SON PREFERENCE AND SEX COMPOSITION OF CHILDREN: EVIDENCE FROM INDIA*

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Although the effect of son preference on sex composition of children ever born is undetectable in national-level estimates that aggregate across all families, this article provides empirical evidence from India that son preference has two pronounced and predictable family-level effects on the sex composition of children ever born. First, data from India show that smaller families have a significantly higher proportion of sons than larger families. Second, socially and economically disadvantaged couples and couples from the northern region of India not only want but also attain a higher proportion of sons, if the effects of family size are controlled.

The term *son preference* refers to the attitude that sons are more important and more valuable than daughters. In many eastern and southern Asian societies, parents prize their sons for economic, religious, or social reasons. In India, for example, adult sons are expected to provide economic support for their parents (Das 1984; Lahiri 1984; Miller 1981; ORG 1983). In contrast, daughters may represent a substantial economic burden in places where their parents provide a dowry. The more valuable sons are to their parents in relation to daughters, presumably the greater the parents' desire for a high ratio of sons to daughters. One simple measure of the degree of son preference is a woman's expressed desire for the ideal number of sons and daughters, converted into the ideal proportion of sons (ideal number of sons / ideal total number of children).

Two factors—the couple's fertility and the mortality of their sons and daughters—can affect the actual proportion of sons in a family. A substantial body of research documents that couples with strong son preference may provide less food or poorer health care to their daughters; this practice may increase daughters' childhood mortality rate and thus may alter the sex composition of the *surviving* children (Bardhan 1974, 1982; Basu 1989; Chen, Huq, and D'Souza 1981; Das Gupta 1987; D'Souza and Chen 1980; Kynch and Sen 1983; Miller 1981; Nair 1996; Sen and Sengupta 1983; Timaeus, Harris, and Fairbairn 1997: chap. 7). Researchers have given less attention, however, to the potential effects of son preference on fertility and fertility decisions. In an effort to fill this gap, I explore the relationship between son preference and fertility decisions, and thus employ the measure of children ever born.

MEANS OF AFFECTING THE SEX COMPOSITION OF CHILDREN EVER BORN

Unlike the sex composition of surviving children, relatively few factors can affect the sex composition of children ever born. Although parents with son preference want to produce a high proportion of sons, they may not be able to achieve this goal. Three mechanisms could affect the sex composition of children ever born. First, biological factors may influence the sex of the child. Second, where the technology is available, couples may use sex-selective abortion. Finally, couples may practice differential stopping behavior (DSB). In differential stopping behavior, couples who already have attained the desired sex composition of children are more likely to stop having children than couples who have not reached the desired sex composition. For families with son preference, practicing DSB means that they are more likely to continue having children until they reach the desired number of sons.

Biological Factors

Some scholars have speculated that different couples have different biological propensities to have a male child. Yet the most recent research on the biological links to the sex ratio at birth (SRB) shows no genetic family bias toward one sex or the other (Rodgers 1997). Most empirical research has focused on the biological effects of mother's age, father's age, birth order, race, and other socioeconomic characteristics on the likelihood of having a male child. These studies find weak evidence of effects of race and birth order on the child's sex. Couples, however, cannot deliberately control or alter these factors (Teitelbaum 1972). Thus, for demographic purposes, the sex of any given child may be considered a random event with a 0.513 probability of having a boy and an SRB of about 1.05. This sex ratio is found in most Western countries and shows a surprisingly narrow band of variation (Johansson and Nygren 1991; Waldron 1983, 1987).

Sex-Selective Abortion

Because couples cannot biologically control the sex of a particular child, sex-selective abortion is currently the only as-

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sured way of producing a son. In countries such as China and Korea, sex-selective abortion has been available since the early 1980s and has had a large impact on SRB (Park and Cho 1995; Yi, Liao, and Cho 1997). In contrast, sex-determining techniques such as amniocentesis and ultrasound were not introduced into northern India until the late 1980s, and have spread southward slowly.

Although sex-selective abortion eventually may have a significant effect on the SRB, sex-selective abortion was not common in India before the early 1990s (Arnold 1997; Das Gupta and Bhat 1995; Nair 1996). Because the birth history data used in this paper were collected in 1992 and 1993 and cover all of India, the great majority of births in the sample occurred before sex-determining technologies were available. Indeed, only 15% of the births in this sample occurred in northern India after 1985 and thus could possibly have been affected by sex-selective abortion. Consequently, sex-selective abortion cannot be considered a major means of affecting the sex composition of children ever born in this sample.

Differential Stopping Behavior

Even in the absence of sex-selective abortion, couples may seek to achieve their ideal number of sons through differential stopping behavior. An extensive literature documents the existence of DSB in countries with son preference. Some of this literature focuses on the parity progression ratios of couples by the sex composition of children already born (Arnold 1997; Das 1987; Feeney and Yi 1986; Wen 1992). Other literature examines the effect of current sex composition on the likelihood of using contraception. The authors of these studies find that couples with more sons are more likely than couples with more daughters to use contraception because they do not want any more children (Amin and Mariam 1987; Arnold 1997; Arnold and Liu 1986; De Silva 1993; Rahman et al. 1992; Sarma and Jain 1974). Finally, other researchers have measured DSB with hazard models, which show that the length of the birth interval before the next child is longer for couples with more sons (Haughton and Haughton 1996; Pong 1994; Rahman and Da Vanzo 1993).

In keeping with these findings, evidence from India reveals widespread use of DSB. Couples with fewer sons are more likely to continue having children, want to have more children, are less likely to use contraception, and have shorter birth intervals (Arnold 1997; Bairagi and Bhattacharya 1989; Das 1987; IIPS 1997; Mutharayappa et al. 1997; Nag 1991; Nath and Land 1994; Raju and Bhat 1995).

Many demographers are concerned that son preference will keep the national fertility rates high, because couples who have had mainly daughters will exceed their ideal family size in their effort to have sons. Using a method developed by Arnold (1985), researchers have found that son preference increases national fertility by roughly 10% in several south Asian countries (Bairagi and Langsten 1986; Chowdhury and Bairagi 1990; Chowdhury, Bairagi, and Koenig 1993; Das 1987). In previous research using data from the 1992–1993 National Family Health Survey, it is estimated that sex preference increases total national fertility in India by 8.4% (Arnold 1997; IIPS 1997; Mutharayappa et al. 1997). Yet although DSB may cause a noticeable increase in the national fertility rates, it has no effect on the national sex composition of children ever born. Thus the national sex ratio of children ever born will remain around 1.05.

In contrast, at the family level, DSB alters not only fertility (family size) but also the sex composition of the children ever born within a family. DSB will not increase the family size in all families: Many couples practicing DSB will have their desired number of sons early and thus will not need to exceed their ideal family size. DSB, however, will affect the sex composition of children in all families that practice DSB. In families that have their sons early, DSB will produce a high proportion of sons; in families that have their sons later, DSB will produce a low proportion of sons. These effects of DSB on family sex composition of children are washed out in national averages, which aggregate over parities; yet they are evident at the family level.

Moreover, individual families must cope with the immediate and practical consequences of DSB. Indeed, it is at the family level that the costs of not having sons and the costs of having additional children are borne. In addition, decisions about how many sons are desired and decisions about whether to continue childbearing are made at the family level. Therefore, unlike previous research on DSB, this article focuses on the family-level effects of DSB. Specifically, I analyze the effects of DSB on the sex composition of children ever born within a family.

THEORETICAL EFFECTS OF DIFFERENTIAL STOPPING BEHAVIOR

Previous Research on Stopping Rules

One reason why researchers have not investigated the effects of DSB at the family level is that it is difficult to define the exact stopping rules that individual couples follow when they are practicing DSB (Ben-Porath and Welch 1976). The stopping rule followed by a couple depends not only on the *magnitude* of the son preference (how many sons relative to daughters a couple desires) but also on the *intensity* of this preference (the strength of a couple's determination to have their desired number of sons) (McClelland 1979). Coombs and colleagues made the most elegant attempt to quantify stopping rules empirically in the 1970s in Korea and Taiwan (Coombs 1979; Coombs, Coombs, and McClelland 1975; Coombs and Sun 1978; also see Kwon and Lee 1976; Widmer, McClelland, and Nickerson 1981). These researchers devised an ordinal scale, which identified not only the magnitude of the couple's preference for sons but also their willingness to have additional children in order to achieve their ideal number of sons.

Unfortunately, most demographic surveys do not employ the Coombs index; instead they only gather data on the ideal number of sons, the ideal number of daughters, and the ideal number of children. With these data we can measure the *mag-*

nitude of the son preference (the ideal proportion of sons) but not the *intensity* of that preference. There are many reasons, however, to believe that son preference in India is intense and that many couples are willing to exceed their ideal number of children in an effort to have the desired number of sons. Data from the National Family Health Survey, India 1992–1993, show that 39% of women who have their ideal number of children but fewer than their ideal number of sons want to have more children, whereas only 5% of women who have their ideal number of children and their ideal number of sons want more children. Moreover, according to the Family Planning Practices Survey in India, 83% of the couples in India are willing to have one or more additional daughters in order to have a *second* son (ORG 1983).

The societal pressure to have a son and the determination of at least some couples to have a son regardless of its effect on the total number of children were articulated by a Hindu woman living near Bijnor in northern India. When asked about her plans to have children, she said "I myself would like one son. And I don't want many children. But it isn't a question of what I want. Until I have a son, I won't stop having children" (Jeffery and Jeffery 1996:96). Thus, although the precise stopping rules that couples follow are unknown, the theoretical effects of differential stopping behavior can be explored by using the simplest stopping rule.

Simple Stopping Rules and the Theoretical Effects of DSB

The simplest stopping rule is that couples will continue to have children until they reach their ideal number of sons. The practice of differential stopping behavior with this simple stopping rule has two theoretical effects on the sex composition of children. First, DSB will cause the proportion of sons in the family to decline as the total family size increases. Second, within a given family size, characteristics of couples who *want* a higher proportion of sons will be the same as characteristics of couples who *have* a higher proportion of sons.

To illustrate how DSB would produce the first effect, consider an extreme example of a society in which everyone wants two sons and will continue to have children until they reach this goal. Assume also that the sex ratio at birth is 1.05, that couples have no size or daughter preference, and that fertility is unlimited. Table 1 shows the proportion of sons and the distribution of completed families in this imagined society. Even when a strict stopping rule is used, the effect of DSB on fertility is not large. More than one-quarter of the couples will have their desired number of sons in their first two attempts. Another one-quarter will need to produce only one additional child (total family size of three) to have their two sons. Nearly 98% of all the couples will have achieved their goal of two sons by their eighth child.

However, the effect of DSB on the sex composition of children is apparent among all couples who practice DSB. Couples who limit their family size to two children have two sons (100% sons); couples who go on to have eight children have two sons and six daughters (25% sons). Therefore small families have a significantly higher proportion of sons, while larger families have a low proportion of sons. Clearly, no society follows such a strict stopping rule, although data from Korea show a surprisingly similar pattern whereby the proportion of sons decreases sharply as family size increases (Park and Cho 1995). This simplified stopping rule, however, provides some insight regarding how DSB can produce a negative relationship between proportion of sons and family size.

The second effect of differential stopping behavior is that if son preference is heterogeneous, then couples who *want* more sons will *have* more sons within a given family size. Consequently, characteristics of couples who *want* a higher proportion of sons will be the same as characteristics of couples who *have* a higher proportion of sons if family size is controlled. To illustrate this effect, assume heterogeneity of son preference within the population. Instead of assuming that all couples want two sons, assume that one-third of couples want three sons, one-third want two sons, and one-third want only one son. In addition, assume that all couples have, on average, the same ideal total number of children. Then, on average, couples who want three sons will have a higher ideal proportion of sons.

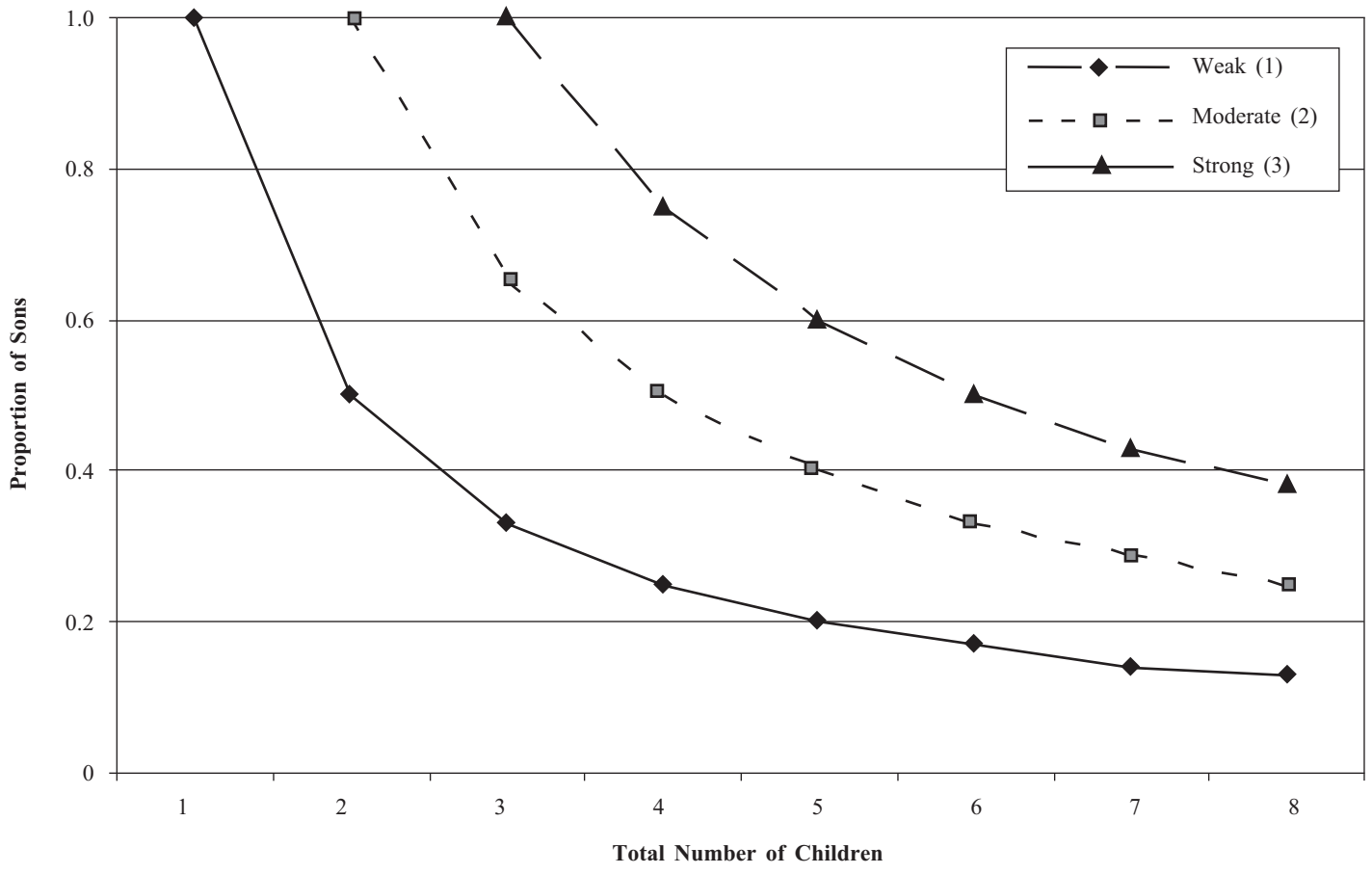
Figure 1 shows that within each family size, couples with the strongest son preference (couples who want the highest proportion of sons) will have the highest proportion of sons. Couples who want three sons (couples with the strongest son preference) will stop at three children only if all of their children are males. Couples who want two sons will stop at three children only if they have a daughter and two sons. Couples who desire only one son (couples with relatively weak son preference) will stop at three children if they have two daughters followed by one son. Thus, at a completed family size of three children, couples with the strongest son preference will have more sons than families with the weakest son preference.

Consequently, characteristics of couples with the strongest son preference will be associated with actually having a higher proportion of sons *within a given family size*. For example, if couples with strong son preference tend to be less

TABLE 1. PREDICTED PROPORTION OF SONS AND DISTRIBUTION WITH A STOPPING RULE OF TWO SONS

	Family Size (No. of Children)							
	1	2	3	4	5	6	7	8
Proportion of Sons	n/a	1.00	0.66	0.50	0.40	0.33	0.29	0.25
Percentage of Families	n/a	26.4	25.3	18.9	12.0	7.4	4.4	2.5

FIGURE 1. PREDICTED PROPORTION OF SONS IN A HETEROGENEOUS POPULATION WITH A ONE-, TWO-, AND THREE-SON STOPPING RULE



educated, then—within any given family size—less-educated couples will have a higher proportion of sons.

This theoretical inference contradicts previous assumptions made by demographers. Most demographers assumed that "[b]ecause parents cannot choose the sex of their children, the sex composition of children in a family is largely uncorrelated with other household characteristics" (Muhuri and Preston 1991:420). This convenient assumption implies that boys and girls are assigned randomly to households. This second predicted effect of DSB, however, suggests that this assumption may not be valid in societies that practice DSB. Even if only some couples follow stopping rules some of the time, the two effects of DSB will be evident in the data.

DATA

Sample

To test these two predictions, I use data from the National Family Health Survey 1992–1993 (NFHS), the largest demographic survey ever conducted in India. In the full survey, 89,777 ever-married women aged 13–49 were interviewed in all 24 states and the National Capital Territory of Delhi (IIPS 1995). When the sample is restricted to mothers (women who have ever had any children), 10,429 women are removed from the sample. An additional 13 mothers who did not want any children also were removed. The final sample consists of 79,335 ever-married mothers aged 13–49.

Study Design

The survey was conducted in three phases from April 1992 to September 1993. The core survey in each state asked identical questions about basic social, economic, and demographic characteristics and gathered data on fertility preferences and complete birth histories. Sampling was conducted in two stages in rural areas and three stages in urban areas (IIPS 1995). All of the following analyses control for the clustering effects of this multistage sampling design.

Data Quality

Women in this survey reported both the month and the year of birth for an unusually high percentage of their children (98% of living children and 92% of deceased children; IIPS 1995:325). Yet because all retrospective data are plagued with the problem of misreporting, it is difficult to gauge the "reliability" of such a low percentage of missing data. There is no evidence of suspicious fluctuations in the distribution of births by year, which would indicate substantial omissions or displacements of birth dates. Moreover, in a critical analysis of the quality of the birth histories, Bhat (1995) finds that "various checks show that the NFHS data on the total number of children ever born to women appear to be nearly complete, except in Rajasthan" (p. 257). The analyses presented in this paper include data from Rajasthan, but the results of models that exclude data from Rajasthan (not shown) are essentially the same as those presented here.

In addition, there is relatively little systematic underreporting of female births. One indicator of underreporting of female births is a high sex ratio at birth (SRB). Although the estimated SRB fluctuates, it never exceeds 1.07 (males/females) for any of the five-year periods after 1971 (IIPS 1995). Before 1971, however, the estimated SRB was 1.12. If we assume that the true SRB at birth was 1.05, this figure suggests that female births were underreported by about 6%. The problem of underenumeration is more severe in northern India (see Table 2).

Finally, in this article I use stated ideal size and sex composition preferences (which were given at the time of the interview) in two models (Table 4 and panel 2 of Table 7). I compare these models that use stated ideal sex composition with models that use the actual sex compositions. The use of stated preferences raises the concern that women have adjusted their stated ideal sex composition to match their actual sex composition. It seems implausible, however, that women would adjust their stated preference *away* from their actual sex composition. Thus differences between models employing ideal and actual proportions of sons indicate that women do not *completely* adjust their ideal sex composition to match their actual sex composition. These comparisons, however, cannot establish that women do not adjust their sex preferences at all. Thus the comparisons of these models are conservative estimates of the differences between the ideal and the actual sex compositions of children.

TABLE 2. SEX RATIOS AT BIRTH, BY REGION OF INDIA

	Total SRB	North SRB	East SRB	South SRB
1987–1991	1.06	1.07	1.05	1.03
1982–1986	1.06	1.09	1.07	1.05
1977–1981	1.07	1.09	1.05	1.04
1972–1976	1.07	1.10	1.05	1.02
1971 and Earlier	1.12	1.13	1.14	1.10
Total	1.07	1.10	1.07	1.05

Source: NFHS 1992–1993.

Description of Data

Independent variables. The multivariate models include various socioeconomic variables that could be associated with a preference for sons. Educational attainment in India, particularly for women, remains low by international standards: Only 37.7% of the women in the sample have ever attended school. Nearly three-quarters of the women live in rural areas. The majority of the women (81.8%) are Hindu; approximately 12% are Muslim (see Table 3).

TABLE 3. SELECTED CHARACTERISTICS OF HOUSEHOLDS AND WOMEN (*N* = 79,335)

Independent Variables	
Mother's age (mean)	31.7
Education (%)	
No schooling	62.3
Ever schooled	37.7
Caste (%)	
Other	79.2
Scheduled caste	12.0
Scheduled tribe	8.8
Residence (%)	
Rural	73.5
Urban	26.5
Religion (%)	
Hindu	81.8
Muslim	12.1
Christian	2.4
Sikh	1.9
Other	1.7
Region (%)	
North	41.2
East	25.8
South	33.0
Dependent Variables	
Actual children (mean)	
Total children ever born	3.5
Total sons ever born	1.8
Total daughters ever born	1.7
Actual proportion of sons	0.514
Ideal children (mean)	
Total ideal children	2.9
Total ideal sons	1.6
Total ideal daughters	1.1
Total ideal either son or daughter	0.2
Ideal proportion of sons	0.552

Source: NFHS 1992–1993, weighted data.

The NFHS provides only limited economic indicators. Most of the economic variables that were reported at the time of the survey, such as ownership of consumer goods, do not represent the economic conditions that prevailed earlier, when fertility decisions were made. Further, some economic indicators are endogenous to family size and sex composition. For example, ownership of bicycles may be a function of the total number of sons. In addition, older sons in particular may contribute directly to household income and wealth.

To avoid these endogeneity problems, I use membership in a scheduled caste or scheduled tribe to provide a rough indication of lower economic and/or social status. Unlike other indicators of economic well-being, the woman's caste remains constant from the beginning of her birth history to the time of the survey. About 12% of the women in this sample belonged to one of the scheduled castes, the lowest and traditionally poorest castes of the Hindu caste system. The term *scheduled tribes* refers to various aboriginal ethnic minorities, who are concentrated in their traditional lands in the far northeastern region of India.

Because members of the scheduled tribes and scheduled castes have distinctive social identities and face substantially different forms of social and economic discrimination, the effects of these two groups are differentiated in the analyses. Both groups are identified by the Indian government as economically severely disadvantaged; thus they benefit from various quotas and social reform programs. In recent years these programs have helped many members of both groups to achieve considerable economic prosperity, making membership in these groups a somewhat unreliable measure of lower economic status. Yet when the models that follow included a quality-of-housing variable (which is less endogenous than some other measures of economic status), living in the lowest-quality housing (Kachha housing) has effects similar to those of membership in a scheduled caste (models not shown).

In addition to these social characteristics, geography plays an important role in shaping couples' social and political environments. Dyson and Moore (1983) suggest that son preference varies across the three main regions of India (north, south, and east); they contend that it is strongest in the northern region and weakest in the south. One-third (33.0%) of the sample live in the southern region, one-quarter (25.8%) in the eastern region, and two-fifths (41.2%) in the northern region.

Dependent variables. The two dependent variables are conceptualized as the ideal proportion of sons and the actual proportion of sons in a family. I calculated the actual proportion of sons from the birth histories of children ever born as reported by the mothers. On average, the women included in the analyses had 3.5 total children and 1.8 sons. Hence the overall proportion of sons was 0.514; this yields a sex ratio of 1.06, which is close to the biological norm.

In addition to questions about their past fertility experience, women were queried about future fertility preferences. All women were asked "Would you like to have another child or would you prefer not to have any more children?" Two-thirds of the women reported that they did not want more children or that either they or their spouse were sterilized. These women are considered to have completed families. One-quarter of the women responded that they wanted to have additional children. About 8% of the sample were undecided, left the decision "up to God," or could no longer become pregnant.

I construct the ideal proportion of sons from questions about a woman's ideal number of children and her ideal number of sons. Specifically the women were asked "If you could go back to the time when you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" On average, the women wanted 2.9 children, a number considerably lower than their average actual number of children. The women also were asked "How many of these children would you like to be boys and how many would you like to be girls?" Respondents were given the option of specifying the number of boys, the number of girls, and the number of "either" sex they wanted. Thirteen percent of the women indicated that "either" sex would be acceptable for one or more of the children.

These measures of ideal sex composition reveal a substantial son preference. Overall, women wanted almost 50% more sons than daughters (1.6 sons and 1.1 daughters). The ideal proportion of sons is 0.552, considerably above the biologically expected proportion. Moreover, this ideal proportion underestimates son preference because the "either" responses are counted in the denominator of total ideal children but not in the numerator of the ideal number of boys. Thus the ideal proportion of sons is really the ideal *minimum* proportion of sons desired by the couple.

Finally, preliminary analysis shows that women who want only one child are significantly less concerned about that child's sex than are women who want more than one child. Wanting only one child is unusual in India: Only 3% of the sample stated that one child is the ideal number. More than half (52%) of this small group responded that either a boy or a girl is acceptable. In contrast, only 11% of couples who want two or more children indicated that either sex is acceptable for one or more of their children. Thus couples who want only one child constitute an anomalous group, which wants fewer children and is less concerned about their child's sex.

METHODS

Here I test the two theoretical effects of DSB described above. To model the relationship between family size and the proportion of sons in a family, I use maximum-likelihood logistic estimation on data grouped by each family. I assume that each family has one mother, so the data also are grouped by each mother. In this method it is assumed that a child's sex has a binomial distribution and is a Bernoulli random variable which takes the value 1 if the child is a boy and 0 if the child is a girl. Each mother (or family) has n_i children (which represents her number of trials) in family i. Of these trials, there are y_i sons in family i. With data grouped by the mother,

the actual probability of having sons in family *i* is "actual π_i." For this discussion, "actual π_i" may be regarded as the actual proportion of sons in the family. Models of the ideal proportion of sons are analogous to models of the actual proportion of sons, where "ideal π_i" may be considered as the ideal proportion of sons or the ideal probability of having sons.

The models used in this article are shown below. Before testing the two theoretical effects of DSB, I identify the characteristics of couples who have a strong son preference in Section 1. Specifically, I model the effects of socioeconomic characteristics (age, education, caste, urban residence, religion, and region) without controlling for family size on the ideal proportion of sons.

$$\begin{aligned}\text{Logit (Ideal } \pi_i) = {} & \Sigma\beta_j Age_i + \beta_7 School_i \\ & + \beta_8 S.\ Caste_i + \beta_9 S.\ Tribe_i + \beta_{10} Urban_i \\ & + \beta_{11} Muslim_i + \beta_{12} Christian_i + \beta_{13} Sikh_i \\ & + \beta_{14} Other\ relig._i + \beta_{15} North_i + \beta_{16} South_i. \end{aligned} \quad (1)$$

In Section 2, I model the effects of socioeconomic characteristics on the actual probability of having sons to establish that other influences such as sex-selective abortion, biological factors, and underreporting of female births do not produce a correlation between sex composition and socioeconomic characteristics.

$$\begin{aligned}\text{Logit (Actual } \pi_i) = {} & \Sigma\beta_j Age_i + \beta_7 School_i + \beta_8 S.\ Caste_i \\ & + \beta_9 S.\ Tribe_i + \beta_{10} Urban_i + \beta_{11} Muslim_i \\ & + \beta_{12} Christian_i + \beta_{13} Sikh_i + \beta_{14} Other\ relig._i \\ & + \beta_{15} North_i + \beta_{16} South_i. \end{aligned} \quad (2)$$

In Section 3, I test the first theoretical effect of DSB by modeling the effect of family size on the actual proportion of sons.

$$\text{Logit (Actual } \pi_i) = \Sigma\beta_k Family\ Size_i. \quad (3)$$

I also contrast the relationship of actual proportion of sons and family size with the relationship between ideal proportion of sons and family size.

$$\text{Logit (Ideal } \pi_i) = \Sigma\beta_k Family\ Size_i. \quad (4)$$

Finally, in Section 4, I combine the two models and discuss the effects of socioeconomic characteristics on the actual proportion of sons, controlling for family size. I compare the results from Eq. (1) with the results from Eq. (5) to check for the second theoretical effect of DSB.

$$\begin{aligned}\text{Logit (Actual } \pi_i) = {} & \Sigma\beta_k Family\ Size_i + \Sigma\beta_j Age_i \\ & + \beta_{14} School_i + \beta_{15} S.\ Caste_i + \beta_{16} S.\ Tribe_i \\ & + \beta_{17} Urban_i + \beta_{18} Muslim_i + \beta_{19} Christian_i \\ & + \beta_{20} Sikh_i + \beta_{21} Other\ relig._i + \beta_{22} North_i \\ & + \beta_{23} South_i. \end{aligned} \quad (5)$$

RESULTS

Section 1: What are the characteristics of couples who have a strong son preference?

According to my definition of son preference, couples with a strong son preference desire a high ideal proportion of sons. I hypothesize that son preference is not distributed randomly but rather is concentrated among couples with distinctive characteristics. Previous researchers universally agree that an overall "preference" for sons is strongest among couples in the northern region of India. Although there is currently much debate about the effect of low income and low education on gender inequality, one could hypothesize that lower socioeconomic status and less education would be associated with a stronger preference for sons (Arnold and Liu 1986; Dyson and Moore 1983; Kwon and Lee 1976; Miller 1981; Murthi, Guio, and Dreze 1995; Raju and Bhat 1995).

Using Eq. (1), I test to see whether these social, economic, demographic, and geographic characteristics are associated with a strong son preference (i.e., wanting a high ideal proportion of sons). Table 4 shows the odds ratios for characteristics of women who want a high proportion of sons. An odds ratio below 1 suggests that couples with this characteristic have a lower ideal proportion of sons; an odds ratio above 1 suggests that they have a higher ideal proportion. If all women simply adjusted their stated ideal proportion of sons to match their actual proportion of sons, we would find no significant associations between socioeconomic characteristics and the ideal proportion of sons because the probability of having a son is a random event.

The main hypothesis, that son preference is heterogeneous within the population, is confirmed in Table 4. Specifically, among women who ever attended school, the odds of wanting sons are 18% lower than among non-educated women. Women who belong to the scheduled castes want a significantly higher proportion of sons. Rural women want a higher proportion of sons than do urban women. Muslim and Hindu women want significantly more sons than do Christian women. Finally, women living in southern India want fewer sons than do women living in the northern or eastern regions. Notably, no relationship exists between the mother's age and her ideal proportion of sons: Older women do not want a higher proportion of sons than do younger women, or vice versa. This finding suggests that son preference has not changed significantly across cohorts. Overall, Table 4 shows that couples who are socially and economically disadvantaged, who are either Hindu or Muslim, or who live in northern or eastern India want the highest proportion of sons.

Section 2: If the effect of family size is not controlled, are the characteristics of couples who *want* a high proportion of sons the same as those of couples who *have* a high proportion of sons?

In Section 2, I examine whether couples with the characteristics identified in Section 1 have a high proportion of sons without controlling for the effects of family size. With no controls for family size, the null hypothesis is that no relationship exists between proportion of sons and household characteristics. Even though some couples may want more sons than other couples, they cannot attain their ideal sex composition in the absence of sex-selective abortion. Furthermore, unless there is systematic misreporting of female births or biological variation by mother's characteristics, we

TABLE 4. SECTION 1: MAXIMUM-LIKELIHOOD ESTIMATES OF THE EFFECTS OF SOCIOECONOMIC CHARACTERISTICS ON THE IDEAL SEX COMPOSITION (STATED IDEAL PROPORTION OF SONS) (*N* = 72,136)

Variable	Odds Ratio	95% Confidence Interval
Mother's Age		
< 20	1.00	— —
20–24	0.99	(0.97, 1.02)
25–29	0.99	(0.97, 1.02)
30–34	0.99	(0.96, 1.02)
35–39	1.01	(0.98, 1.04)
40–44	0.99	(0.96, 1.02)
45–49	0.99	(0.96, 1.03)
Education		
No school	1.00	— —
School	0.82	(0.80, 0.83)***
Caste		
Other	1.00	— —
Scheduled caste	1.04	(1.02, 1.06)***
Scheduled tribe	0.97	(0.95, 1.00)
Residence		
Rural	1.00	— —
Urban	0.85	(0.83, 0.87)***
Religion		
Hindu	1.00	— —
Muslim	0.96	(0.93, 0.99)
Christian	0.86	(0.83, 0.90)***
Sikh	1.03	(0.99, 1.07)
Other	0.96	(0.91, 1.03)
Geographic Region		
East	1.00	— —
North	1.01	(0.99, 1.03)
South	0.74	(0.72, 0.76)***
Log-Likelihood	–144,918.91	
Chi-Square (*df* = 16)	2,477.79	

***$p < .001$

should find no association between the actual proportion of sons and the characteristics of couples with strong son preference.

In general, the findings presented in Table 5 show that without controlling for family size, most household characteristics are not associated with the actual proportion of sons, although women living in the northern region have a slightly higher proportion of sons ($p = .01$). Because sex-determining technology was first introduced in the north, one may suspect that this significance is caused by sex-selective abortion. According to Nair (1996), however, sex-determining technology was not available outside the major cities even in the north before the early 1990s. Furthermore, Table 2 does not show an increasing sex ratio in northern India since 1985. Instead it reveals long-term underreporting of female births in the north and much less underreporting of female births in the south. Overall, given the lack of significant associations, Table 5 contains little evidence of systematic underreporting of female births, biological determinants, or sex-selective abortion.

Table 5 shows that (without controlling for family size) characteristics of women who want a high proportion of sons and those of women who have a high proportion of sons are

TABLE 5. SECTION 2: MAXIMUM-LIKELIHOOD ESTIMATES OF THE EFFECTS OF SOCIOECONOMIC CHARACTERISTICS ON THE ACTUAL SEX COMPOSITION OF CHILDREN EVER BORN (ACTUAL PROPORTION OF SONS) (*N* = 79,335)

Variable	Odds Ratio	95% Confidence Interval
Mother's Age		
< 20	1.00	— —
20–24	1.02	(0.96, 1.08)
25–29	1.04	(0.97, 1.10)
30–34	1.06	(1.00, 1.13)
35–39	1.06	(0.99, 1.12)
40–44	1.04	(0.98, 1.11)
45–49	1.04	(0.97, 1.11)
Education		
No school	1.00	— —
School	0.99	(0.98, 1.01)
Caste		
Other	1.00	— —
Scheduled caste	1.02	(0.99, 1.04)
Scheduled tribe	1.01	(0.98, 1.03)
Residence		
Rural	1.00	— —
Urban	1.01	(1.00, 1.03)
Religion		
Hindu	1.00	— —
Muslim	0.98	(0.96, 1.00)
Christian	0.98	(0.94, 1.01)
Sikh	1.00	(0.95, 1.05)
Other	1.03	(0.97, 1.09)
Geographic Region		
East	1.00	— —
North	1.03	(1.01, 1.05)
South	0.98	(0.96, 1.00)
Log-Likelihood	– 190,475.62	
Chi-Square (*df* = 16)	51.77	

TABLE 6. SECTION 3: FAMILY SIZE SEX RATIOS AND ACTUAL PROPORTION OF SONS FOR ALL FAMILIES AND COMPLETED FAMILIES

	1	2	3	4	5	6	7	8+	Total
All Families									
Sex ratio	1.14	1.23	1.20	1.09	1.02	0.99	0.95	0.97	1.08
Proportion sons	0.53	0.55	0.55	0.52	0.51	0.50	0.49	0.49	0.52
Completed Families									
Sex ratio	1.32	1.54	1.36	1.16	1.06	1.01	0.97	0.98	1.40
Proportion sons	0.57	0.61	0.58	0.54	0.51	0.50	0.49	0.50	0.58

not similar. Despite a couple's desire to have a high proportion of sons, couples with a strong son preference are not more likely to achieve this goal.

Section 3: Do the data show the predicted negative relationship between the actual proportion of sons and family size?

According to the first predicted effect of DSB, we should find a negative relationship between the actual proportion of sons and family size. The null hypothesis is that family size is not associated with the proportion of sons, because if couples are not practicing DSB, then families with two children are no more likely than a family with eight children to have a high proportion of boys. Because the full effects of DSB may not become evident until all couples have completed their families, Table 6 shows the actual proportion of sons among all families and among completed families. When the sample is restricted to complete families (couples who either are sterilized or who state that they do not want any more children), the DSB effect becomes even more pronounced. Couples who stop with two children have 61% sons on average; couples who stop with eight or more children have only 50% sons.

A similar pattern is seen in panel 1 of Table 7, which shows that among all couples with two children, the odds of having sons are 23% higher than among all couples with eight children. As a point of comparison, it is interesting to ask "What happens to the ideal proportion of sons as family size increases?" (Eq. (4)). Panel 2 of Table 7 shows that in contrast to the actual proportion of sons, the ideal proportion of sons is related *positively* to the total family size. On average, women with larger families wanted a higher proportion of sons, but actually had a lower proportion. This result may be explained by differential stopping behavior, which highlights an irony produced by Bernoulli mathematics: Among couples with a strong son preference (those who want a high proportion of sons), some will be "lucky" and will have their desired sons early. Other couples with a strong son preference, however, will be "unlucky" and will be compelled to continue bearing children, thus having larger families with a lower proportion of sons. Table 7 reinforces the idea that stated ideals are not adjusted to match the actual sex compo-

TABLE 7. SECTION 3, CONTINUED: MAXIMUM-LIKELIHOOD ESTIMATES OF THE EFFECTS OF FAMILY SIZE ON ACTUAL AND IDEAL SEX COMPOSITION OF CHILDREN (ACTUAL AND IDEAL PROPORTION OF SONS)

	Actual Sex Composition (N = 79,335)		Ideal Sex Composition (N = 72,136)	
Variable	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Family Size				
1 child	1.00	— —	1.00	— —
2 children	1.08	(1.04, 1.13)***	0.99	(0.96, 1.01)
3 children	1.05	(1.01, 1.10)	1.15	(1.13, 1.17)***
4 children	0.95	(0.92, 0.99)	1.17	(1.14, 1.19)***
5 children	0.90	(0.86, 0.93)***	1.22	(1.19, 1.25)***
6 children	0.87	(0.83, 0.90)***	1.21	(1.18, 1.25)***
7 children	0.84	(0.80, 0.88)***	1.23	(1.18, 1.27)***
8+ children	0.85	(0.82, 0.88)***	1.23	(1.18, 1.27)***
Log-Likelihood	–190,217.11		– 145,927.89	
Chi-Square (df = 7)	487.22		556.93	

***$p < .001$

sition and that couples cannot always attain their preferred sex composition.

Section 4: Within a given family size, are the characteristics of couples who *want* a high proportion of sons the same as the characteristics of couples who *have* a high proportion of sons?

According to the second theoretical effect of DSB, *within a given family size*, couples who desire a higher proportion of sons will have a higher proportion of sons. Figure 2 divides women with completed families into three groups according to the strength of their son preference. Couples with strong son preference have an ideal proportion of sons above 0.5; couples with moderate son preference have an ideal proportion of sons equal to 0.5; couples with weak son preference desire fewer than 0.5 sons. Figure 2 shows that within any given family size, couples with the strongest son preference have the highest proportion of sons. If we ignore the anomalous behavior of women who want only one child, the general patterns of the theoretical effects of DSB predicted in Figure 1 are similar to the actual effects of DSB shown in Figure 2. (The magnitude of the actual effects is much smaller, however.)

Furthermore, if couples who want a higher proportion of sons have a higher proportion of sons (with controls for family size), then characteristics of couples with strong son preference will be associated with having a higher actual proportion of sons. Table 4 (Eq. (1)) has already established that son preferences are strongest among couples who are less highly educated, belong to a lower caste, live in rural areas, are either Hindu or Muslim, and live in northern or eastern India. The results of Eq. (5), presented in Table 5, show that without controlling for family size there is no relationship between proportion of sons and these social, economic, and geographic characteristics. The lack of correlation between socioeconomic and household characteristics, as seen in Table 5, has led some demographers to conclude, somewhat hastily, that because parents cannot determine the sex of a particular child, sex composition of children is not related to socioeconomic characteristics (Muhuri and Preston 1991). This conclusion, however, ignores the potential effect of differential stopping behavior, which would cause these social, economic, and geo-

FIGURE 2. ACTUAL PROPORTION OF SONS IN A HETEROGENEOUS POPULATION WITH SON PREFERENCE (IDEAL PROPORTION OF SONS) LESS THAN HALF, HALF, AND MORE THAN HALF

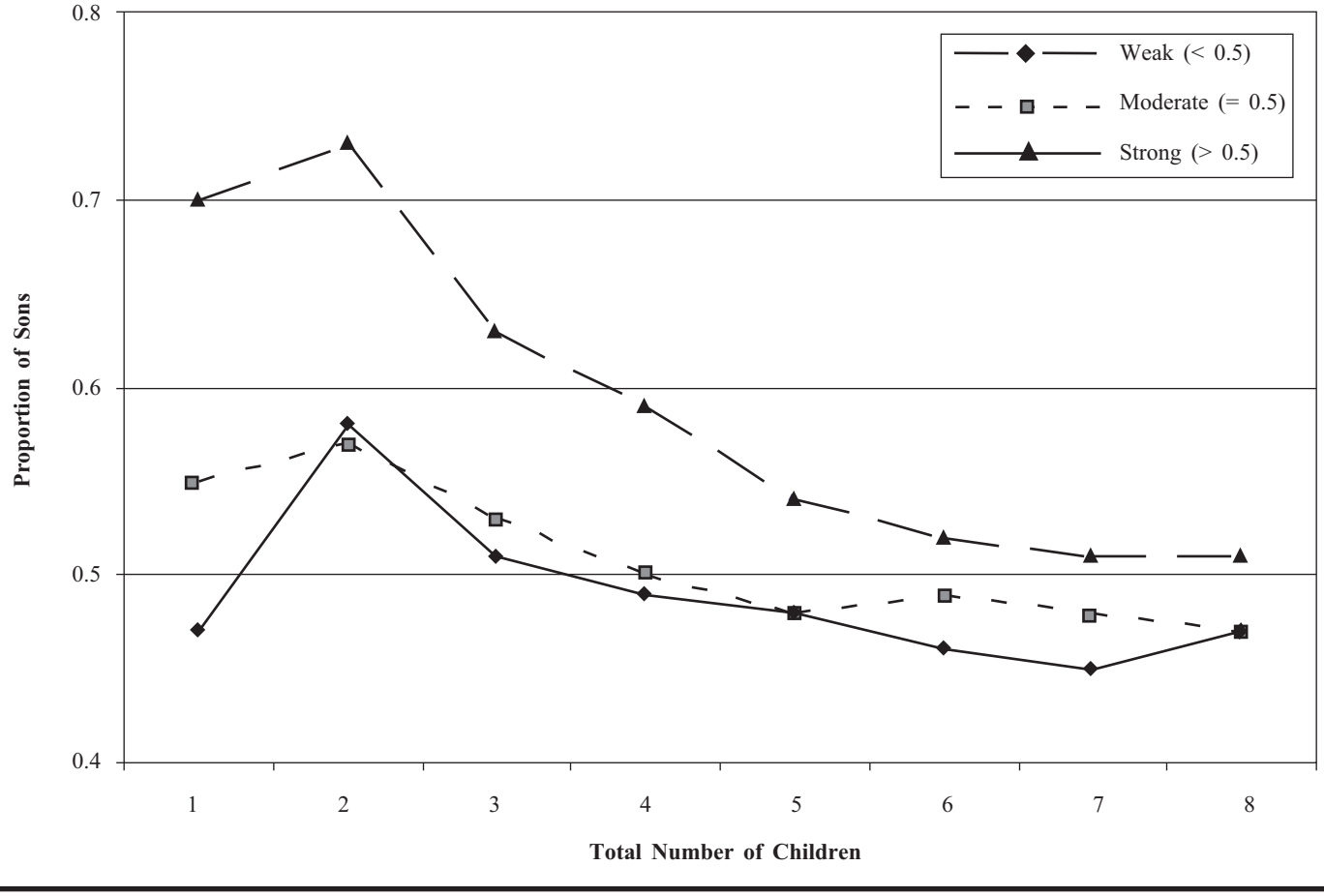


TABLE 8. SECTION 4: MAXIMUM-LIKELIHOOD ESTIMATES OF THE EFFECTS OF FAMILY SIZE AND SOCIOECONOMIC CHARACTERISTICS ON SEX COMPOSITION OF CHILDREN (ACTUAL PROPORTION OF SONS)

	Panel 1		Panel 2	
	All Families (N = 79,349)		Completed Families (N = 53,417)	
Variable	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Family Size				
1 child	1.00	— —	1.00	— —
2 children	1.01	(0.97, 1.06)	1.17	(1.09, 1.27)***
3 children	0.93	(0.90, 0.98)	1.00	(0.92, 1.08)
4 children	0.81	(0.77, 0.84)***	0.83	(0.76, 0.89)***
5 children	0.73	(0.70, 0.77)***	0.73	(0.68, 0.79)***
6 children	0.69	(0.66, 0.73)***	0.69	(0.63, 0.75)***
7 children	0.66	(0.63, 0.69)***	0.65	(0.60, 0.71)***
8+ children	0.65	(0.62, 0.68)***	0.64	(0.60, 0.70)***
Mother's Age				
< 20	1.00	— —	1.00	— —
20–24	1.08	(1.01, 1.15)	1.14	(1.00, 1.30)
25–29	1.21	(1.13, 1.29)***	1.13	(0.99, 1.28)
30–34	1.33	(1.25, 1.43)***	1.17	(1.03, 1.33)
35–39	1.39	(1.30, 1.49)***	1.17	(1.03, 1.34)
40–44	1.41	(1.32, 1.51)***	1.18	(1.04, 1.35)
45–49	1.44	(1.34, 1.54)***	1.21	(1.06, 1.38)
Education				
No school	1.00	— —	1.00	— —
School	0.93	(0.91, 0.94)***	0.90	(0.88, 0.92)***
Caste				
Other	1.00	— —	1.00	— —
Scheduled caste	1.04	(1.02, 1.07)***	1.04	(1.01, 1.07)
Scheduled tribe	1.02	(0.99, 1.04)	1.00	(0.97, 1.03)
Residence				
Rural	1.00	— —	1.00	— —
Urban	0.99	(0.97, 1.00)	0.98	(0.96, 1.00)***
Religion				
Hindu	1.00	— —	1.00	— —
Muslim	1.04	(1.01, 1.06)***	1.04	(1.01, 1.07)
Christian	0.96	(0.92, 0.99)	0.92	(0.88, 0.96)***
Sikh	0.95	(0.91, 1.01)	0.94	(0.89, 0.99)
Other	1.02	(0.97, 1.08)	1.01	(0.95, 1.07)
Geographic Region				
East	1.00	— —	1.00	— —
North	1.02	(1.00, 1.04)	1.05	(1.01, 1.06)
South	0.94	(0.92, 0.96)***	0.91	(0.88, 0.92)***
Log-Likelihood	–189,952.36		–144,600.60	
Chi-Square (df = 23)	1,006.07		1,687.06	

***p < .001

graphic characteristics to be associated with the actual proportion of sons within a given family size.

Panel 1 of Table 8 includes the sample of all mothers. In panel 2, however, this sample is restricted to mothers who have completed their families.[1] Because two-thirds of the women in the sample do not want more children, the difference between these two samples is not large. With controls for the effects of family size, Table 8 shows that in both samples less highly educated, lower-caste, rural Muslim and Hindu couples from northern and eastern India have the highest proportion of sons. The main difference between all families (panel 1) and completed families (panel 2) is that age is not a significant predictor of the proportion of sons for women who have completed their families. In panel 1, the mother's age has a significant and positive relationship to the proportion of sons. This finding is not surprising because older women will have had a longer time to practice DSB, whereas younger women still may be trying to have their desired number of sons.

The socioeconomic characteristics have rather small effects on the likelihood of having sons, with controls for family size. Nonetheless, any significant association is interesting in view of the usual assumption that socioeconomic characteristics are completely unrelated to the sex composition of children. Educational attainment has the strongest effect on the actual proportion of sons within a given family size. Women who have ever attended school have significantly lower odds of having sons than do women who did not attend school. (Educated women show a 7% decrease in odds of having sons in the sample of all families and a 10% decrease in the sample of completed families.) Women who belong to the scheduled castes are 4% more likely to have sons than are women of higher castes. Muslims and Hindus are significantly more likely to have sons than are Christians. Finally, women who live in northern India are significantly more likely to have sons than women living in the southern region. In general, Table 8 shows that within a given family size, couples who have a high proportion of sons possess the same characteristics as couples with a strong son preference (Table 4, Eq. (1)), confirming the second predicted effect of DSB.

CONCLUSIONS

Unlike previous research, this article examines the effects of differential stopping behavior (DSB) at the family level rather than at the national level, which aggregates across parities. At the family level, DSB affects both the total family size and the sex composition of children ever born.

A simple theory of differential stopping behavior predicts that DSB will produce a negative relationship between the proportion of sons and family size. This first predicted effect of DSB is tested empirically and is confirmed. Thus, on average, girls belong to larger families because families with girls tend to become large in an effort to have boys. Moreover, the large families with many girls are often the families that did not want many girls.

The second hypothesized effect of DSB, which is that couples who *want* a high proportion of sons will *have* a high proportion of sons within a given family size, is also investigated empirically. This theoretical effect of DSB implies that characteristics of couples with strong son preference will be the same as those of couples with more sons if family size is controlled. This implication contradicts demographers' previous assumptions that socioeconomic characteristics are unrelated to the sex composition of children in a given household. I find that couples who are less highly educated, live in rural areas, do not belong to the scheduled castes, are Hindu or Muslim, or live in northern India not only *want* but also *have* the highest proportion of sons. Consequently, with controls for family size, boys come from families that are poorer and less highly educated on average, and are more likely to be either Hindu or Muslim.

Does the practice of DSB explain some of the difference between boys' and girls' childhood mortality rates? If one can no longer assume that boys and girls are assigned randomly to households, how do differences in family structures affect the welfare of boys and girls? In particular, the findings reported here suggest that DSB produces a large group of girls who are unwanted: those who belong to large families that became large in an effort to have sons. It seems plausible that these unwanted girls would experience an unusually high risk of dying young. Other findings based on the NFHS show that girls who are born in excess of their parents' ideal number of girls experience a greater risk of mortality than do other girls and all boys (Clark 1999).

In this article I provide both theoretical and empirical evidence that the desire to have sons can affect fertility decisions and thus can alter the size and sex composition of children within a given family. As stated above, the effect of son preference on sex composition is undetectable in national estimates that aggregate across different parities. At the family level, however, its effects on family structure and sex composition are pronounced, which may have an important impact on children's well-being.

1. "Complete" families can be identified in several ways. If "complete" families refer to mothers who are over age 35 or mothers who have not had a child in the last 10 years, the results of the multivariate model are similar to the results shown in panel 2 of Table 8.

REFERENCES

Amin, R. and A.G. Mariam. 1987. "Son Preference in Bangladesh: An Emerging Barrier to Fertility Regulation." *Journal of Biosocial Science* 19:221–28.

Arnold, F. 1985. "Measuring the Effect of Sex Preference on Fertility: The Case of Korea." *Demography* 22:280–88.

———. 1997. "Gender Preferences for Children." *Demographic and Health Surveys Comparative Studies* 23:1–56.

Arnold, F. and Z. Liu. 1986. "Sex Preference, Fertility, and Family Planning in China." *Population and Development Review* 12:221–46.

Bairagi, R. and A.K. Bhattacharya. 1989. "Parental Sex Preference and Its Effects on Fertility Intention and Contraceptive Use in Calcutta." *Rural Demography* 16(1 and 2):43–56.

Bairagi, R. and R. Langsten. 1986. "Sex Preference for Children

and Its Implications for Fertility in Rural Bangladesh." *Studies in Family Planning* 17:302–307.

Bardhan, P. 1974. "On Life and Death Questions." *Economic and Political Weekly* 9(special number):1293–304.

———. 1982. "Little Girls and Death in India." *Economic and Political Weekly*:1448–50.

Basu, A.M. 1989. "Is Discrimination in Food Really Necessary for Explaining Sex Differentials in Childhood Mortality?" *Population Studies* 43:193–210.

Ben-Porath, Y. and F. Welch. 1976. "Do Sex Preferences Really Matter?" *Quarterly Journal of Economics* 90:285–307.

Bhat, P.N.M. 1995. "On the Quality of Birth History Data Collected in National Family Health Survey, 1992–1993." *Demography India* 24:245–58.

Chen, L., E. Huq, and S. D'Souza. 1981. "Sex Bias in the Family Allocation of Food and Health Care in Rural Bangladesh." *Population and Development Review* 7:55–69.

Chowdhury, M. and R. Bairagi. 1990. "Son Preference and Fertility in Bangladesh." *Population and Development Review* 16:749–57.

Chowdhury, A.I., R. Bairagi, and M. Koenig. 1993. "Effects of Family Sex Composition on Fertility Preferences and Behavior in Rural Bangladesh." *Journal of Biosocial Science* 25:455–64.

Clark, S. 1999. "The Demographic Effects of Son Preference: Evidence From India." PhD dissertation, Woodrow Wilson School of Public and International Affairs and the Office of Population Research, Princeton University.

Coombs, L. 1979. "Prospective Fertility and Underlying Preferences: A Longitudinal Study in Taiwan." *Population Studies* 33:447–55.

Coombs, C., L. Coombs, and G. McClelland. 1975. "Preference Scales for Number and Sex of Children." *Population Studies* 29:273–98.

Coombs, L and T.H. Sun. 1978. "Family Composition Preference in a Developing Culture: The Case of Taiwan." *Population Studies* 1:43–64.

Das, N. 1984. "Sex Preference Pattern and Its Stability in India: 1970–80." *Demography India* 13(1 and 2):108–19.

———. 1987. "Sex Preference and Fertility Behavior: A Study of Recent Indian Data." *Demography* 24:517–30.

Das Gupta, M. 1987. "Selective Discrimination Against Female Children in Rural Punjab, India." *Population and Development Review* 13:77–100.

Das Gupta, M. and P.N.M. Bhat. 1995. "Intensified Gender Bias in India: A Consequence of Fertility Decline." Working Paper 95-03, Center for Population and Development Studies, Harvard University.

De Silva, W.I. 1993. "Influence of Son Preference on the Contraceptive Use and Fertility of Sri Lankan Women." *Journal of Biosocial Science* 25:319–31.

D'Souza, S. and L. Chen. 1980. "Sex Differentials in Mortality in Rural Bangladesh." *Population and Development Review* 6:257–70.

Dyson, T. and M. Moore. 1983. "On Kinship Structure, Female Autonomy, and Demographic Behavior in India." *Population and Development Review* 9:35–60.

Feeney, G. and J. Yi. 1986. "The Effect of Son Preference on Fertility in China." Presented at the annual meetings of the Population Association of America, San Francisco.

Haughton, D. and J. Haughton. 1996. "Using a Mixture Model to Detect Son Preference in Vietnam." *Journal of Biosocial Science* 28:355–65.

International Institute for Population Sciences (IIPS). 1995. *National Family Health Survey (MCH and Family Planning), India 1992–1993.* Bombay: IIPS.

———. 1997. "Is Son Preference Slowing Down India's Transition to Low Fertility?" *National Family Health Survey Bulletin* 4:1–4.

Jeffery, P. and R. Jeffery. 1996. *Don't Marry Me to a Plowman! Women's Everyday Lives in Rural North India*. Boulder: Westview.

Johansson, S. and O. Nygren. 1991. "The Missing Girls of China: A New Demographic Account." *Population and Development Review* 17:35–51.

Kwon, T.H. and H.Y. Lee. 1976. "Preferences for Number and Sex of Children in a Korean Town." *Bulletin of the Population and Development Studies Center* (Seoul) 5:1–11.

Kynch, J. and A. Sen. 1983. "Indian Women: Well-Being and Survival." *Cambridge Journal of Economics* 7:363–80.

Lahiri, B. 1984. "Demand for Sons Among Indian Couples by Rural-Urban Settlement Size." *Demography India* 13(1 and 2):120–32.

McClelland, G. 1979. "Determining the Impact of Sex Preferences on Fertility: A Consideration of Parity Progression Ratio, Dominance, and Stopping Rule Measures." *Demography* 16:377–88.

Miller, B. 1981. *The Endangered Sex: Neglect of Female Children in Rural North India*. Ithaca: Cornell University Press.

Muhuri, P. and S. Preston. 1991. "Effects of Family Composition on Mortality Differentials by Sex Among Children in Matlab, Bangladesh." *Population and Development Review* 17:415–34.

Murthi, M., A.-C. Guio, and J. Dreze. 1995. "Mortality, Fertility, and Gender Bias in India: A District-Level Analysis." *Population and Development Review* 21:745–82.

Mutharayappa, R., M.K. Choe, F. Arnold, and T.K. Roy. 1997. "Son Preference and Its Effect on Fertility in India." National Family Health Survey Subject Report, No. 3:1–35.

Nag, M. 1991. "Sex Preference in Bangladesh, India and Pakistan, and Its Effect on Fertility." *Demography India* 20:163–85.

Nair, P.M. 1996. "Imbalance of Sex Ratio of Children in India." *Demography India* 25:177–87.

Nath, D.C. and K.C. Land. 1994. "Sex Preference and Third Birth Intervals in a Traditional Indian Society." *Journal of Biosocial Science* 26:377–88.

Operations Research Group (ORG). 1983. *Family Planning Practices in India: Second All-India Survey*. Baroda: Operations Research Group.

Park, C.B. and N.H. Cho. 1995. "Consequences of Son Preference in a Low-Fertility Society: Imbalance of the Sex Ratio at Birth in Korea." *Population and Development Review* 21:59–84.

Pong, S.L. 1994. "Sex Preference and Fertility in Peninsular Malaysia." *Studies in Family Planning* 25:137–48.

Rahman, M., J. Akbar, J. Phillips, and S. Becker. 1992. "Contraceptive Use in Matlab, Bangladesh: The Role of Gender Preference." *Studies in Family Planning* 23:229–42.

Rahman, M. and J. Da Vanzo. 1993. "Gender Preference and Birth Spacing in Matlab, Bangladesh." *Demography* 30:315–32.

Raju, K.N.M. and T.N. Bhat. 1995. "Sex Composition of Living Children Against Socio-Economic Variables While Accepting Family Planning Methods." *Demography India* 24:87–99.

Rodgers, J. 1997. "Does Having Boys (or Girls) Run in the Family?" Presented at the annual meetings of the Population Association of America, Washington, DC.

Sarma, D.V.N. and A.K. Jain. 1974. "Preference for Sex of Children and Use of Contraception Among Women Wanting No More Children in India." *Demography India* 3:81–104.

Sen, A. and S. Sengupta. 1983. "Malnutrition of Rural Indian Children and the Sex Bias." *Economic and Political Weekly* 18(19–21) :855–64.

Teitelbaum, M.S. 1972. "Factors Associated With the Sex Ratio in Human Populations." Pp. 90–109 in *The Structure of Human Populations,* edited by G.A. Harrison and A.J. Boyce. London: Oxford University Press.

Timaeus, I., K. Harris, and F. Fairbairn. 1996. "Can Use of Health Care Explain Sex Differentials in Child Mortality in the Developing World?" Pp. 203–34 in *Too Young to Die: Genes or Gender?*, edited by Population Division, United Nations. New York: United Nations Secretariat.

Waldron, I. 1983. "Sex Differences in Human Mortality: The Role of Genetic Factors." *Social Science and Medicine* 17:321–33.

———. 1987. "Patterns and Causes of Excess Female Mortality Among Children in Developing Countries." *World Health Statistical Quarterly* 40:194–210.

Wen, X. 1992. "The Effect of Sex Preference on Subsequent Fertility in Two Provinces in China." *Asia-Pacific Population Journal* 7(4):25–40.

Widmer, K., G. McClelland, and C. Nickerson. 1981. "Determining the Impact of Sex Preference on Fertility: A Demonstration Study." *Demography* 18:27–37.

Yi, Y., T.F. Liao, and N.H. Cho. 1997. "Male-Child Preferences and Sex-Selective Abortions in Korea." Presented at the annual meetings of the Population Association of America, Washington, DC.