The Missing Women Phenomenon in India: Causes and Effects

Wiebke Probst
Universität Hamburg
Correspondence: wiebke.probst@wiso.uni-hamburg.de

Abstract

For decades, India's demography has featured an unnaturally low child sex ratio. Much fewer girls than boys have been born, which has given rise to the so-called missing women phenomenon. Most plausibly, this bias can be assumed to be caused by the rational discriminatory behavior of parents who prefer sons over daughters. The present demographic development is not only morally reprehensible; it may also have undesirable socio-economic consequences such as criminal violence and social disorder. This paper provides both theoretical and empirical evidence regarding the causes and effects of the missing women phenomenon. It offers a socio-economic theory of son preference based on gender-specific cost and revenues as well as parents' opportunity of choice. The unwaning importance of dowry payments and the proliferation and affordability of modern preconceptual and prenatal sex selection techniques are suggested to be the key drivers of the skewed sex ratio. Three hypotheses derived from this theory are tested by means of a district-level multiple regression analysis based on 2001 census data. The regression results confirm that the overall economic status is negatively correlated with the child sex ratio. Regarding the relative economic value of females as compared to males, empirical evidence is mixed. As expected, conservative, anti-female socio-cultural attitudes, as proxied by religion, cast, and political party affiliation, are correlated with lower child sex ratios.

Introduction

While the natural, i.e., unmanipulated, sex ratio at birth is estimated to lie between 935 and 952 females per thousand males (Hesketh/Xing, 2006; Coale, 1991), the all-India child sex ratio age 0-6 was only 927.3 females per thousand males in the year 2001. Moreover, the child sex ratio varied considerably among districts as shown in, ranging from 766 in Fatehgarh, Punjab to 1,035 in

Year	1961	1971	1981	1991	2001
Child Sex Ratio (age 0-6)	976	964	962	945	927

Source: Registrar General of India 2001 (http://www.censusindia.gov.in)

Table 2. Time Trend of the All-India Child Sex Ratio

East Kameng, Arunachal Pradesh (Census India 2001). The trend is alarming: over the last four decades, child sex ratio continued to fall, where the most dramatic drop occurred between 1991 and 2001 (Table 1).

The resulting imbalance becomes visible in the population pyramid (Figure 1). In most developed countries, e.g. Canada, there is a small male surplus for cohorts younger than 40, an even sex ratio in the 40s cohort, and a pronounced female surplus in cohorts older than 50 due to higher natural mortality among males at every age. In India's pyramid, however, the male surplus is considerably higher and does not even out before the cohort of 60-64. Different approaches have been used to quantify the gender gap in the early 1990s. Sen (1992) estimated a number of 41.59 million missing women in India in a rather
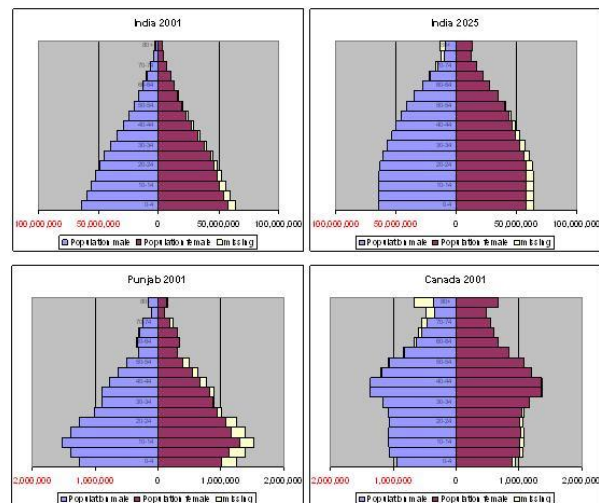

Sources: U.S. Census Bureau, International Data Base (India, Canada); Census of India (Punjab)

Figure 1. Population Pyramids

coarse calculation based on the actual sex ratio in Sub-Saharan Africa as a reference. Coale's (1991) estimate of 22.76 million missing women in India is based on a model stable population, incorporating levels of fertility and mortality prevailing some ten years earlier according to Model Life Tables "West" and assuming 944 as the stable sex ratio at birth. The most sophisticated method was applied by Klasen (1994), who used the more appropriate Model Life Tables "East" and variable sex ratios at birth, leading to an estimate of 35.87 million missing women. Klasen's update based on 2001 Indian Census data showed that the number

of missing women has increased to 39.1 million (Klasen and Wink, 2003).

Since natural or biological differences do not qualify as a sufficient explanation, the skewed sex ratio can be assumed to be caused by
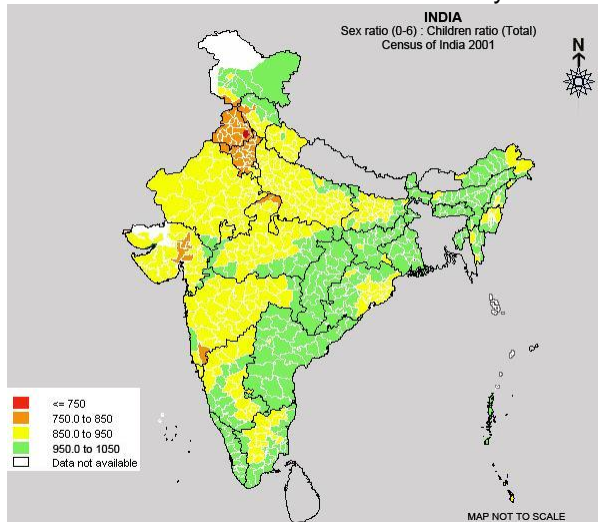
Figure 2. Child Sex Ratio (0-6 Years) among the Population by District

parental behavior such as sex-selective abortion, female infanticide, and discriminatory negligence of girl children resulting in inadequate nutrition and health care supply. Why do these parents prefer male offspring? To shed light on this question, this paper provides a socio-economic theory of son preference based on investment theory and assuming that parents behave as if they maximized the net present value of all economic and non-economic future revenues and expenditures associated with having a child. The expected utility flows are notably gender-specific – and mostly biased in favor of males. For example, a son could earn a higher money income than a daughter, enabling him to contribute to the family funding and to support his parents in their old age. A daughter, on the other hand, would leave her natal family after marriage to live with her husband's kin according to local custom, and would not be in charge to take care of her parents. Moreover, in some Indian societies, families are obliged to pay a high dowry on the occasion of a daughter's marriage, whereas they receive both dowry payments and a new family member who works in-house or contributes a money income when a son marries. However, parents' utility is not restricted to monetary components but also embraces cultural and religious beliefs. Thus, the considerable economic and non-economic expected loss from raising a female child may trigger parents' discriminatory behavior and lead to

a great number of "missing women" on an aggregate level.

To provide empirical evidence as to which socioeconomic variables might account for this phenomenon, I have conducted a cross-sectional, district-level multiple regression analysis based on 2001 census data. The results of my econometric survey suggest that a higher general economic status lowers the child sex ratio, where dowry payments appear to be the critical point. Religious, socio-cultural and economic factors reinforce each other to produce especially grave distortions. Beyond the impact of economic regressors on the population structure, repercussions on an economy's well-being caused by its demographic distortions are likely to occur. I will discuss these feedback effects to illustrate that the subject is relevant not only on moral grounds, but also in economic terms. The remainder of the paper is structured as follows: Section 2 provides a brief literature review and outlines a theory of parental behavior based on investment theory. Section 3 describes methodology, measures, and data used for the empirical analysis. Section 4 presents the empirical results. Section 5 concludes with an evaluation of consequences and future prospects.

A Socioeconomic Theory of Son Preference
Many scholars have conducted research on the Missing Women phenomenon, with Amartya Sen being the most prominent representative (Sen, 1992, 1998, 2003). Most of the previous empirical research concentrates on India and China, as the case is most striking in these two countries. The majority of India-specific studies are concerned with the impact of different cultural, political and economic variables on sex ratios, e.g. Chamarbagwala/Ranger (2006); Borooah/Iyer (2005) on the impact of religious demography; Rao (1993) and Anderson (2003, 2007) on dowry and the marriage market; Rose (1998) on the impact of transitory shocks on gender-specific infant mortality; Arnold/Choe/Roy (1998) on the effects of family composition on excess child mortality for girls; Kishor (1993) and Agnihotri et al. (2002) on female labor force participation and kinship structure; and Jha et al. (2006) on the contribution of prenatal sex determination and selective abortion to low sex ratios.

Although both hot spots India and China still suffer from high levels of poverty, the missing women case is not solely a poverty problem, which becomes clear in the light of counterexamples from other developing countries, such as findings suggesting that females are not at a nutritional disadvantage in Sub-Saharan

Africa (Svedberg, 2002). Hence, deeply-rooted cultural motives are most likely to be relevant, as described by the Indologist Syed (2001) who illustrates the historical foundations of the traditional preference of sons and the rejection of daughters with Old Indic texts. Growing concern about aggravated sex imbalance due to the increasing mass-availability of prenatal diagnostics has motivated another strand of research, e.g. Zubair et al. (2007) on gender preferences and demand for preconception sex selection in Pakistan; Junhong (2001) on prenatal sex determination and sex-selective abortion in rural China.

Based on this comprehensive body of research, it becomes clear that the causes of the missing women phenomenon are manifold. The aim of this paper is to align different key factors within a self-contained theory of son preference, to derive falsifiable hypotheses from this theory and to test these hypotheses by means of an empirical analysis. My attempt to theoretically explain parental behavior relies on investment theory, asserting that a rational decision maker chose the investment object with the highest net present value, i.e., the maximum sum of discounted expected revenues minus costs. This perspective seems somewhat odd in the context of childbearing, but has its merits, provided that the conceptions of 'costs', 'revenue', 'choice', and 'decision maker' are defined accordingly.

Gender-Specific Costs
Costs that occur before/at birth and in childhood are little gender-specific: they include the mother's income loss due to reduced physical fitness during pregnancy, the risk of maternal death, and expenses on food, childcare, clothing, healthcare, education, etc. These costs can be assumed to be roughly the same for boys and girls - unless intentionally reallocated, e.g. by spending more money on a boy's than a girl's school education. However, the picture changes drastically as children reach adulthood. A daughter becomes a severe financial burden when her family has to pay a dowry on the occasion of her marriage. Although the request, payment or acceptance of a dowry is prohibited by the Dowry Prohibition Act enacted in 1961, the practice is not only still very common in Hindu and Sikh societies but real dowries have been rising significantly in India for the last six decades (Anderson 2007). Table 2 provides a sense of the magnitudes involved.

Region	Time period	Average payments	Magnitude of average payments
Rural Karnataka	1960-1995	66,332 Rps. (1995)	6x annual village male wage
Rural Uttar Pradesh	1960-1995	46,096 Rps. (1995)	3x annual village male wage
Rural south-central India	1920s-1980s	4,792 Rps. (1983)	68% of total household assets before marriage
Rural Uttar Pradesh	1970-1994	$ 700	7x per capita annual income
Rural Tamil Nadu	1970-1994	$ 769	8x per capita annual income
Delhi	1920-1984	>50,000 Rps. (1984)	4x annual male income

Source: Anderson 2007, p. 157

Table 2: Average Dowry Payments in Selected Regions of India

From an economic perspective, dowry can be regarded as the price for a husband on the marriage market. In view of the total surplus of males in the Indian population, there is reason to argue that there should be excess supply of potential husbands. Thus, dowry payments would be expected to flow directly opposed to what is observed. Two characteristics of Indian kinship structures account for this surprising outcome: hypergyny and the marriage squeeze (Rao 1993). The Indian caste system creates submarkets that are impermeable for brides, but permeable for husbands. Most marriages take place within one caste, where a woman aspires to marry a man of higher status (hypergyny). Caste purity is tied to a woman's purity, which is why she is not allowed to marry beneath her status (Hudson/den Boer 2004, p. 70). The second built-in asymmetry emerges from the fact that women tend to marry older men. In India, population has been growing continuously for decades, obviously resulting in larger younger cohorts than older ones, as depicted in Figure 1. Hence, despite of the intra-cohort male surplus, a large number of women of marriageable age compete for a smaller cohort of potential grooms (Rao 1993, Anderson 2003). To make matters worse, competition among women is directed towards high-status men. Samuel (2002, p. 206) states that "modern dowry rates are exorbitant in urban areas among the socially enlightened families of doctors, engineers, dentists, businessmen and 'progressive' farmers". The amount of dowry generally increases with both the wealth of the bride's father and the groom's future prospects and is largest amongst the highest ranking castes (Anderson 2007). Finally, gender-specific non-monetary costs may arise from the permanent effort to supervise girls in order to preserve their chastity and virginity, since in Hindu, Sikh and Muslim societies, premarital sexual intercourse is considered to bring great dishonor and disrespect to the family and practically precludes a non-virgin girl from marriage (Syed 2001, p. 179).

Gender-Specific Revenues

Revenues associated with having a child are gained when it reaches adolescence, aside from child labor and household chores delegated to children. The main source of parental revenue consists in the share of the child's income and time dedicated to support and take care for its parents. Here again, gender differences become evident in the very pronounced wage differential: depending on the sector, female wages are on average 20 to 40 percent lower than male wages (Chandrasekhar/Ghosh 2002). Most striking with respect to gender inequality, however, are the culturally and religiously determined revenues: First of all, the receipt of dowry from the in-laws on the occasion of a son's marriage is a sizeable wealth transfer to his family. Second, as a woman leaves her natal family after marriage, she is not supposed to take care of her parents in their old age. She becomes part of her husband's family, lives in its household and contributes to its sustenance (Syed 2001). A son, on the other hand, remains responsible for his parents for his whole life. Apart from the monetary revenue, the traditional Hindu and Sikh cremation ritual *pind daan* requires that a son light his parents' funeral pyres and thereby ensures that the deceased reach heaven, whereas women are not allowed to attend the ceremony (Syed 2001, p. 85). Thus, only a son can provide for his parents' salvation after death; moreover, he is the one who continues the lineage, since descent is generally traced through the male line (Hudson/den Boer 2004).

To summarize, a son's expected net present value is considerably higher than a daughter's, where the difference is largely determined by cultural and religious customs. From this it follows that parents prefer male over female children. The next question is whether they actually have the choice to decide according to their preferences.

Choice

A couple can choose between having a(nother) child or not, where the availability and affordability of contraceptives facilitates this choice. If they wish to have a boy, they can make use of fertility centers offering preconceptual sex selection techniques such as in vitro fertilization with prior sperm-sorting or preimplantation genetic diagnosis. Despite the high costs, these services enjoy great popularity among wealthy couples in the urban areas (Syed 2001, p. 63). Much less expensive and widely available even in rural areas is prenatal sex determination by amniocentesis, chorion biopsy, or sonography, followed by sex-selective abortion. Although prohibited by the Pre-Natal Diagnostic Techniques Act since 1996, these techniques are becoming more widespread and affordable for broad levels of the population (Syed 2001, p. 66). After birth, parents can choose to kill their newborn daughter. The cruel practice of female infanticide has persisted in Tamil Nadu and Rajasthan, as reported by Syed (2001, p. 84-6). Finally, parents decide over the intrafamiliar distribution of necessities. Depending on the degree of son preference and the family composition, they might choose to deprive a girl of water, food, and healthcare and thereby increase its mortality risk (Syed 2001, p. 94-8). The stages of choice sketched above differ in terms of monetary costs and moral scruples, where monetary costs are highest for preconceptual techniques, lower for sex selective abortion and very low or zero for infanticide and neglect; in contrast to this, moral and legal concerns are lowest for discriminatory decisions prior to conception and rise as it comes to abortion or even child murder.

Who makes the choice? Until now, it was understood that parents act as a unity. However, this might not be the case. Sen (1999, chp. 8) considers distributive decisions within the family as a bargaining game, the outcome of which is determined by the respective family members' implicit bargaining power in solving cooperative conflicts. Claiming that mothers are more inclined to promote their offspring's wellbeing -irrespective of gender- than the society as a whole, they would prefer to divide the limited supply of vital provisions according to their children's needs rather than their sex. If this is the case, increasing maternal bargaining power may lead to a less discriminatory resource division and can in particular alleviate the mortality bias. Similarly, decisions on family planning, contraception, and abortion can be reached mutually or by one of the parents, depending on women's empowerment. Based on these theoretical considerations, I propose three hypotheses:

H1: A higher general economic standard will decrease the child sex ratio.
Among the middle and upper class, son preference is more pronounced due to a greater importance attached to dowry issues. Moreover, better-off families have access to effective selection methods such as contraceptives, preconceptual/prenatal diagnostics and lower-risk sex selective abortions.

H2: A lower relative economic value of females as compared to males will decrease the child sex ratio.

Large gender-specific imbalances of the expected net present value associated with having a child reinforce parents' son preference and account for more discrimination. Additionally, women who possess little economic power will not be able to assert themselves in intrafamiliar decision situations.

H3: A lower socio-cultural standing of women will decrease the child sex ratio.

Cultural and religious traditions determine a woman's relative economic and non-economic value, where conservative Hindu and Sikh communities are expected to show higher son preference than Muslim and tribal communities.

Materials and Methods

In order to test these hypotheses, I conduct a cross-sectional, district-level multiple regression analysis, using Ordinary Least Squares (OLS) to estimate the coefficients of the linear regression model $CSR = X\beta + \varepsilon$. The dependent variable (CSR) is the child sex ratio in the age group 0-6 years. As suggested earlier (e.g. Coale 1991, Hudson/den Boer 2004 p. 104), I use the child sex ratio instead of the total sex ratio in order to avoid that the results become biased through migration and mortality patterns unrelated with parental behavior.

Unfortunately, the economic value attached to females and their socio-cultural standing are not directly observable. In the following, I shall elucidate in what sense it is appropriate to use the explanatory variables contained in the matrix X as proxies.

The variables *per capita net state domestic product* (NSDP) and *share of people living below the poverty line* (poverty) are used to represent the overall economic wellbeing of a district's inhabitants. High per capita income and low poverty rates indicate a high economic standard. To account for the diminishing marginal utility of income, I shall also run an alternative regression using the *log of per capita net state domestic product* (ln_NSDP). Apart from these monetary measures, *male literacy rate* (lit_male), *male workforce participation rate* (WPR_male) and *percentage of urban population* (perc_urban) were included, where higher values point to a higher development level associated with a higher general economic standard.

As suggested by Kishor (2003), I attempt to measure gender-specific economic power by using the *relative female literacy rate*

(lit_fem_percofmale) and the *relative female workforce participation rate* (WPR_fem_percofmale) and thereby controlling for differences in the level of male workforce participation across districts, whereas most empirical research has focused on absolute rates (Chamarbagwala/Ranger 2006, Agnihotri et al. 2002). Higher values indicate a higher *relative* ability of women to earn an outside income, resulting in a higher perceived relative economic value and less economic dependence. The prevalence of *dowry-motivated murder* (dowry_m) and *dowry-motivated suicide* (dowry_s) indicate a great importance attached to dowry issues in a society. These crime statistics should be viewed as a makeshift, since reliable figures on dowry payments are not available for all-India. *Crude birth rate* (crude_BR) and *total fertility rate* (TFR) are included as variables to account for reproduction patterns, assuming that high values lead to more competition for jobs, physical resources like food and health care and -most notably- spouses and thus further reduce the relative economic value of already disadvantaged female offspring.

Culture can affect the economic and non-economic value of girls in many, often subtle, ways and is therefore particularly difficult to measure. A high share of votes polled for the conservative *Bharatiya Janata Party* (BJP) suggests a widespread patriarchic attitude. The prevalence of *early marriage among females* (child_marriage) indicates little decision making power and high dependence of women. The *religion* variables (perc_hindu, perc_muslim and perc_sikh) were included to account for gender-relevant religious traditions and social structures; so were affiliation to *scheduled casts* (perc_SC) and *scheduled tribes* (perc_ST). The *total sex ratio* (TSR) serves as a measure of male dominance, where low levels indicate a comparatively higher mortality among females as opposed to males in the past and/or gender-specific migration patterns. The dataset used in the analysis contains 589 observations corresponding to 589 from a total of 593 districts in India (the set is reduced by 4 missing values). Most figures originate from official government statistics and are either directly incorporated or assembled as specified in Table 3. The data on crude birth rates and total fertility rates were retrieved from estimates based on the 2001 census (Guilmoto/Rajan 2002). Unless otherwise noted, all data refer to the year 2001. The variables concerning dowry crime, child marriage, BJP votes, net state domestic product, and poverty were available only at the state level.

To preserve the sound district-wise disaggregation, I chose to use state-level data for all districts within a state where inevitable. Although this procedure causes a loss of information, the incorporation of the respective variables provides additional insights, since a total number of 32 state-level observations still yield a reasonable spread.

Results

First of all, I estimated two alternative OLS regressions, using the net state domestic product (NSDP) in the first run and the log of NSDP in the second run as income variable. The regression results are summarized in Table 4.

CSR	Coefficient	Std.Error	t-Value	Coefficient	Std. Error	t-Value
NSDP	-.0001536	.0002887	-0.53			
Ln_NSDP				-10.73119	5.435226	-1.97**
perc_poverty	138.9448	16.64551	8.35***	125.3388	17.19777	7.29***
lit_male	-38.49859	18.02263	-2.14**	-37.77396	17.91211	-2.11**
WPR_male	213.9161	33.44039	6.40***	217.8765	33.39828	6.52***
Perc_urban	5.578603	8.041102	0.69	8.133511	7.798777	1.04
crude_BR	.4390489	1.104665	0.40	.8386671	1.112545	0.75
TFR	-7.921291	7.632374	-1.04	-10.91128	7.718715	-1.41
lit_fem_percofmale	-44.12222	19.0723	-2.31**	-38.93173	19.09895	-2.04**
WPR_fem_percofmale	-20.3364	8.514866	-2.39**	-17.69986	8.591747	-2.06**
dowry_m	-166.0815	44.24691	-3.75***	-178.149	44.37242	-4.01***
dowry_s	-69.81879	21.64241	-3.23***	-70.90973	21.57429	-3.29***
perc_SC	40.25074	19.5715	2.06**	42.24041	19.53316	2.16**
perc_ST	56.81282	9.276424	6.12***	56.90223	9.170241	6.21***
BJP	-17.64146	10.59621	-1.66*	-18.84204	10.57583	-1.78*
child_marriage	27.02813	13.609	1.99**	22.20986	13.62371	1.63
Perc_hindu	-24.56964	11.40122	-2.16**	-23.33487	11.37193	-2.05**
Perc_muslim	63.85344	12.91748	4.94***	62.58708	12.72615	4.92***
perc_sikh	-162.3137	15.3664	-10.56***	-162.6442	15.27584	-10.65***
TSR	.3044222	.0262712	11.59***	.3001788	.0262391	11.44***
Constant	586.4872	41.95499	13.98	686.6294	66.87182	10.27
Observations	589			589		
R-squared	0.7190			0.7207		
Adj.R-squared	0.7096			0.7114		
F (19, 569)	76.61			77.29		
Root MSE	25.588			25.507		
*** significant at 1%, ** significant at 5%, * significant at 10%						

Table 4: Regression Results for the OLS Regressions

For the OLS results to be valid, it is necessary that the variance of the error terms is constant, i.e., that the condition of homoskedasticity is satisfied. Whenever the error variance changes across different values of the explanatory variables, we have to deal with a heteroskedasticity problem. To check for potential violation of the homoskedasticity assumption, I used the Breusch-Pagan-Test for heteroskedasticity of unknown form and followed the procedure that is proposed by Wooldridge (2003, p.267). The hypothesis tested is H0: error variance is constant. Regressing the squared residuals of the simple OLS regression on the independent variables (X) yields $\chi^2(1) = 35.85$ (p-value: 0.0000); this indicates that the coefficients of this regression are jointly significant. H0 is rejected in favor of heteroskedasticity; therefore, the OLS estimates are not valid for inference. The STATA software package provides the option to estimate robust standard errors. Using this method does not change the coefficients, only the variance would be overestimated when not controlling for heteroskedasticity. Table 5 displays the results of the robust regressions.

Because of the slightly better explanatory power (R-squared of 0.7207 versus 0.7190), I shall infer my conclusions from the results of the second regression.

H1: A higher general economic standard will decrease the child sex ratio. Empirical evidence supports this hypothesis. The coefficient for the log per capita net state domestic product is negative and statistically significant: the higher the average per capita income in a district, the lower is the child sex ratio. This direction is also reflected in the positive, highly significant poverty coefficient, stating that an increase of the share of people living below the poverty line by one percentage point increases the child sex ratio by 1.25. The negative coefficient for male literacy, here used as a proxy for economic power in general, points in the same direction. These consistent findings are thwarted by the second economic proxy: the coefficient for male workforce participation, calculated as the number of male workers divided by the total male population, is strongly *positive* and statistically significant at a 99% confidence level. That is to say, a one percentage point increase of WPR_male increases the child sex ratio by 2.18. A possible explanation for this outcome could lie in the decomposition of the variable: it contains not only information regarding economic behavior, i.e., the number of workers proportional to the working age population, but also includes a demographic component, i.e., the share of the working age population in the total population. Ceteris paribus, a low share of young people results in a high workforce participation rate. Thus, the behavioral component could still be in line with the general findings suggesting that a higher economic status is associated with a lower child sex ratio, whereas the demographic element supports the competition argument: fewer children mean less fierce competition for resources, which could favor otherwise disadvantaged female offspring. The negative coefficient of the total fertility rate, although not statistically significant, confirms this argument. To verify my conjecture, I calculated the bivariate correlation of WPR_male and TFR from

CSR	Coefficient	Robust Standard Error	t-Value	Coefficient	Robust Standard Error	t-Value
NSDP	-.000153	.000355	-0.43			
Ln_NSDP				-10.73119	5.903877	-1.82*
perc_poverty	138.9448	17.47153	7.95***	125.3388	17.71775	7.07***
lit_male	-38.49859	16.2569	-2.37**	-37.77396	15.8879	-2.38**
WPR_male	213.9161	35.87931	5.96***	217.8765	35.93666	6.06***
Perc_urban	5.578603	8.973661	0.62	8.13351	8.805434	0.92
lit_fem_percofmale	-44.12222	18.23963	-2.42**	-38.93173	18.15171	-2.14**
WPR_fem_percofmale	-20.3364	8.274766	-2.46**	-17.69986	8.364568	-2.12**
dowry_m	-166.0815	36.33311	-4.57***	-178.149	36.65098	-4.86***
dowry_s	-69.81879	19.07783	-3.66***	-70.90973	18.97949	-3.74***
crude_BR	.439048	1.188697	0.37	.838667	1.17081	0.72
TFR	-7.921291	8.187877	-0.97	-10.91128	8.137871	-1.34
BJP	-17.64146	12.45172	-1.42	-18.84204	12.46662	-1.51
child_marriage	27.02813	14.92026	1.81*	22.20986	14.98864	1.48
Perc_hindu	-24.56964	11.88563	-2.07**	-23.33487	11.80073	-1.98**
Perc_muslim	63.85344	15.02995	4.25***	62.58708	14.5429	4.30***
perc_sikh	-162.3137	15.77693	-10.29***	-162.6442	15.57327	-10.44***
perc_SC	40.25074	19.85545	2.03**	42.24041	19.7825	2.14**
perc_ST	56.81282	9.400263	6.04***	56.90223	9.202663	6.18***
TSR	.304422	.033715	9.03***	.300179	.033326	9.01***
Constant	586.4872	48.31186	12.14	686.6294	76.63619	8.96
Observations	589			589		
R-squared	0.7190			0.7207		
F (19, 569)	71.79			71.85		
Root MSE	25.588			25.507		
*** significant at 1%, ** significant at 5%, * significant at 10%						

Table 5: Robust Regression Results

the data used in the regression. I found a noticeable negative relationship (correlation coefficient) of -0.5175, which proves that more than half of the workforce participation rate variance is explained by the demographic constituent. The result reinforces the findings of earlier quantitative studies, e.g. Chamarbagwala/Ranger (2006), who undertook a more detailed analysis using expenditure percentiles. They reason that, at very low expenditure levels, rising income may make sex selection affordable without giving households the resources to raise girls: abortion costs can be as low as a few hundred rupees whereas dowries are substantially higher (p. 9). This also substantiates Sen's proposition that "modernization (when not accompanied by empowerment of women) can even *strengthen*, rather than weaken, the gender bias in child survival" (Sen, 1999, p. 197, italics in original).

H2: A lower relative economic value of females as compared to males will decrease the child sex ratio.
Regarding the second hypothesis, empirical evidence is mixed. Both relative female literacy rate and relative female workforce participation rate show *negative*, statistically significant coefficients, whereas Chamarbagwala/Ranger's

survey (2006), likewise based on 2001 census data, found no significant effects for *absolute* female literacy and workforce participation rates. My findings contradict the expectation expressed by Sen (1999) that better educated and working women would possess more bargaining power to influence intrafamiliar decisions on reproduction and resource distribution and would exercise this power in favor of their girl children. However, this argument appears to be too optimistic regarding women's agency. The negative impact of literacy and economic participation could be traced back to increased access to and knowledge about preconceptual sex determination and prenatal sex detection and selective abortion. Moreover, a working woman's decision to have fewer children while still desiring to have at least one boy could further strengthen her son preference – and daughter aversion. Parents consider the family to be complete once a son is born, and therefore discontinue any further family-planning activities. The government's efforts to propagate and incentivize the small-family norm (Ministry of Health and Family Welfare, n.d.) supports these tendencies.

A particular and novel feature of my analysis compared to earlier studies is the introduction of dowry crime variables. The coefficients of both the share of dowry-motivated murder and the share of dowry-motivated suicide are negative, highly significant, and large in value; they suggest that the child sex ratio is notably lower where great importance is attributed to dowry issues. The competition argument, suggesting that fewer children mean less fierce competition for resources and thereby a relative improvement of girl's prospects, is not supported; still, the negative coefficient of the total fertility rate points into the right direction. The hypothesis has proven to be too general; it has to be rejected in so far as relative female literacy and workforce participation are concerned. However, with respect to the dowry variables, empirical evidence supports the relative value hypothesis.

H3: A lower socio-cultural standing of women will decrease the child sex ratio.
The third hypothesis is confirmed by empirical evidence. The only deviation from what was anticipated is the positive sign for the child marriage coefficient; yet the relation is not statistically significant. A possible explanation traces again back to dowry: for child brides, dowry requirements are less high because parents' time pressure to wed their daughter is low and child brides are assumed to be more obedient (Syed 2001, p. 113). The political variable BJP shows the

expected negative coefficient, but is also not statistically significant. The most striking results for this hypothesis pertain to the religion variables. Both share of Hindus and share of Sikhs bear highly significant negative coefficients, where the marginal decrease of child sex ratio is seven times higher for a one percentage point increase in the share of Sikhs than for a one percentage point increase in the share of Hindus. The perc_muslim coefficient is positive and statistically significant, indicating that the antifemale bias is less pronounced among the Muslim population. This outcome confirms the findings of Borooah/Iyer (2005), whose survey on India's religious demography establishes "a much lower degree of 'daughter aversion' for Muslims than for Hindus" (p. 3). The remarkably high coefficient for the share of Sikhs has been observed earlier by Chamarbagwala/Ranger (2006). The Sikh ideal advocates gender equality as a fundamental principle and prohibits dowry practices, as emphasized by various Sikhist organizations such as The Sikh Coalition and Sikh Women. However, reality looks different. In a 1984 field study on the Jat cast in rural Punjab, which a substantial proportion of Sikhs belongs to, Das Gupta (1987) has observed that local custom not only requires a family to pay a dowry, but also to provide their girl with clothes and gifts for her in-laws throughout her life. Das Gupta (1987, p. 92) emphasizes that "The flow of resources is always supposed to be from the men of the woman's household of birth to her husband's household. […] [Her father or brothers] are supposed to receive nothing in exchange"; they even refuse to accept food or beverage in the son-in law's house unless they pay for it. Although these observations have been made more than 20 years ago, they provide further insight on how the value of females is adversely affected through cast culture and religion. This is reaffirmed by the positive, statistically significant coefficients for the share of population belonging to scheduled casts and scheduled tribes among which dowry payments and other gender-discriminating traditions are less common (see Syed, 2001, p. 36-7). Finally, the regression coefficient for the total sex ratio is significantly positive, but very small in number. The fact that men outnumber women in total does not account for big distortions of the child sex ratio.

Conclusions

Prenatal sex determination has been available since about 1985. Thus, the consequences of the skewed sex ratio dawn on India now, as the first large cohorts of "surplus" young men reach adulthood (Hesketh/Xing 2006). Hudson/den Boer (2004) depict a gloomy scenario: As women become scarce, competition on the marriage market increases. The young men left behind belong mostly to the lowest socioeconomic class, because they are outcompeted by men of higher standing. The authors' compilation of different empirical surveys exhibits a striking correlation of low sex ratios to criminal violence, crime against women such as trafficking and rape, and social disorder. Moreover, there is cause for concern that these men tend to be attracted to military-type organization, thus becoming an incalculable domestic and international safety hazard. The pattern of male surplus and violence has been evident throughout history and across cultures, e.g. in the nineteenth-century North American "Wild West", most impressively described by Courtwright (1996). The same lawlessness that ruled this era seems to revive in the northwestern region of India, nowadays referred to as the "Indian Wild West" (Hudson/den Boer 2004, p. 239).

Hesketh/Xing denote certain consequences of distorted sex ratios as "positive outcome" (2006, p. 13274), such as an increasing tolerance toward homosexuality, a higher share of wanted births leading to less discrimination and lower female mortality, control of population growth, and an increasing female value due to scarcity – admitting that it is rather the males who benefit from this increase. Hesketh/Xing's valuation appears like bitter irony as it implies that sex-selective abortion is preferable over discrimination against girls. Moreover, the correctness of their implications is challenged by Hudson/den Boer (2004, p. 202 ff), who suggest that with increasing scarcity of women, powerful men are triggered to control them even more tightly; kidnapping and trafficking becomes rampant; a race for brides starts, driving the female marriage age down; and population growth does not necessarily slow down because tighter male control may result in more births per woman. The government is taking action: dowry practices and prenatal sex determination are prohibited by law, infanticide and child maltreatment are heavily punished (Syed 2001, p. 30). The Ministry of Health and Family Welfare appeals to parents with slogans like 'Beti ya beta, dono ek hain' (boy or girl, they are both equal) and launched incentive programs, e.g. awarding a cash incentive of Rs. 500 at the birth of a girl child of birth order 1 or 2 (Ministry of Health and Family Welfare, n.d.). Still, enforcement is not strict enough, the law is widely

ignored. As Hudson/den Boer (2004, p. 247) point out, "Tradition can be a stubborn, often inflexible force". Sen's hope that women's active agency could alleviate the skewed child sex ratio by strengthening the intrafamiliar bargaining power of mothers and by assigning a higher expected economic value to daughters (Sen 1999, chp. 8) seems dashed. The problem appears to be that intrafamiliar power structures are mostly implicit, conventions-based and strongly influenced by the social and cultural value system. Changing them takes long, as social perceptions of gender-specific contribution and productivity tend to be inert and not only persist among men, but also bias women's self-esteem and sense of entitlement.

What will the future hold? In a 2004 interview, the demographer Ashish Bose perceptively stated that "in India, there is an unholy alliance between tradition and technology. Tradition is marked by son-preference. Technology started in the '80s with amniocentesis" (Gurung 2004). Refining this proposition, I have identified three forces that may determine India's future sex ratio: (1) increased availability of prenatal sex determination methods, (2) secularization and Westernization of the young generation, (3) alleviation of the marriage squeeze.

Due to technological progress, techniques for preconceptual and prenatal sex determination become cheaper and more accurate; at the same time, the general income level rises. Thus, these methods become more and more affordable for the middle and lower class, providing people the opportunity to act according to their reproductive preferences. Ceteris paribus, this factor aggravates the missing women problem.
There is reason to assume that the ubiquitous son preference is mitigated by the trend of secularization. The young upper and middle class is well-educated and open-minded; in many places, love marriages outnumber arranged marriages; and emancipated young women, being well aware of their professional opportunities, strictly refuse dowry payments. High media coverage of dowry deaths, infanticide, and young men's problems in finding brides might help to raise public awareness and to exert pressure on policymakers and law enforcement authorities. So do countless campaigns by local and international NGOs. Hopes for accelerating the trickle-down of policies that promote the advancement of women in the society can be pinned to the women themselves because women are typically in charge of child rearing and education. Whether as

mothers towards their own offspring or as nurses, nannies and teachers towards other peoples' children, women act as disseminators and therein have a salient chance to influence the young generation's perceptions. They serve as role models for girls and exemplify a female image to boys through their own life.

Finally, demographic change could alleviate the marriage squeeze. In the past, high population growth rates made sure that potential brides -on average 5.62 years younger than their spouses- were abundant. As becomes evident from the demographic forecast, the base of the population pyramid narrows (see Figure 1), so does the "bride supply" (Rao, 1993). In combination with the prevailing male surplus in a cohort, this should cause dowries to fall and thus mitigate the gender imbalance regarding expected net present values.
I believe that the child sex ratio will gradually increase over the next decades; however, irreparable damage has already been done, not only to the countless girls who were deprived of their natural right of life, but also to society as a whole.

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