| Nepal | 1996, 2001, 2006 | 23042 | 84505 |
| Nicaragua | 1997-1998, 2001 | 18971 | 70977 |
| Nigeria | 1990, 1999, 2003 | 17209 | 74438 |
| Niger | 1992, 1998, 2006 | 18194 | 87107 |
| Pakistan | 1990-1991 | 5905 | 27369 |
| Paraguay | 1990 | 3970 | 15346 |
| Peru | 1986, 1991-1992 ,1996, 2000, 2004 | 60700 | 217275 |
| Philippines | 1993, 1998, 2003 | 26609 | 98932 |
| Rwanda | 1992, 2000, 2005 | 17876 | 77114 |
| Senegal | 1986, 1992-1993, 1997, 2005 | 23525 | 102547 |
| South Africa | 1998 | 8223 | 22934 |
| Sri Lanka | 1987 | 5388 | 17701 |
| Sudan | 1989-1990 | 5277 | 25805 |
| Tanzania | 1991-1992, 1996, 1999, 2004 | 23504 | 96542 |
| Thailand | 1987 | 6025 | 17803 |
| Togo | 1988, 1998 | 8825 | 37051 |
| Trindad & Tobago | 1987 | 2440 | 7837 |
| Tunisia | 1988 | 3856 | 16463 |
| Turkey | 1993, 1998, 2003 | 18861 | 59996 |
| Uganda | 1988-1989, 1995, 2000-2001, 2006 | 20946 | 92326 |
| Uzbekistan | 1996 | 3018 | 9650 |
| Vietnam | 1997, 2002 | 10742 | 29900 |
| Yemen | 1991-1992 | 5378 | 29803 |
| Zambia | 1992, 1996-1997, 2001-2002 | 17013 | 70726 |
| Zimbabwe | 1988-1989, 1994, 1999, 2005-2006 | 17881 | 62855 |
| 65 Countries | 159 Surveys | 1341432 | 4940984 |

**Table 2. Differential stopping behavior in different world regions among women aged 40+ at the time of the survey.**
Probability of an additional birth as a function of sex composition of existing children.

| | Family size | Probability after zero boys | Probability after zero girls | DSB | Significance of difference (p-value) | Mean number of children | Ratio of ideal male / female children |
|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (1) - (2) | | | |
| **Latin America/Caribbean** | **2+** | 0.030 ** | 0.019 | 0.011 | 0.541 | 5.08 | 0.97 |
| | **2** | 0.026 ** | 0.016 | 0.009 | 0.457 | . | . |
| | **3** | 0.020 ** | 0.011 | 0.009 | 0.211 | . | . |
| | **4** | 0.041 ** | 0.048 ** | -0.007 | 0.724 | . | . |
| | **5** | -0.013 * | 0.048 ** | -0.061 | 0.003 ** | . | . |
| **Middle East/North Africa** | **2+** | 0.074 ** | 0.016 * | 0.058 | 0.000 ** | 6.04 | 1.13 |
| | **2** | 0.018 * | 0.014 ** | 0.004 | 0.520 | . | . |
| | **3** | 0.037 ** | 0.013 | 0.024 | 0.033 * | . | . |
| | **4** | 0.037 ** | 0.009 | 0.028 | 0.065 | . | . |
| | **5** | 0.056 * | 0.030 * | 0.026 | 0.225 | . | . |
| **Eastern Europe/Central Asia** | **2+** | 0.117 ** | 0.023 | 0.094 | 0.000 ** | 4.05 | 1.02 |
| | **2** | 0.087 ** | 0.032 ** | 0.055 | 0.029 * | . | . |
| | **3** | 0.121 ** | 0.012 ** | 0.109 | 0.000 ** | . | . |
| | **4** | 0.166 ** | 0.064 ** | 0.102 | 0.001 ** | . | . |
| | **5** | 0.170 ** | 0.031 | 0.139 | 0.001 ** | . | . |
| **South Asia** | **2+** | 0.107 ** | 0.029 ** | 0.078 | 0.000 ** | 4.94 | 1.37 |
| | **2** | 0.054 ** | -0.007 * | 0.060 | 0.010 ** | . | . |
| | **3** | 0.107 ** | 0.012 | 0.095 | 0.062 | . | . |
| | **4** | 0.137 ** | 0.020 ** | 0.116 | 0.034 * | . | . |
| | **5** | 0.142 ** | 0.047 ** | 0.095 | 0.010 * | . | . |
| **South-East Asia** | **2+** | 0.052 ** | 0.015 | 0.037 | 0.040 * | 4.74 | 1.01 |
| | **2** | 0.035 * | 0.016 ** | 0.019 | 0.354 | . | . |
| | **3** | 0.031 | 0.042 ** | -0.011 | 0.785 | . | . |
| | **4** | 0.068 | 0.020 * | 0.048 | 0.341 | . | . |
| | **5** | 0.099 * | 0.047 ** | 0.053 | 0.317 | . | . |
| **Sub-Saharan Africa** | **2+** | 0.024 ** | 0.024 ** | 0.000 | 0.982 | 6.63 | 1.08 |
| | **2** | 0.005 * | 0.002 | 0.003 | 0.543 | . | . |
| | **3** | 0.012 | -0.005 | 0.017 | 0.005 ** | . | . |
| | **4** | 0.021 ** | 0.010 | 0.011 | 0.276 | . | . |
| | **5** | 0.004 | 0.010 | -0.006 | 0.740 | . | . |

Note: Table reports the estimated probability of an additional birth as a function of having no boys and no girls. Models are estimated at the region level and include country dummy variables. Family size 2+ estimates are weighted averages for family sizes 2 and greater (see text for details). The ratio is the mean desired number of boys divided by the mean desired number of girls. * (**) indicates significance at the 5(1) percent level.

**Table 3. Differential stopping behavior in different world regions among women at the time of the survey.**
Probability of an additional birth as a function of sex composition of existing children.

| | Probability after zero boys | Probability after zero girls | DSB | Significance of difference (p-value) | Mean number of children | Ratio of ideal male / female children |
|---|---|---|---|---|---|---|
| | (1) | (2) | (1) - (2) | | | |
| | **Women Aged 40-49, Population Unadjusted Weights** | | | | | |
| | (1) | (2) | (1) - (2) | | | |
| **Latin America/Caribbean** | 0.018 | 0.018 | 0.000 | 0.984 | 5.31 | 0.93 |
| **Middle East/North Africa** | 0.072 ** | 0.016 * | 0.057 | 0.000 ** | 6.46 | 1.10 |
| **Eastern Europe/Central Asia** | 0.126 ** | 0.049 ** | 0.078 | 0.001 ** | 3.49 | 1.03 |
| **South Asia** | 0.080 ** | 0.034 ** | 0.046 | 0.001 ** | 5.45 | 1.41 |
| **South-East Asia** | 0.055 ** | 0.017 | 0.038 | 0.048 * | 4.84 | 0.99 |
| **Sub-Saharan Africa** | 0.032 ** | 0.017 * | 0.015 | 0.165 | 6.62 | 1.04 |
| | **Women Aged 40-49, No Weights** | | | | | |
| | (1) | (2) | (1) - (2) | | | |
| **Latin America/Caribbean** | 0.031 ** | 0.031 ** | 0.000 | 0.977 | 5.17 | 0.92 |
| **Middle East/North Africa** | 0.075 ** | 0.013 ** | 0.061 | 0.000 ** | 5.82 | 1.15 |
| **Eastern Europe/Central Asia** | 0.145 ** | 0.019 | 0.126 | 0.000 ** | 3.57 | 1.05 |
| **South Asia** | 0.119 ** | 0.025 ** | 0.094 | 0.000 ** | 4.67 | 1.34 |
| **South-East Asia** | 0.044 ** | 0.020 ** | 0.024 | 0.020 * | 4.95 | 0.99 |
| **Sub-Saharan Africa** | 0.025 ** | 0.019 ** | 0.006 | 0.482 | 6.73 | 1.06 |
| | **Full Sample of Women, Population Adjusted Weights** | | | | | |
| | (1) | (2) | (1) - (2) | | | |
| **Latin America/Caribbean** | 0.042 ** | 0.026 ** | 0.016 | 0.134 | 5.08 | 0.95 |
| **Middle East/North Africa** | 0.063 ** | 0.020 ** | 0.043 | 0.000 ** | 6.04 | 1.12 |
| **Eastern Europe/Central Asia** | 0.122 ** | 0.036 ** | 0.086 | 0.000 ** | 4.05 | 1.03 |
| **South Asia** | 0.102 ** | 0.013 ** | 0.089 | 0.000 ** | 4.94 | 1.35 |
| **South-East Asia** | 0.046 ** | 0.023 ** | 0.023 | 0.100 | 4.74 | 1.01 |
| **Sub-Saharan Africa** | 0.018 ** | 0.021 ** | -0.003 | 0.609 | 6.63 | 1.09 |

Note: Table reports the estimated probability of an additional birth as a function of having no boys and no girls. Models are estimated at the region level and include country dummy variables. Estimates are for family sizes 2 and up (see text for details). The ratio is the mean desired number of boys divided by the mean desired number of girls. * (**) indicates significance at the 5(1) percent level.

**Table 4. Differential stopping behavior by select mother or household characteristics, for women aged 40-49.** Probability of an additional birth as a function of sex composition of existing children.

| Region | Probability after zero boys | Probability after zero girls | DSB | Mean number of children | Probability after zero boys | Probability after zero girls | DSB | Mean number of children | Difference |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (1) - (2) | | (3) | (4) | (3) - (4) | | [(1) - (2)] - [(3) - (4)] |
| | **Urban** | | | | **Rural** | | | | **Difference** |
| **Latin America/Caribbean** | 0.041 ** | 0.049 ** | -0.009 | 4.46 | 0.044 * | -0.011 | 0.055 | 6.05 | -0.064 |
| **Middle East/North Africa** | 0.048 ** | 0.009 | 0.039 ** | 5.08 | 0.076 ** | 0.019 | 0.057 ** | 6.94 | -0.018 |
| **Eastern Europe/Central Asia** | 0.124 ** | 0.035 * | 0.090 ** | 3.50 | 0.096 ** | 0.034 * | 0.062 ** | 4.88 | 0.028 |
| **South Asia** | 0.137 ** | 0.032 ** | 0.105 ** | 4.27 | 0.098 ** | 0.026 ** | 0.072 ** | 5.22 | 0.033 |
| **South-East Asia** | 0.077 ** | 0.023 * | 0.054 ** | 4.29 | 0.042 * | 0.013 | 0.029 | 4.94 | 0.025 |
| **Sub-Saharan Africa** | 0.041 ** | 0.030 * | 0.012 | 5.55 | 0.019 * | 0.023 * | -0.004 | 7.05 | 0.016 |
| | (1) | (2) | (1) - (2) | | (3) | (4) | (3) - (4) | | [(1) - (2)] - [(3) - (4)] |
| | **Six or more years of schooling** | | | | **Less than six years of schooling** | | | | **Difference** |
| **Latin America/Caribbean** | -0.003 | 0.063 ** | -0.066 ** | 3.46 | 0.031 ** | 0.006 | 0.025 | 5.91 | -0.090 ** |
| **Middle East/North Africa** | 0.109 ** | 0.044 ** | 0.064 ** | 3.78 | 0.074 ** | 0.011 | 0.062 ** | 6.57 | 0.002 |
| **Eastern Europe/Central Asia** | 0.104 ** | 0.044 ** | 0.060 ** | 3.52 | 0.136 ** | -0.001 | 0.137 ** | 4.65 | -0.077 ** |
| **South Asia** | 0.198 ** | 0.004 | 0.193 ** | 3.32 | 0.094 ** | 0.029 ** | 0.066 ** | 5.35 | 0.128 ** |
| **South-East Asia** | 0.062 ** | 0.020 | 0.042 * | 4.20 | 0.049 ** | 0.023 | 0.026 | 5.19 | 0.017 |
| **Sub-Saharan Africa** | 0.047 ** | -0.007 | 0.054 * | 5.10 | 0.019 | 0.027 ** | -0.008 | 7.05 | 0.062 * |
| | (1) | (2) | (1) - (2) | | (3) | (4) | (3) - (4) | | [(1) - (2)] - [(3) - (4)] |
| | **Above median "wealth" households** | | | | **Below median "wealth" households** | | | | **Difference** |
| **Latin America/Caribbean** | 0.020 | 0.043 * | -0.023 | 3.55 | 0.056 ** | 0.053 ** | 0.003 | 5.07 | -0.026 |
| **Middle East/North Africa** | 0.042 ** | 0.037 ** | 0.005 | 5.17 | 0.040 * | 0.008 | 0.032 | 6.55 | -0.027 |
| **Eastern Europe/Central Asia** | 0.117 ** | 0.027 | 0.089 ** | 3.57 | 0.114 ** | 0.028 | 0.087 ** | 4.58 | 0.003 |
| **South Asia** | 0.144 ** | 0.028 ** | 0.116 ** | 4.43 | 0.086 ** | 0.026 * | 0.060 ** | 5.54 | 0.056 ** |
| **South-East Asia** | 0.079 ** | 0.036 ** | 0.043 | 4.23 | 0.042 * | -0.003 | 0.045 * | 4.98 | -0.002 |
| **Sub-Saharan Africa** | 0.033 ** | 0.008 | 0.025 | 6.31 | 0.026 * | 0.019 | 0.007 | 6.62 | 0.018 |

Note: Table reports the estimated probability of an additional birth as a function of having no boys and no girls. Models are estimated at the region level and include country dummy variables. Estimates are for birth orders 2 and up (see text for details). * (**) indicates significance at the 5(1) percent level.

**Table 5. DSB regressed on "Region" interacted with "Five year cohorts of mother birth year", for women aged 40-49**

| | All Countries (Cohorts 1941-1965) | | | |
|---|---|---|---|---|
| | **Mother Birth Year Cohort** | **Region-Cohort Interaction** | **F-test: All Interactions Equal** | **F-test: First and Last Equal** |
| **Latin America/Caribbean** | **1941 - 1945** | -0.004 | 0.784 | 0.904 |
| | **1946 - 1945** | 0.013 | . | . |
| | **1951 - 1945** | -0.009 | . | . |
| | **1956 - 1945** | 0.025 | . | . |
| | **1961 - 1965** | 0.001 | . | . |
| **Middle East/North Africa** | **1941 - 1945** | 0.062 | 0.851 | 0.733 |
| | **1946 - 1945** | 0.055 | . | . |
| | **1951 - 1945** | 0.031 | . | . |
| | **1956 - 1945** | 0.010 | . | . |
| | **1961 - 1964** | 0.040 | . | . |
| **Eastern Europe/Central Asia** | **1946 - 1950** | 0.017 | 0.414 | 0.490 |
| | **1951 - 1950** | 0.087 * | . | . |
| | **1956 - 1950** | 0.134 ** | . | . |
| | **1961 - 1965** | 0.073 | . | . |
| **South Asia** | **1941 - 1945** | 0.017 | 0.001 ** | 0.000 ** |
| | **1946 - 1945** | 0.067 ** | . | . |
| | **1951 - 1945** | 0.078 ** | . | . |
| | **1956 - 1945** | 0.120 ** | . | . |
| | **1961 - 1965** | 0.170 ** | . | . |
| **South-East Asia** | **1941 - 1945** | 0.024 | 0.027 * | 0.874 |
| | **1946 - 1945** | 0.002 | . | . |
| | **1951 - 1945** | 0.013 | . | . |
| | **1956 - 1945** | 0.108 ** | . | . |
| | **1961 - 1963** | 0.033 | . | . |
| **Sub-Saharan Africa** | **1941 - 1945** | -0.001 | 0.025 * | 0.895 |
| | **1946 - 1945** | 0.000 | . | . |
| | **1951 - 1945** | 0.034 | . | . |
| | **1956 - 1945** | -0.047 ** | . | . |
| | **1961 - 1965** | -0.006 | . | . |
| | **Countries with DSB for cohorts 1946-1960** | | | |
| **Latin America/Caribbean** | **1946 - 1950** | 0.020 | 0.410 | 0.491 |
| | **1951 - 1950** | -0.020 | . | . |
| | **1956 - 1960** | 0.000 | . | . |
| **Middle East/North Africa** | **1946 - 1950** | 0.050 | 0.593 | 0.311 |
| | **1951 - 1950** | 0.024 | . | . |
| | **1956 - 1960** | 0.010 | . | . |
| **Europe/Central Asia** | **1946 - 1950** | 0.084 | 0.710 | 0.456 |
| | **1951 - 1950** | 0.147 ** | . | . |
| | **1956 - 1960** | 0.148 ** | . | . |
| **South Asia** | **1946 - 1950** | 0.093 ** | 0.219 | 0.275 |
| | **1951 - 1950** | 0.080 ** | . | . |
| | **1956 - 1960** | 0.120 ** | . | . |
| **South-East Asia** | **1946 - 1950** | 0.007 | 0.124 | 0.615 |
| | **1951 - 1950** | -0.038 | . | . |
| | **1956 - 1960** | 0.024 | . | . |
| **Sub-Saharan Africa** | **1946 - 1950** | 0.018 | 0.042 * | 0.037 * |
| | **1951 - 1950** | 0.016 | . | . |
| | **1956 - 1960** | -0.035 * | . | . |

Note: The results in the interaction column are the coefficients of the interaction terms. The F-tests are region specific. The results in the F-test columns are the p-values for the F-tests. Data is weighted by sample size. * (**) indicates significance at the 5(1) percent level.

Note: Countries in the second panel include: Bangladesh, Bolivia, Burkina Faso, Cameroon, Colombia, Dominican Republic, Egypt, Ghana, Haiti, India, Indonesia, Ivory Coast, Kenya, Madagascar, Malawi, Mali, Morocco, Namibia, Niger, Nigeria, Peru, Philippines, Rwanda, Senegal, Tanzania, Turkey, Uganda, Zambia, Zimbabwe

**Table 6. Multivariate correlates of differential stopping behavior (DSB)**

| | DSB | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | | (4) | | (5) | |
| **Urban** | 0.014 | . | . | | -0.022 | ** | -0.020 | ** |
| | [0.010] | . | . | | [0.010] | | [0.010] | |
| **Six or more years of schooling** | . | 0.027 | . | | -0.026 | *** | -0.023 | *** |
| | . | [0.020] | . | | [0.009] | | [0.009] | |
| **Mean number of children** | . | . | -0.020 | * | -0.029 | ** | -0.027 | ** |
| | . | . | [0.011] | | [0.012] | | [0.012] | |
| **Birth year dummies** | No | No | No | | No | | Yes | |
| **Observations** | 3478 | 3478 | 3478 | | 3478 | | 3478 | |
| **R-squared** | 0.00 | 0.01 | 0.04 | | 0.05 | | 0.06 | |

Note: Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Each observation is a country, urban/rural, high/low education, year of birth cell. Data are weighted by sample size

**Table 7. Mean number of siblings of children aged 0-15**

| | Children of women aged 40 and over | | | | All children | | | |
|---|---|---|---|---|---|---|---|---|
| | Male Children | Female Children | Male - Female | | Male Children | Female Children | Male - Female | |
| **Latin America/Caribbean** | 4.99 | 5.06 | -0.07 | ** | 3.08 | 3.14 | -0.06 | ** |
| **Middle East/North Africa** | 5.27 | 5.29 | -0.02 | | 3.67 | 3.73 | -0.06 | ** |
| **Europe/Central Asia** | 4.19 | 4.30 | -0.10 | * | 2.58 | 2.73 | -0.14 | ** |
| **South Asia** | 4.59 | 4.72 | -0.13 | ** | 2.81 | 2.96 | -0.15 | ** |
| **South-East Asia** | 4.46 | 4.52 | -0.07 | ** | 2.82 | 2.86 | -0.04 | ** |
| **Sub-Saharan Africa** | 5.49 | 5.49 | 0.01 | | 3.55 | 3.56 | -0.01 | * |

Note: * (**) indicates significance at the 5 (1) percent level.