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Sex-Selective Abortions, Gender Discrimination in Child Health and Nutrition, and Marriage Patterns: Empirical Evidence from India

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Thesis directed by Prof. Terra McKinnish

This dissertation is composed of three studies. The first chapter examines the substitutability between sex-selective abortions and postnatal gender discrimination. The second chapter explores the relationship between parental son preference, level of female autonomy, and gender gaps in child nutrition. The final chapter examines differences in spousal choices and intra-household gender relations across different marriage types prevalent in India.

The first chapter tests whether sex-selective abortions have substituted for discrimination against girls after birth. First, I identify the groups where the likelihood of sex-selective abortions being used is the greatest and then check if these same groups have experienced increases in girls' health investments and outcomes. Results indicate that wealthy urban households exhibit the largest sex ratio imbalance. This same group exhibits a relative increase in the duration of breastfeeding for girls. In contrast, the biggest improvements in relative female postneonatal mortality rates are observed in poorer rural households who are less likely to practice sex selection. Overall, the results suggest that sex selection and postnatal discrimination are practiced by different groups.

The second chapter examines whether gender gaps in child nutrition are evident in the presence of parental son preference and then tests if this relationship varies with the level of female autonomy. When mothers have a son preference, gender gaps in child nutrition are observed if she is involved in making household decisions. In contrast, no independent association is found between child nutrition outcomes and paternal son preference.

The third chapter examines differences in spousal choices and intra-household gender relations across marriage types, which are categorized based on the extent of a woman's say in the choice of her partner. The results indicate that in arranged marriages, women are more likely to marry someone from the same caste and someone at least as educated as her. On the other hand, self-arranged marriages are likely to take place between similarly aged individuals and individuals from different castes. Furthermore, the greatest autonomy in decision making is found among women involved in the choice of their spouse together with their parents rather than among women in self-arranged marriages.

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Chapter 1

Sex-Selective Abortions and Gender Differentials in Child Health Investments

1.1 Introduction

There is a general consensus that household resources are allocated differently between male and female children in India. This is evident from several studies which document the existence of gender gaps in education, health and nutrition outcomes, and in mortality rates (Das Gupta 1987; Kingdon 2002; Oster 2009b; Pande 2003). More recently, researchers have sought to explain increases in the male to female sex ratio, which has perpetuated the problem of 'missing women' in India.[1] Since the sex ratio is found to vary by birth order and the sex composition of older siblings, imbalances in this ratio have largely been attributed to the increasing use of prenatal sex determination followed by the selective abortion of female fetuses.[2] Both forms of discrimination, sex-selective abortions and the neglect of female children, stem from a strong preference for sons over daughters.[3]

This paper tests whether sex-selective abortions have substituted for discrimination against

[1] The 'natural' sex ratio at birth is about $104 - 107$ boys per 100 girls (Ganatra 2008). In contrast, estimates from the Indian Census indicate that the sex ratio in the $0 - 6$ age group has increased from 105.8 in 1991 to 109.4 in 2011 (Jha et al. 2011). Almond and Edlund (2008) and Almond et al. (2009) have shown that such sex ratio imbalances exist even among the children of Asian-Indian immigrants in the US and Canada.

[2] Some direct evidence of use of sex-selective abortions comes from hospital or community based studies (Sachar et al. 1993; Booth et al. 1994; Ganatra et al. 2001). However, given the paucity of nationwide direct estimates of sex-selective abortions, most studies have analyzed the National Family and Health Survey (NFHS) for indirect indicators of the same (Arnold et al. 2002; Retherford and Roy 2003).

[3] This son preference has evolved due to various social, cultural and religious reasons. For example, parents perceive that it is more costly to bring up a daughter because they have to arrange for substantial amounts of money as dowry payments for the daughter's marriage but get little or no financial support in their old age from adult daughters compared to sons. Readers may refer to Shepherd (2008) for a book length exposition on reasons for son preference.

girls after birth. Specifically, I examine whether the time periods and conditions associated with a higher likelihood of sex-selective abortion are also associated with improvements in girls' health investments and outcomes. To identify the births that are most likely to be prenatally selected, I examine changes in the proportion of male births, a proxy used in previous literature for the use of sex-selective abortions. Then I examine the trends in gender gaps in postneonatal mortality, breastfeeding duration and vaccination status in these same groups.

Goodkind (1996) was the first to suggest that sex-selective abortions could substitute for postnatal gender discrimination. The basic idea of this 'substitution hypothesis' is that, with the use of sex-selective abortions, girls who are most likely to have been postnatally discriminated are terminated prenatally instead so we should observe an increase in the welfare of girls. He assessed vital registration data in East Asia, a region where the existence of son preference has also been documented. In Korea, sex-selective abortion was found to substitute for postnatal discrimination, because even though sex ratio at birth increased, more female infants survived after birth. In contrast, China experienced high female child mortality rates as well as a high prevalence of sex-selective abortion, suggesting additive effects of sex-selective abortion. A recent study by Lin et al. (2008) found that, in Taiwan, sex-selective abortions have led to fewer female deaths during infancy. Shepherd (2008) is the first study to test the 'substitution hypothesis' for India by using data which includes births till 1999. She found that sex-selective abortion is associated with increased gender discrimination in neonatal mortality and vaccination rates but has no effect on gender gaps in postneonatal mortality and treatment of diseases.

The issue of substitutability between sex selection and postnatal discrimination is much less explored than the incidence of sex-selective abortions itself. This paper contributes to that strand of literature in several ways.[4] First, compared to Shepherd (2008), this study uses data from a time when sex-selective abortion was more accessible to the population, improving the ability to observe them. Second, the analysis includes breastfeeding which is an investment of maternal time,

[4] In the process of preparing this manuscript for submission, I found a working paper by Hu and Schlosser (2010) that was just posted in September 2010. The analysis in my paper and this working paper, despite the fact that they are independent and concurrent work, are substantially similar and yield similar results.

as opposed to mortality and vaccination which may be more dependent on income. Finally, to facilitate the examination of substitution effects in the correct groups, the analysis here is stratified by wealth status and urban-rural location of household, which influence access to prenatal tests, abortion facilities and postnatal health care.

Consistent with previous literature, this paper finds increased proportion of male births in higher birth orders in wealthy households, which indicates the use of sex-selective abortions. No strong evidence of a change in relative investments between girls and boys is observed in these same groups. An exception is found in rich urban households, where the duration of breastfeeding for female children experienced a relative increase. Surprisingly, the biggest improvements in relative female postneonatal mortality rates is found in poorer rural households who are less likely to practice sex selection. The absence of strong substitution effects suggest that sex selection and postnatal gender discrimination are practiced among different groups.

1.2 Sex Determination: Technologies and Policies

In India, abortions have been legal since the passage of the Medical Termination of Pregnancy (MTP) Act in 1971. This law specifies who can seek abortion, the medical and social circumstances under which an abortion can be performed, and requires abortions to be performed by registered medical practitioners in certain approved facilities.[5]

Sex-selective abortion is the targeted abortion of female fetuses and is preceded by a test to determine the sex of the fetus. Currently, there are three procedures that can be used for fetal sex determination: amniocentesis, chorionic villus sampling and ultrasound. The first two technologies have been available since the 1970s (Arnold et al. 2002; Luthra 1994). Amniocentesis can be used between 15 and 17 weeks while chorionic villus sampling can be used between 10 and 12 weeks to determine the sex of a fetus. However, high costs of these procedures have restricted their usage to very wealthy families (Pörtner 2009; Shepherd 2008). Introduced in the mid-1980s, ultrasound can detect the sex of a fetus at the 20th week (Shepherd 2008). Because of it's low cost relative to the

[5] Readers may refer to Arnold et al. (2002) for more details on the MTP Act.

previous two procedures, ultrasound is currently the most commonly used technique (Arnold et al. 2002; Ganatra et al. 2001).[6] The low price accompanied by the portability of the ultrasound equipment increased the reach of prenatal tests to a wider population and gradually extended the availability of sex determination tests to remote and rural parts of India (Arnold et al. 2002; Sharma et al. 2007).

The increasing availability of sex determination technologies and the selective abortion of female fetuses triggered public debate and concern. Certain feminist movements started linking sex selection to the issue of female discrimination, and more broadly, to human rights violation (Gangoli 1998). Accordingly, in 1994, the Government of India passed the Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act (PNDT Act), imposing a nationwide ban on the use of prenatal techniques to determine the sex of a fetus.[7] The enforcement of this law, however, has been poor (George 2002; Subramanian and Selvaraj 2009). Monitoring of private laboratories and clinics has been lax and doctors have resorted to communicate the results of a sex determination test verbally rather than in writing (Retherford and Roy 2003). Pressure from the medical community has also prevented government officials from taking legal action against doctors who are in violation of this law (Mudur 2006). Therefore, although illegal, problems with enforcement and easy evasion of the PNDT Act have resulted in the rampant misuse of prenatal testing methods for sex determination purposes.

1.3 Methodology

Since sex selection guarantees male births, the 'substitution hypothesis' put forward by Goodkind (1996) predicts that girls who would have experienced the greatest postnatal discrimination will be terminated prenatally instead and so we should observe more equitable investments between male and female children. Using data from the National Family and Health Survey (NFHS) to test this hypothesis, the first step is to identify births where the likelihood of sex-selective abortion

[6] The typical cost of an ultrasound is in the range of $\$10 - \$20$ while the cost of an amniocentesis is double this amount (Arnold et al. 2002). Chorionic villus sampling costs even more than an amniocentesis (Pörtner 2009).

[7] The use of these technologies for prenatal care, however, continues to be legal.

being used is the greatest. The next step is to examine whether the time periods and conditions associated with a higher likelihood of sex-selective abortion are also associated with smaller gender gaps in postneonatal mortality and child health investments.

1.3.1 Use of Sex-Selective Abortions

As a starting point, I use the time variation in access to sex determination technologies to examine changes in the proportion of male births over time. The proportion of male births serve as a proxy for the use of sex-selective abortions in the absence of direct nationwide measures of the same.[8] Using births of children as the units of analysis, I estimate a linear probability model given by:

$$male_{ist} = \alpha_0 + \alpha_1 T_1 + \alpha_2 T_2 + \gamma_s + \epsilon_{ist} \tag{1.1}$$

where *male* is an indicator for the gender of child i born in state s in time period t. T_1 and T_2 are the decades $1986 - 1995$ and $1996 - 2005$ and the excluded time period is the decade $1976 - 1985$ (period T_0). γ_s represents a vector of state fixed effects. The regressions are estimated by birth order of child since a higher birth order implies that couples are close to their target family size, which increases the probability of prenatally selecting the child. Urban-rural location and wealth status of the household are factors that can alter the affordability and accessibility of prenatal tests (Retherford and Roy 2003; Kishor and Gupta 2009). Therefore, regressions are also estimated separately by location and wealth quintile of household.[9] ,[10]

The coefficients of interest are α_1 and α_2, which give the difference in the proportion of male births in time periods T_1 and T_2 relative to the baseline period T_0. Although prenatal tests have

[8] This proxy has also been used by Shepherd (2008).

[9] In each of the three rounds, NFHS reports the wealth quintiles of households. Wealth indices are constructed from information on ownership of household assets (such as furniture and vehicles), dwelling characteristics (such as water source), home construction materials and whether a household member has a bank or post office account. These composite indices are then categorized by quintiles (relative to households in each survey round), quintile 1 denoting the poorest households and quintile 5 denoting the wealthiest households.

[10] Logit models are usually preferred when the dependent variable is binary. Because the models are estimated on smaller subgroups (such as birth order 1 in households falling in wealth quintile 1 residing in urban areas), enough observations are perfectly predicted that it becomes problematic to estimate the non-linear model in some cases. Aggregating across the wealth quintiles, I have compared estimates of the linear probability and logit models and find no substantial differences in significance levels or magnitudes of the estimated marginal effects.

been available since the 1970s, sex-selective abortions became widespread only in the 1990s (Clark 2000). Based on this information, in the first decade (1976 – 1985), the sex ratio should be close to the 'natural' ratio of about 104 – 107 boys per 100 girls. The second decade is when the use of these technologies is starting to increase and the third decade is the most recent time period when these technologies are highly diffused. Since diffusion of these testing methods positively correlate to the use of sex-selective abortions, we would expect to observe an increase in the proportion of male births over time.

The identification strategy rests on the premise that no changes occurred over the time of higher spread of sex determination technology that would affect the proportion of male births and differentially affect it at higher births orders. Alternate mechanisms suggested in previous literature such as differential stopping behavior (Clark 2000) and Hepatitis B (Oster 2005) are unable to explain increasing proportion of male births at higher birth orders.[11] ,[12] Similarly, if the increased availability of prenatal testing methods now enable mothers to bring to full term more male infants, who are more frail and more likely to die in utero than females, there is reason for concern only if these improvements have different birth order effects. However, a study by Lin et al. (2008) shows that this is an unlikely scenario.

1.3.2 'Substitution Hypothesis'

The next step is to examine trends in the gender gaps in postneonatal mortality and child health investments over the time periods and conditions associated with high rates of sex-selective abortion. First, I consider the incidence of postneonatal mortality, which refers to the death of an infant from the end of the first month up to 11 months after birth (Shepherd 2008). I estimate the following linear probability model.

$$z_{ist} = \lambda_0 + \lambda_1 T_1 + \lambda_2 T_2 + \lambda_3 (male_{ist} \times T_0) + \lambda_4 (male_{ist} \times T_1) + \lambda_5 (male_{ist} \times T_2) + X_{ist}\phi + \gamma_s + \epsilon_{ist} \quad (1.2)$$

[11] Differential stopping behavior means that couples keep having children until they attain the desired number of sons. Clark (2000) says that although these stopping rules can alter sex ratios within a family, this imbalance evens out at the national level.

[12] The study by Oster (2005) presents evidence that carriers of Hepatitis B virus have around 1.5 boys per girl.

where z is an indicator which equals one if the child i born in state s in time period t died in the postneonatal period and equals zero if the child survived. $Male_{ist}$ indicates the gender of the child. T_0, T_1 and T_2 are the three decades: $1976-1985$, $1986-1995$ and $1996-2005$. Maternal characteristics such as the level of education and age at childbirth are important factors affecting children's outcomes (Finlay et al. 2011; Shepherd 2008). These controls are included in X. State fixed effects, given by the vector γ_s, are included throughout. As before, regressions are estimated separately by birth order of child, urban-rural location and wealth quintile of household.

Of primary interest are the coefficients on the interaction terms, which give the gender bias in mortality rates in the three time periods. If prior to the availability of sex determination tests, unwanted female children were denied proper care and nutrition, it would have led to higher rates of female deaths relative to male deaths. This would be indicated by a negative coefficient on the $(male_{ist} \times T_0)$ term. With increasing use of sex-selective abortions, the 'substitution hypothesis' predicts a lowering of the gender gap in mortality rates and λ_4 and λ_5 would get close to zero.

Conditional on a child being alive, number of months for which the child is breastfed and the vaccination status of the child are the other outcome variables of interest. The NFHS collected this information only for recent births prior to the completion of each survey round and not for older children. As a result, observations are limited to time periods T_1 and T_2 only and so a truncated form of equation (1.2) is used to test the 'substitution hypothesis'. This is given by:

$$v_{ist} = \omega_1 + \omega_2 T_2 + \omega_3(male_{ist} \times T_1) + \omega_4(male_{ist} \times T_2) + X_{ist}\phi + \gamma_s + \epsilon_{ist} \tag{1.3}$$

where the dependent variable v_{ist} denotes the health outcome of the child i born in state s in time period t, either number of months for which the child is breastfed or an indicator which equals one if the child is fully vaccinated between $12-23$ months of age and zero if not.[13] $Male_{ist}$ indicates the gender of the child. X includes the same controls as in equation (1.2). γ_s is a vector of state fixed effects. Again, regressions are estimated separately by birth order of child, urban-rural location and wealth quintile of household. The method of estimation is ordinary least squares.

[13] To be considered fully vaccinated, a child ought to have received seven vaccinations: three diphtheria-pertussis-tetanus (DPT) vaccines, three polio vaccines and one tuberculosis (BCG) vaccine.

The validity of the 'substitution hypothesis' is tested by assessing the coefficients on the interaction terms. If mothers are likely to breastfeed a male child longer than a female child or are more likely to vaccinate a male child, it would show up as a positive value of ω_3 in equation (1.3). If substitution were to take place, the gender gap would reduce and ω_4 would get close to zero.

The identification for the effect of sex-selective abortion on excess female mortality and postnatal gender discrimination is based on the assumption that no changes occurred over the period when high rates of sex selection are in place that would affect the health outcomes of males and females differentially and have a differential impact at higher births orders.

1.4 Data and Descriptive Statistics

Data come from the $1992-93$, $1998-99$ and $2005-06$ rounds of the National Family and Health Survey (NFHS) of India.[14] This is a repeated cross-sectional, nationally representative dataset. Each survey round covered approximately $90,000$ ever-married women between the ages of $15-49$, who were asked detailed questions on birth histories, health of children, and fertility preferences. As with typical household surveys, this dataset also contains information on basic household demographics, dwelling characteristics, household assets, and household member educational attainment and employment status.

For purposes of this analysis, the unit of observation is an individual child. The information from the birth histories of women is used to create a dataset of births in the 18 years prior to the completion of each survey round, which are then pooled across the three survey rounds. Children from multiple births and from birth orders higher than seven (above 95^{th} percentile) are excluded from the sample. So are children born to women who were visitors to the household. Certain adjustments are also made regarding the observations from some states.[15] The final sample includes children born between 1976 and 2005. Since information on breastfeeding and vaccination

[14] The NFHS data are available upon request from `http://www.measuredhs.com`.

[15] Chhattisgarh, Jharkhand and Uttaranchal are three new states that were created in the year 2000. Observations from these states are included in the original states they belonged to: Chhattisgarh was part of Madhya Pradesh, Jharkhand was part of Bihar and Uttaranchal was part of Uttar Pradesh. The state of Sikkim was not covered in the first survey round so observations from this state are dropped from the later rounds as well.

status was collected only for very young children prior to the completion of each survey round, the sample for analysis of these variables includes observations for children born between 1988 and 2005.

Table 1.1 reports maternal and household characteristics as well as the distribution of birth orders of children. The sample size is 1,62,842 children from urban households and 3,42,816 children from rural households. The birth order means indicate that observations are well distributed across the four categories. As expected, mothers in urban areas are more educated and older at childbirth than mothers in rural areas. Based on the wealth quintiles reported by NFHS for each survey round, urban households fall disproportionately in the highest wealth quintile (quintile 5) while rural households are primarily concentrated in the first three wealth quintiles.

Table 1.1: Descriptive Statistics

	Urban		Rural	
	Mean	S.D.	Mean	S.D.
	(1)	(2)	(3)	(4)
Birth Order				
1	0.32	0.47	0.26	0.44
2	0.28	0.45	0.24	0.43
3	0.18	0.39	0.19	0.39
4 +	0.22	0.41	0.31	0.46
Wealth Quintiles				
1 /Poorest	0.02	0.15	0.25	0.44
2 /Poorer	0.06	0.23	0.24	0.43
3 /Middle	0.12	0.33	0.24	0.43
4 /Richer	0.29	0.45	0.19	0.39
5 /Richest	0.51	0.50	0.07	0.26
Age of mother at childbirth	24.17	4.73	23.85	5.09
Education of mother				
No education	0.35	0.48	0.66	0.47
Some/Completed Primary	0.17	0.37	0.16	0.37
Some/Completed Secondary	0.36	0.48	0.16	0.37
Some/Completed Higher	0.12	0.33	0.02	0.12
N	1,62,842		3,42,816	

A ratio of 104 – 107 girls per 100 boys is considered to be the 'natural' sex ratio at birth (Ganatra et al. 2001). Higher sex ratios at higher birth orders are indicative of some human intervention, specifically the use of sex-selective abortions.[16] To provide a snapshot of the time variation used in this analysis, Table 1.2 reports the calculated sex ratios by birth order for the three decades: T_0, T_1 and T_2. In time period T_0, in both urban and rural areas, sex ratios in all birth orders are mostly found to be within the normal range. In period T_1, sex ratios are found to be higher in birth orders 2, 3 and 4+ in urban areas but no such birth order effects are apparent in rural areas. In period T_2, however, the increase in sex ratios in higher birth orders is apparent in both urban and rural households. The observed patterns in sex ratios echo the findings from Retherford and Roy (2003). These patterns are also consistent with the timing of availability of prenatal testing methods in urban areas and rural areas.

Table 1.2: Calculated Sex Ratios at Birth by Birth Order

	Birth Order 1 (1)	Birth Order 2 (2)	Birth Order 3 (3)	Birth Order 4+ (4)
Urban Households				
T_0	106	107	108	106
T_1	108	110	111	110
T_2	105	113	110	111
Rural Households				
T_0	108	107	108	106
T_1	106	107	107	107
T_2	106	109	111	108

Notes: Sex ratios are calculated as the number of males per 100 females. The ‘natural’ sex ratio at birth is in the range of $104 - 107$ boys per 100 girls. T_0 includes births from $1976 - 1985$, T_1 includes births from $1986 - 1995$ and T_2 includes births from $1996 - 2005$. These sex ratios have been calculated by aggregating across the wealth quintiles.

In this analysis, I look at three measures of postnatal child well-being: postneonatal mortality, duration of breastfeeding, and vaccination status. Summary statistics for these outcome variables, which are used to test the ‘substitution hypothesis’, are presented in Table 1.3. For all the three outcomes, female children are found to fare worse than male children; this differential is more pronounced in rural households. Another pattern that emerges is that, irrespective of gender, children in rural households have higher mortality rates and lower vaccination rates compared to

[16] Using the number of females per 100 males to define sex ratios, a recent study by Jha et al. (2011) estimated that a 1 percent drop in the sex ratio among children under the age of 6 meant an additional $1.2 - 3.6$ million abortions of females.

their urban counterparts. Finally, for all children, in both urban and rural households, mortality rates and vaccination rates are lower, and duration of breastfeeding is higher in the most recent time period, T_2.

Table 1.3: Summary Statistics of Postnatal Outcome Variables

	Time period	Male			Female		
		Mean	S.D.	N	Mean	S.D.	N
		(1)	(2)	(3)	(4)	(5)	(6)
Urban households							
Postneonatal Mortality	T_0	0.024	0.15	20,729	0.026	0.16	19,633
	T_1	0.017	0.13	40,906	0.019	0.13	37,597
	T_2	0.014	0.12	22,884	0.013	0.11	21,093
Breastfeeding Duration	T_1	14.42	9.86	5,567	13.69	9.24	5,116
	T_2	15.43	10.22	11,962	15.14	10.16	10,817
Vaccination Status	T_1	0.68	0.47	1,452	0.65	0.48	1,283
	T_2	0.67	0.47	2,958	0.66	0.48	2,666
Rural households							
Postneonatal Mortality	T_0	0.037	0.19	48,702	0.042	0.20	46,034
	T_1	0.027	0.16	87,898	0.030	0.17	82,832
	T_2	0.019	0.14	40,044	0.021	0.14	37,306
Breastfeeding Duration	T_1	16.22	10.42	14,036	15.63	9.99	13,297
	T_2	16.86	10.80	22,288	16.13	10.31	20,464
Vaccination Status	T_1	0.47	0.50	3,558	0.42	0.49	3,526
	T_2	0.50	0.50	5,888	0.46	0.50	5,173

Notes: T_0 includes births from $1976 - 1985$, T_1 includes births from $1986 - 1995$ and T_2 includes births from $1996 - 2005$. These statistics have been calculated by aggregating across the wealth quintiles.

1.5 Results

The first subsection presents results that help identify the births that are most likely to be prenatally selected. The remaining subsections report results on the trends in gender differentials in postneonatal mortality, breastfeeding duration, and vaccination status in these same groups.

1.5.1 Trends in the Proportion of Male Births

Using the proportion of male births to proxy for sex-selective abortions, equation (1.1) aims to examine changes in this proportion over the three time periods under analysis. The estimation results for urban households are presented in Table 1.4. The regressions are estimated separately by birth order of child and wealth quintile of household. In the first four wealth quintiles, there is no discernible variation in the proportion of male births by birth order. In the fifth wealth quintile, however, birth order effects are observed and these effects are found to be statistically significant in both time periods, T_1 and T_2. In column (2), for example, which reports results for the second birth order, the proportion of male births is found to be 1.4 percentage points and 3.3 percentage points higher in periods T_1 and T_2 compared to the baseline time period T_0. But, for the first birth, there is no significant change in the proportion of male births over time.

Such patterns are also observed in rural households and are presented in Table 1.5. A higher proportion of male births is observed in higher birth orders in wealth quintiles 4 and 5 but in period T_2 only. Although male births are also found to be higher in the second birth order in the third wealth quintile, this increase is not observed in third and higher birth orders.

The results suggest that first births can still be considered a random event and parents wait until subsequent births to sex select. The costs of prenatal tests and abortion facilities limits the use of sex selection to richer households in both urban and rural areas who are able to afford them. Overall, the results are consistent with findings from previous studies (Dubey and Verschoor 2007; Kishor and Gupta 2009). Besides, the timing of the increase in male births in urban and rural households is also consistent with the timing of availability of prenatal tests in those locations.

Table 1.4: Proportion of Male Births: Urban Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	T_1	-0.075	-0.027	-0.023	0.031
		(0.047)	(0.042)	(0.049)	(0.038)
	T_2	-0.12**	-0.10**	-0.047	0.056
		(0.052)	(0.047)	(0.053)	(0.040)
	N	899	905	777	1,415
Quintile 2	T_1	0.028	0.010	-0.061**	-0.025
		(0.029)	(0.026)	(0.031)	(0.026)
	T_2	-0.0072	-0.053*	-0.074**	-0.015
		(0.030)	(0.030)	(0.033)	(0.027)
	N	2,397	2,313	1,914	3,081
Quintile 3	T_1	0.028	-0.013	0.032	0.023
		(0.019)	(0.020)	(0.022)	(0.017)
	T_2	0.011	-0.028	0.011	0.017
		(0.021)	(0.021)	(0.024)	(0.019)
	N	5,587	5,305	4,099	6,227
Quintile 4	T_1	0.0015	-0.0059	-0.00076	0.0062
		(0.011)	(0.011)	(0.013)	(0.011)
	T_2	0.0033	0.010	-0.019	0.016
		(0.012)	(0.012)	(0.015)	(0.014)
	N	14,281	12,962	9,278	12,289
Quintile 5	T_1	0.0059	0.014*	0.013	0.019**
		(0.0071)	(0.0076)	(0.0094)	(0.0091)
	T_2	0.00075	0.033***	0.043***	0.028**
		(0.0080)	(0.0086)	(0.012)	(0.014)
	N	30,484	25,794	14,450	13,750

Notes: Dependent variable is the gender of the child born (= 1 if male and = 0 if female). Robust standard errors clustered at the primary sampling unit level are reported in parentheses.
*** p< 0.01, ** p< 0.05, * p< 0.1.

Table 1.5: Proportion of Male Births: Rural Households

		Birth order 1	Birth order 2	Birth order 3	Birth order 4+
		(1)	(2)	(3)	(4)
Quintile 1	T_1	-0.0036	-0.00046	-0.0025	0.013*
		(0.0083)	(0.0083)	(0.0088)	(0.0068)
	T_2	-0.0086	-0.010	-0.0054	0.00018
		(0.010)	(0.0099)	(0.010)	(0.0077)
	N	20,553	20,402	17,670	33,922
Quintile 2	T_1	-0.023***	-0.0037	-0.00010	-0.0049
		(0.0087)	(0.0086)	(0.0096)	(0.0071)
	T_2	-0.020**	-0.0010	0.00071	-0.0084
		(0.0096)	(0.010)	(0.011)	(0.0083)
	N	20,944	20,142	16,663	29,076
Quintile 3	T_1	-0.0020	0.017**	-0.0089	-0.011
		(0.0079)	(0.0080)	(0.0090)	(0.0071)
	T_2	0.0016	0.020**	0.0069	0.0037
		(0.0094)	(0.0095)	(0.011)	(0.0092)
	N	22,175	20,965	16,806	25,898
Quintile 4	T_1	0.0063	-0.0035	0.0055	0.0051
		(0.0085)	(0.0091)	(0.010)	(0.0084)
	T_2	0.0043	0.0013	0.024*	0.045***
		(0.0100)	(0.011)	(0.013)	(0.012)
	N	19,871	17,901	12,982	17,478
Quintile 5	T_1	0.0030	-0.013	0.017	0.019
		(0.014)	(0.014)	(0.016)	(0.016)
	T_2	-0.0055	0.033**	0.078***	0.066***
		(0.015)	(0.015)	(0.021)	(0.023)
	N	9,353	8,013	4,700	4,315

Notes: Dependent variable is the gender of the child born (= 1 if male and = 0 if female). Robust standard errors clustered at the primary sampling unit level are reported in parentheses.
*** p< 0.01, ** p< 0.05, * p< 0.1.

1.5.2 Gender Differentials in Postneonatal Mortality

Before discussing the regression results, it is useful to review the summary statistics presented in Table 1.3. These statistics reveal higher rates of female mortality than male mortality in urban and rural households for the three time periods under analysis. For example, in period T_0, 24 out of 1000 male children and 26 out of 1000 female children died in the postneonatal period. The corresponding numbers for rural households are 37 and 42 respectively. Over time, the mortality rates for all children experience a decline, which is expected if, for instance, health facilities get better and become more accessible.

The crux of the analysis is to examine if female mortality declines at a faster rate than male mortality so as to reduce or eliminate the gender gap among the groups most likely to sex select. Regression results from estimating equation (1.2) for urban households are presented in Table 1.6. The regressions are estimated separately by birth order of child and wealth quintile of household. Only the coefficients on the interaction terms, which indicate the average gender gap in mortality rates in the three time periods, are reported. In wealth quintile 5, starting from an initial gender gap in the third birth order in period T_1 and in birth orders four and above in period T_0, the gender gap is found to disappear in period T_2.

The results for rural households are reported in Table 1.7. There is some weak evidence of closing of the gender gap in mortality in birth orders four and above in wealth quintile 4 and in the third birth order in wealth quintile 5. However, the biggest improvements in relative female mortality rates are observed in the first three wealth quintiles, where the biggest gender gaps in period T_0 were present.

If the 'substitution hypothesis' is supported, we would expect to find the largest reduction in gender gaps in mortality in higher birth orders in richer households in urban and rural areas since these are the groups where the likelihood of sex-selective abortions being used is the greatest. Since that is not the case, the results for postneonatal mortality do not support the 'substitution hypothesis'.[17] The biggest improvements in relative female mortality rates are found in poorer rural

[17] The previous study by Shepherd (2008) also found no effect of sex selection on postneonatal mortality. However,

Table 1.6: Gender Differentials in Postneonatal Mortality: Urban Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	$male_{ist} \times T_0$	-0.015	0.0084	0.071**	-0.014
		(0.033)	(0.034)	(0.031)	(0.027)
	$male_{ist} \times T_1$	0.014	-0.046**	0.024	0.019
		(0.021)	(0.018)	(0.016)	(0.020)
	$male_{ist} \times T_2$	0.034**	-0.017	0.016	-0.013
		(0.017)	(0.016)	(0.013)	(0.012)
	N	826	855	743	1,341
Quintile 2	$male_{ist} \times T_0$	0.014	-0.024	0.036*	0.0081
		(0.017)	(0.021)	(0.019)	(0.020)
	$male_{ist} \times T_1$	-0.0096	-0.023**	-0.0019	0.0029
		(0.012)	(0.011)	(0.013)	(0.0099)
	$male_{ist} \times T_2$	0.0050	0.0046	-0.017	-0.021**
		(0.012)	(0.011)	(0.015)	(0.0097)
	N	2,250	2,207	1,841	2,936
Quintile 3	$male_{ist} \times T_0$	-0.025*	-0.0054	-0.0076	-0.015
		(0.013)	(0.011)	(0.012)	(0.012)
	$male_{ist} \times T_1$	-0.000058	-0.00011	-0.0088	-0.0093
		(0.0065)	(0.0058)	(0.0066)	(0.0063)
	$male_{ist} \times T_2$	0.0080	0.0032	0.0032	0.00064
		(0.0059)	(0.0061)	(0.0058)	(0.0080)
	N	5,295	5,091	3,970	5,962
Quintile 4	$male_{ist} \times T_0$	0.011*	0.0074	-0.015*	-0.0099
		(0.0064)	(0.0062)	(0.0082)	(0.0065)
	$male_{ist} \times T_1$	0.0019	0.0051	-0.0019	-0.0026
		(0.0035)	(0.0035)	(0.0039)	(0.0039)
	$male_{ist} \times T_2$	0.0014	0.0024	-0.000088	-0.0052
		(0.0033)	(0.0034)	(0.0051)	(0.0058)
	N	13,667	12,581	9,011	11,857
Quintile 5	$male_{ist} \times T_0$	0.0023	-0.0014	-0.00088	-0.0086*
		(0.0030)	(0.0032)	(0.0039)	(0.0045)
	$male_{ist} \times T_1$	0.0011	-0.0011	-0.0046*	-0.0029
		(0.0016)	(0.0019)	(0.0027)	(0.0033)
	$male_{ist} \times T_2$	0.0035**	0.00091	0.0033	-0.0054
		(0.0017)	(0.0019)	(0.0041)	(0.0058)
	N	29,645	25,273	14,145	13,346

Notes: Dependent variable is whether a child died in the postneonatal period (= 1 if died and = 0 if lived). Robust standard errors clustered at the primary sampling unit level are reported in parentheses.
*** p< 0.01, ** p< 0.05, * p< 0.1.

Table 1.7: Gender Differentials in Postneonatal Mortality: Rural Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	$male_{ist} \times T_0$	-0.0082	-0.0072	-0.013**	-0.017***
		(0.0060)	(0.0060)	(0.0065)	(0.0051)
	$male_{ist} \times T_1$	0.0041	-0.0041	-0.0035	-0.012***
		(0.0036)	(0.0039)	(0.0040)	(0.0034)
	$male_{ist} \times T_2$	0.0068	0.0018	-0.0025	-0.0048
		(0.0056)	(0.0044)	(0.0049)	(0.0038)
	N	18,994	19,281	16,792	32,031
Quintile 2	$male_{ist} \times T_0$	0.00046	-0.00041	-0.0042	-0.0087
		(0.0060)	(0.0065)	(0.0059)	(0.0055)
	$male_{ist} \times T_1$	0.0090**	-0.0060*	-0.0012	-0.0054*
		(0.0036)	(0.0036)	(0.0041)	(0.0030)
	$male_{ist} \times T_2$	-0.0019	0.0025	0.0014	-0.0033
		(0.0044)	(0.0044)	(0.0050)	(0.0039)
	N	19,513	19,152	15,942	27,636
Quintile 3	$male_{ist} \times T_0$	0.0039	0.00074	0.000071	-0.015***
		(0.0050)	(0.0049)	(0.0055)	(0.0044)
	$male_{ist} \times T_1$	0.0042	-0.0053	0.000047	-0.0068**
		(0.0031)	(0.0032)	(0.0033)	(0.0032)
	$male_{ist} \times T_2$	0.0058	-0.0076**	-0.00078	-0.0064
		(0.0037)	(0.0038)	(0.0041)	(0.0047)
	N	20,924	20,114	16,222	24,809
Quintile 4	$male_{ist} \times T_0$	0.0041	-0.0025	-0.0031	-0.011**
		(0.0046)	(0.0043)	(0.0046)	(0.0043)
	$male_{ist} \times T_1$	0.0035	-0.00081	-0.0017	-0.0077**
		(0.0028)	(0.0028)	(0.0034)	(0.0036)
	$male_{ist} \times T_2$	-0.0018	-0.0040	-0.0066	-0.010*
		(0.0028)	(0.0031)	(0.0044)	(0.0058)
	N	19,029	17,333	12,565	16,823
Quintile 5	$male_{ist} \times T_0$	-0.0017	0.0040	-0.012*	-0.0076
		(0.0053)	(0.0055)	(0.0067)	(0.0078)
	$male_{ist} \times T_1$	-0.0011	-0.00099	0.0036	-0.0081
		(0.0035)	(0.0033)	(0.0047)	(0.0062)
	$male_{ist} \times T_2$	0.0046	-0.0024	-0.0077	-0.0049
		(0.0032)	(0.0034)	(0.0054)	(0.011)
	N	9,062	7,826	4,578	4,190

Notes: Dependent variable is whether a child died in the postneonatal period (= 1 if died and = 0 if lived). Robust standard errors clustered at the primary sampling unit level are reported in parentheses.
*** p< 0.01, ** p< 0.05, * p< 0.1.

households who are less likely to practice sex selection, indicating that these gender gap reductions are likely driven by other factors. A potential explanation is that as these households experienced reductions in family sizes, their monetary constraints got reduced which allowed investments in girls to increase. This is outlined in greater details in the discussion section.

1.5.3 Gender Differentials in Breastfeeding

The summary statistics from Table 1.3 indicate that, in urban households, in period T_1, male children are breastfed for an average of 14.4 months while female children are breastfed for an average of 13.7 months. The corresponding numbers for children in rural households are 16.2 and 15.6 months respectively. The gender differential persists even in period T_2, although all children are found to be breastfed for a longer time than in period T_1.

Before discussing the regressions results, it is useful to bear in mind the motives why mothers might want to prolong the nursing period. Breastfeeding is considered to confer several benefits to the child, for example, immunity against infectious diseases (American Academy of Pediatrics 2005). Limiting postnatal fertility is another reason why mothers might nurse infants for a longer time (Jayachandran and Kuziemko 2011). Therefore, a gender gap in the duration of breastfeeding might be observed if, either (1) mothers prefer to invest more in male children or (2) mothers are more likely to stop having children after the birth of a boy (family size control motive).

Table 1.8 presents the regression results from estimating equation (1.3) for urban households. In the richer households (wealth quintiles 4 and 5), in period T_1, the coefficient on $(male_{ist} \times T_1)$ is found to be positive in birth orders 3 and above. This implies that males were breastfed for a longer time than females. But the gender gap disappears in time period T_2. Since the gender gaps disappear in the same time period where high rates of sex-selective abortions are in place, and among births that are most likely to be sex selected, these results support the 'substitution hypothesis'. Such supporting evidence, however, is not found in Table 1.9, which reports the results for rural households.[18]

the author but did not consider the urban-rural location split neither is her analysis disaggregated by wealth quintiles.

[18] Mishra et al. (2004) and Jayachandran and Kuziemko (2011) have analyzed gender differentials in breastfeeding

Table 1.8: Gender Differentials in Breastfeeding: Urban Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	$male_{ist} \times T_1$	2.22	-2.36	-0.85	2.31
		(3.79)	(3.76)	(3.45)	(2.26)
	$male_{ist} \times T_2$	-0.84	-1.50	0.74	-1.64
		(1.86)	(2.52)	(2.17)	(1.24)
	N	169	161	171	324
Quintile 2	$male_{ist} \times T_1$	-0.48	-0.031	3.15	-0.38
		(1.68)	(1.68)	(2.17)	(1.39)
	$male_{ist} \times T_2$	0.0035	0.68	3.22**	1.07
		(1.10)	(1.10)	(1.54)	(1.10)
	N	464	466	385	670
Quintile 3	$male_{ist} \times T_1$	-2.07*	2.50*	0.85	1.35
		(1.19)	(1.33)	(1.50)	(1.26)
	$male_{ist} \times T_2$	1.02	-0.90	0.29	-0.21
		(0.68)	(0.66)	(0.92)	(0.74)
	N	1,203	1,173	821	1,174
Quintile 4	$male_{ist} \times T_1$	0.37	0.65	1.35*	1.26*
		(0.68)	(0.69)	(0.81)	(0.72)
	$male_{ist} \times T_2$	0.35	1.20***	-0.17	0.057
		(0.39)	(0.43)	(0.57)	(0.60)
	N	3,129	2,935	1,787	2,068
Quintile 5	$male_{ist} \times T_1$	0.035	0.53	1.34**	2.11***
		(0.37)	(0.42)	(0.62)	(0.64)
	$male_{ist} \times T_2$	0.031	0.74**	0.28	1.26*
		(0.28)	(0.32)	(0.53)	(0.67)
	N	6,668	5,436	2,392	1,866

Notes: Dependent variable is the duration (in months) for which a child is breastfed. Robust standard errors clustered at the primary sampling unit level are reported in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1.

Table 1.9: Gender Differentials in Breastfeeding: Rural Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	$male_{ist} \times T_1$	1.07**	-0.040	0.64	0.76*
		(0.54)	(0.56)	(0.63)	(0.43)
	$male_{ist} \times T_2$	0.85*	0.24	1.56***	0.55
		(0.48)	(0.42)	(0.48)	(0.34)
	N	3,321	3,600	3,272	7,095
Quintile 2	$male_{ist} \times T_1$	0.088	-0.28	0.43	0.45
		(0.54)	(0.52)	(0.58)	(0.48)
	$male_{ist} \times T_2$	-0.56	0.82*	1.60***	0.59
		(0.39)	(0.42)	(0.50)	(0.37)
	N	3,957	4,115	3,214	5,623
Quintile 3	$male_{ist} \times T_1$	-0.16	0.56	0.49	1.26***
		(0.46)	(0.48)	(0.56)	(0.48)
	$male_{ist} \times T_2$	0.013	0.60	1.54***	1.07**
		(0.39)	(0.39)	(0.49)	(0.44)
	N	4,547	4,363	3,280	4,437
Quintile 4	$male_{ist} \times T_1$	-0.053	1.39***	0.57	1.36**
		(0.39)	(0.46)	(0.59)	(0.53)
	$male_{ist} \times T_2$	0.43	1.41***	1.34**	0.74
		(0.35)	(0.38)	(0.56)	(0.60)
	N	4,575	4,066	2,541	2,725
Quintile 5	$male_{ist} \times T_1$	1.89***	1.75**	0.37	0.91
		(0.62)	(0.76)	(1.00)	(1.11)
	$male_{ist} \times T_2$	0.93*	0.71	1.35	1.82
		(0.52)	(0.57)	(0.90)	(1.19)
	N	2,164	1,788	832	570

Notes: Dependent variable is the duration (in months) for which a child is breastfed. Robust standard errors clustered at the primary sampling unit level are reported in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1.

Surprisingly, in Table 1.9, a widening of the gender gap in rural households in the first three wealth quintiles is observed in birth orders two and three from period T_1 to T_2. In birth orders 4 and above, on the other hand, the gender gap is found to stay the same (quintile 3) or decrease (quintile 1). Out of the two motives for increased duration of breastfeeding mentioned above, the family size control motive would be particularly important for women in these poorer rural households if they have limited access to modern contraceptive methods. A potential explanation of the widening of the gender gap is that after a boy is born, women would want to stop having children (by increasing the nursing period) sooner if family sizes have fallen over the two decades. That could the reason why the increased breastfeeding found in column (4) in time period T_1 in now observed in birth orders two and three in period T_2.

The analysis above includes children who were being breastfed at the time of the survey. A concern with including these observations is that the nursing period might not reflect the mother's preferences regarding breastfeeding duration. Therefore, as a check, I repeat the same exercise by excluding these children and find that the results are robust to this exclusion (results available upon request).[19]

1.5.4 Gender Differentials in Vaccination Status

From the summary statistics on vaccination coverage presented in Table 1.3, three patterns are evident. First, in both time periods, vaccination coverage is higher for children in urban areas than in rural areas. This is not unexpected since urban areas have greater access to modern medical facilities. Second, although vaccination rates in urban areas remain virtually unchanged across the two decades, these rates have increased for all children in rural areas. Lastly, a gender gap is evident in vaccination coverage for children in rural households in both time periods but not in urban households.

Regression results of equation (1.3) for urban households are presented in Table 1.10. There

but they do not examine the relation between sex selection and breastfeeding.

[19] However, due to big reductions in sample size, these results are weaker.

Table 1.10: Gender Differentials in Vaccination Status: Urban Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	$male_{ist} \times T_1$	-0.59*	-0.28	0.59*	0.067
		(0.32)	(0.37)	(0.30)	(0.16)
	$male_{ist} \times T_2$	-0.32	0.13	-0.099	0.39**
		(0.22)	(0.33)	(0.22)	(0.15)
	N	49	39	49	78
Quintile 2	$male_{ist} \times T_1$	-0.22	0.18	0.052	-0.14
		(0.18)	(0.17)	(0.23)	(0.15)
	$male_{ist} \times T_2$	-0.12	0.10	0.059	0.17
		(0.11)	(0.12)	(0.20)	(0.12)
	N	133	126	75	146
Quintile 3	$male_{ist} \times T_1$	0.11	0.017	-0.071	-0.011
		(0.10)	(0.12)	(0.16)	(0.11)
	$male_{ist} \times T_2$	0.078	0.0072	-0.096	0.011
		(0.068)	(0.067)	(0.093)	(0.066)
	N	288	267	192	260
Quintile 4	$male_{ist} \times T_1$	-0.062	-0.012	0.016	0.043
		(0.056)	(0.071)	(0.078)	(0.078)
	$male_{ist} \times T_2$	-0.052	0.040	0.0046	-0.044
		(0.037)	(0.039)	(0.057)	(0.056)
	N	795	729	442	511
Quintile 5	$male_{ist} \times T_1$	-0.022	0.029	0.14***	0.068
		(0.031)	(0.030)	(0.053)	(0.059)
	$male_{ist} \times T_2$	-0.020	-0.027	-0.0062	0.097
		(0.022)	(0.025)	(0.050)	(0.071)
	N	1,693	1,439	585	463

Notes: Dependent variable is whether a child is fully vaccinated (= 1) or not (= 0). Robust standard errors clustered at the primary sampling unit level are reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 1.11: Gender Differentials in Vaccination Status: Rural Households

		Birth order 1 (1)	Birth order 2 (2)	Birth order 3 (3)	Birth order 4+ (4)
Quintile 1	$male_{ist} \times T_1$	0.012	0.0048	-0.019	0.10***
		(0.047)	(0.047)	(0.046)	(0.030)
	$male_{ist} \times T_2$	0.013	0.053	0.052	-0.0021
		(0.040)	(0.035)	(0.036)	(0.024)
	N	868	935	847	1,704
Quintile 2	$male_{ist} \times T_1$	0.014	0.14***	0.025	-0.020
		(0.045)	(0.047)	(0.050)	(0.034)
	$male_{ist} \times T_2$	-0.013	-0.0087	-0.027	0.033
		(0.036)	(0.034)	(0.042)	(0.030)
	N	1,063	1,070	808	1,404
Quintile 3	$male_{ist} \times T_1$	-0.0098	0.14***	0.047	0.013
		(0.043)	(0.045)	(0.049)	(0.044)
	$male_{ist} \times T_2$	0.0079	-0.0047	0.081*	0.078**
		(0.033)	(0.036)	(0.041)	(0.038)
	N	1,249	1,130	886	1,090
Quintile 4	$male_{ist} \times T_1$	0.074**	0.085**	0.14***	0.031
		(0.034)	(0.042)	(0.054)	(0.049)
	$male_{ist} \times T_2$	0.0068	0.020	0.066	0.094*
		(0.033)	(0.037)	(0.049)	(0.053)
	N	1,264	1,059	635	717
Quintile 5	$male_{ist} \times T_1$	0.15***	0.051	0.064	0.10
		(0.052)	(0.059)	(0.078)	(0.11)
	$male_{ist} \times T_2$	0.0089	0.091**	0.13*	0.23**
		(0.036)	(0.045)	(0.077)	(0.11)
	N	548	486	232	150

Notes: Dependent variable is whether a child is fully vaccinated (= 1) or not (= 0). Robust standard errors clustered at the primary sampling unit level are reported in parentheses. *** p< 0.01, ** p< 0.05, * p< 0.1.

is no clear evidence of a gender gap or variation in this gap over time. The only exception is in the third birth order in wealth quintile 5, where a lowering of the gender gap is observed. The absence of results suggests that vaccination is not being used as a means to differentiate investment between male and female children in urban areas, which is not surprising since urban areas already have high rates (about 67% of children) of immunization coverage.[20]

Table 1.11 reports the corresponding results for rural households. There emerge no clear patterns in the movement of gender differentials in the vaccination status of children in the fourth and fifth wealth quintiles, where sex selection is most likely to take place. Therefore, no conclusive evidence in favor of the 'substitution hypothesis' is found from the results on vaccination status.[21]

1.6 Discussion and Robustness of Results

1.6.1 Discussion

This paper investigates if the welfare of girls has increased in higher birth orders in richer households, where sex selection is most likely to take place. A relative increase in the duration of breastfeeding of girls is found in higher birth orders in urban areas. However, no evidence in favor of the 'substitution hypothesis' is found from the results on postneonatal mortality and vaccination status.

Surprisingly, the largest reductions in relative female mortality rates are observed in poorer rural households. Since the proportion of male births in these households has not increased over time, it suggests a lower likelihood of sex selection being practiced among these groups. This is likely due to the high costs of prenatal tests and abortion facilities. Therefore, the reductions in

[20] Oster (2009a) used a theoretical framework to show that at low and high levels of access to health services there is gender equality in child investments. It is only in the intermediate situation, when access is gradually increasing, that gender disparities are observed. This is because as access increases, parents invest first in boys who are valued more.

[21] These results contrast the findings from Shepherd (2008) who showed that sex selection increased the gender bias in vaccination rates of children in the same age group. However, she used data only from the first two rounds of the NFHS and her analysis was not stratified by urban-rural location or wealth quintile of household. Mishra et al. (2004) also analyzed gender differentials in vaccination status but do not examine the substitution between sex selection and vaccination coverage.

gender gaps must be attributable to some alternate mechanism. The explanation offered in this paper is that these improvements could be due to falling fertility levels. Figure 1 shows that the mean ideal number of children and the mean actual number of children reported by women in poorer rural households (households in wealth quintiles 1, 2 and 3) have declined in each survey round. When fertility was higher, monetary resources in these households were constrained enough so that parents had to concentrate the bulk of these investments in male children who are the preferred gender. Over time, as the number of children decreased, the constraints became relaxed, which allowed investments in girls to increase.[22]

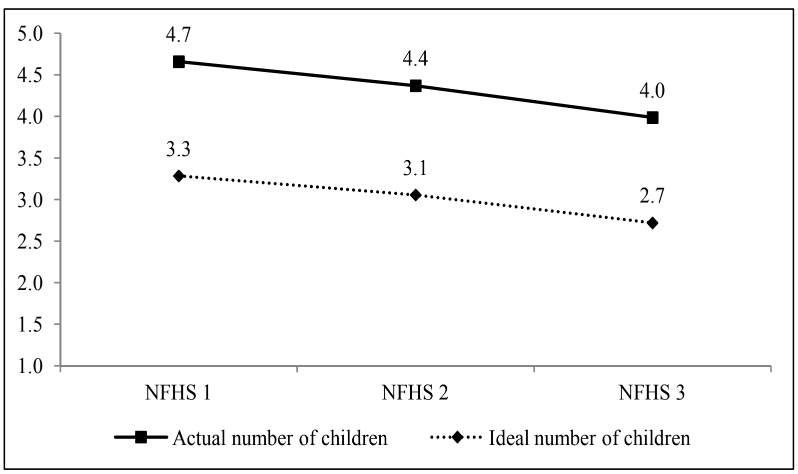

Figure 1.1: This figure shows the mean ideal number of children reported by all women and the mean actual number of children born to women with completed birth histories in each survey round: NFHS 1 conducted in $1992-93$, NFHS 2 conducted in $1998-99$ and NFHS 3 conducted in $2005-06$. Observations are restricted to women in rural households in wealth quintiles 1, 2 and 3.

[22] A study by Das Gupta and Bhat (1997) points out that falling fertility levels could increase postnatal gender discrimination since parents might discriminate more at each parity in order to achieve their desired sex composition of children within their target family size. This explanation would hold true if the couples' desired number of children declines at a faster rate than their target number of sons. However, Appendix Figure A.1 shows that, in fact, the number of boys desired by mothers has declined at a faster rate than the ideal number of children.

Overall, the results show weak evidence of substitutability between the two types of discrimination: sex-selective abortions and postnatal gender discrimination. The absence of substitution effects are likely because these are practiced among different groups – sex selection by richer households and postnatal discrimination by poorer households.

1.6.2 Robustness Checks

Previous literature has documented substantial regional variation in the use of sex-selective abortions. In particular, the sex ratios in some states in northern India have been found to be highly skewed (Arnold et al. 2002; Retherford and Roy 2003). Therefore, it might be instructive to test the 'substitution hypothesis' in these states and check the trends in gender differentials in child health investments. To conduct this analysis, I limit observations to four northern states: Punjab, Haryana, Gujarat and Rajasthan. I find that the substitution results on postneonatal mortality and breastfeeding are preserved and are robust to this subsample (results available upon request).[23]

All the regressions in this analysis are estimated separately by wealth quintiles of households. These wealth quintiles, reported in the NFHS, are constructed from information on dwelling characteristics and ownership of household assets. A potential source of concern is if parents' choice about investing in assets depends on the sex composition of their children. This would imply that this measure suffers from an endogeneity problem. To get around this problem, I use membership in a scheduled caste/scheduled tribe (SC/ST) community, who are traditionally the poorest in the Hindu caste system, as an alternate indicator of economic status. As pointed out by Clark (2000), who has previously used this measure, the caste indicator has two advantages: (1) The membership in these communities is not endogenous to the fertility decisions of the household and (2) It remains constant all through the birth history of a woman. After repeating the entire analysis by dividing the urban and rural samples into SC/ST and non SC/ST households, I find that the results are broadly similar to the results obtained from using quintiles of wealth (results available

[23] The loss in sample size for vaccination status of children is severe enough that the models cannot be estimated.

upon request).

1.7 Conclusion

Sex-selective abortion has provided parents a guaranteed means to avoid female births and the increasing diffusion of this practice in the recent past is confirmed by the growing imbalance in sex ratios. This paper tests if the welfare of girls have increased in groups where sex selection is most likely to be used. The results indicate that the proportion of male births have increased in higher birth orders in richer households, which suggests the use of sex-selective abortions in these groups. However, no strong evidence of a change in relative investments between girls and boys are observed in these same groups. The absence of such substitution effects suggest that sex selection and postnatal gender discrimination are practiced among different groups.

Chapter 2

Son Preference, Female Autonomy, and Gender Gaps in Child Nutrition

2.1 Introduction

A large body of literature has confirmed that son preference, the mindset that sons are more valuable than daughters, is pervasive among Indian parents.[1] Frequently, researchers have deduced the presence of son preference by examining its effects on behavior. Studies have shown that parents who do not have the desired number of sons are less likely to use contraceptives, are more likely to continue having children and have shorter birth intervals (Clark 2000; Haughton and Haughton 1998). An alternate approach has been to focus on the patterns of discrimination against girls. This could be through the differential allocation of resources between male and female children, which becomes evident from gender gaps in health and education outcomes (Subramaniam and Deaton 1991; Kingdon 2002; Oster 2009b), or by selectively aborting female fetuses to ensure that daughters are not born at all (Arnold et al. 2002; Kishor and Gupta 2009).

Spouses do not necessarily have identical preferences, an inference made in several studies which have found that household outcomes vary with the identity of the decision maker.[2] Barring a few exceptions, most empirical studies have concluded that higher female autonomy or improvement in a woman's position within the household is associated with better child outcomes, for instance, greater investments in child health and nutrition (Maitra 2004; Smith et al. 2003).[3] These effects

[1] There exist a number of economic, social and religious reasons for the evolution of these preferences. Readers may refer to Shepherd (2008) for a book length exposition on reasons for son preference in India.

[2] These studies reject the unitary model of household behavior which posits the existence of a representative household member with a single preference function (Becker 1981).

[3] Other studies have found that household and child welfare are maximized when spouses share the bargaining

are not always gender neutral; the underlying implication being that parental preferences vary with the child's gender (Duflo 2003; Thomas 1990; Thomas 1994).

What is missing from the literature is how female autonomy influences the relationship between son preference and child nutrition outcomes. This paper seeks to examine precisely that question. To conduct this analysis, data from the 2005 − 06 round of the National Family and Health Survey are used. Rather than infer the existence of son preference from its effects on behavior, direct and separate measures for parents are created based on survey responses regarding preferred number of boys and girls. The task of finding a satisfactory measure of female autonomy has been challenging for researchers. Some studies have used proxies such as female education, wealth or physical stature (Patel et al. 2007; Thomas 1994). The drawback is that these measures directly affect outcomes such as child's health. To get around endogeneity problems, other studies have looked at exogenous income shocks such as cash transfers (Duflo 2003; Paxson and Schady 2007). But these studies frequently assume that the recipient of the income shock is also the one who decides how to spend the money, which may not always hold true. A recent approach has been to construct an index of female autonomy from survey questions on female involvement in household decisions, freedom of mobility and control of resources (Chakraborty and De 2011). But this too has come under criticism (Alfano et al. 2011) because answers to these questions are weighted equally in the index even though the relative importance of decisions may well vary with the outcome under study. The measure of female autonomy used in this analysis is based on couples' responses to the survey question on routine household purchases. Not only does this give a direct measure, it also focuses on the question that is likely to be the most relevant for investments in child nutrition.

The main findings from this analysis are as follows. Gender gaps in nutrition outcomes of children are observed when mothers have a son preference and are involved in household decision making. This suggests that mothers, who are primarily responsible for the nutrition needs of small

power (Lancaster et al. 2006; Patel et al. 2007). An exception is the study by Berman et al. (1997), who have found that maternal employment is negatively associated with health care spending when children fall ill.

children, are able to manifest their son preference when they have autonomy in making decisions. In contrast, no independent association is found between child nutrition outcomes and paternal son preference.

2.2 Data and Descriptive Statistics

Data come from the 2005 − 06 round of the National Family and Health Survey (NFHS), a nationally representative cross-sectional household survey conducted in India.[4] The advantage of this latest round of the NFHS is that in addition to interviewing women, like in the previous two rounds, men have also been interviewed.[5] The survey contains detailed information on basic household demographics, dwelling characteristics, household assets, and household member educational attainment and employment status. Adult men and women were asked questions about fertility, fertility preferences as well as various aspects of female empowerment. Additionally, information on anthropometry, health and nutrition of children in these households was also collected.

The sample for this analysis is restricted to children under five years of age residing in rural households for whom complete anthropometric information is available and for whom both parents have been interviewed. Children from birth orders higher than nine (above 99^{th} percentile) are excluded from the analysis.[6] The final sample includes 6,897 children from 4,900 households.

The outcome of interest is the weight-for-height z score of a child, which is an anthropometric measure used to assess a child's short-run nutritional status.[7] This measure is based on the World Health Organization (WHO) growth standards. A z score is calculated, which is expressed as standard deviations below or above a median value in the corresponding age and sex group in the reference population (World Health Organization 2006). For example, a weight-for-height z score of −0.5 would imply that a child's weight-for-height is 0.5 standard deviations below the median

[4] The NFHS data are available upon request from `http://www.measuredhs.com`.

[5] The previous two rounds were conducted in 1992 − 93 and 1998 − 99.

[6] The rationale behind this exclusion is that children in birth orders higher than nine may have exceptionally inferior nutrition outcomes and/or may be subject to greater gender discrimination when family sizes are so high. Results reported in this analysis are robust to the inclusion of these observations.

[7] Similar results are obtained for BMI-for-age, another short-run measure. However, no significant results are obtained for height-for-age, which is a long-run indicator of nutritional status.

weight-for-height of a well-nourished child.

Table 2.1 reports the characteristics of children, who form the units of observation in this analysis. The sample size is 3,454 female children and 3,443 male children. The average child is approximately 30 months old. The mean weight-for-height z scores of female and male children are -0.95 and -0.94 respectively. The negative signs indicate that the z scores of children in this sample fall below the median score of a well-nourished child. Figure 2.1 shows the distribution of z scores by gender. It can be seen that female children fare slightly worse than male children, a fact also apparent from their lower mean z scores reported in Table 2.1.[8] The difference, however, is not statistically significant.

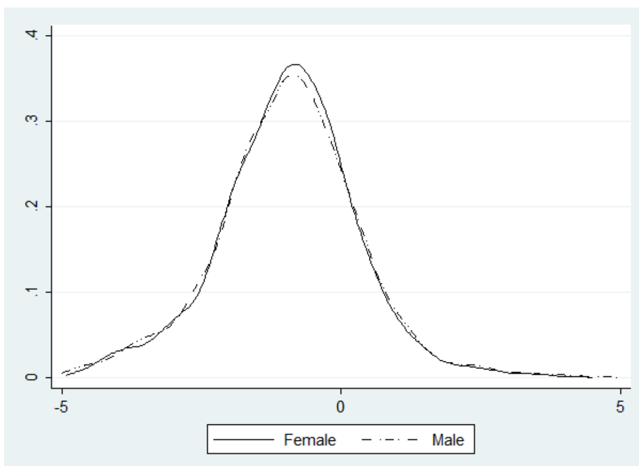

Figure 2.1: Distribution of weight-for-height z scores of children

Table 2.2 illustrates the sample characteristics of parents and households. The average mother's age is 27 years while the average father is 32 years old. The fathers' and mothers' average educational attainment are 6 years and 4 years respectively. 41 percent of mothers and 97 percent of fathers report to have worked in the last twelve months. The NFHS asked questions on the ideal number and ideal sex composition of children to elicit information on the fertility preferences of parents. The mean ideal number of boys and girls reported by mothers are 1.56 and 1.21 respectively which adds to 2.77, their mean ideal number of children. Fathers report their

[8] The use of z scores makes gender comparisons possible since they are adjusted for a child's age and gender.

Table 2.1: Characteristics of Children

	Female		Male	
	Mean	S.D.	Mean	S.D.
	(1)	(2)	(3)	(4)
Weight-for-height z score	-0.95	1.25	-0.94	1.31
Age (months)	30.02	16.86	30.74	16.97
Birth Order				
1	0.25		0.22	
2	0.26		0.26	
3	0.18		0.20	
4+	0.31		0.32	
N	3,454		3,443	

Table 2.2: Parental and Household Characteristics

	Mean	S.D.
	(1)	(2)
Mother Characteristics		
Age	27.20	5.71
Education	3.67	4.38
Worked in last year	0.41	
Ideal no. of children	2.77	1.00
Ideal no. of boys	1.56	0.66
Ideal no. of girls	1.21	0.55
BMI	19.67	2.82
Father Characteristics		
Age	32.23	6.56
Education	5.92	4.75
Worked in last year	0.97	
Ideal no. of children	2.75	1.02
Ideal no. of boys	1.57	0.70
Ideal no. of girls	1.18	0.56
Household Characteristics		
Wealth Quintile		
1	0.25	
2	0.28	
3	0.25	
4	0.16	
5	0.06	
Religion		
Hindu	0.73	
Muslim	0.10	
Christian	0.13	
Others	0.04	
Male household head	0.95	
Total no. of children	3.18	1.87
Number of households	4,900	

ideal number of boys and girls to be 1.57 and 1.18 respectively, adding up to 2.75 ideal number of children. Based on wealth quintiles reported by NFHS for the entire survey sample, the majority of the households in this sample fall in the first four wealth quintiles and only 6 percent of the total 4,900 households fall in the highest wealth quintile.[9] Majority (about three-quarters) of the households belong to the Hindu community and the household is headed by a male member in 95 percent of the sample. The average number of children in these households is 3.18.

2.3 Measuring Son Preference

The term son preference refers to "the attitude that sons are more important and more valuable than daughters" (Clark 2000, p.95). The NFHS includes questions on the ideal number and ideal sex composition of children which are asked to both parents. Specifically, the two questions asked to obtain information on fertility preferences are: (1) "If you could go back to the time 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?" and (2) "How many of these children would you like to be boys and how many would you like to be girls?" A point to note is that because of the manner in which these questions have been framed, they are more likely to capture innate preferences rather than dynamic ones that could evolve due to factors such as the sex composition of children already born.

Separate measures of son preference for each parent are derived from their responses to the second question mentioned above. Using information from a parent's report on the number of boys and girls they would ideally like to have, son preference is calculated as a binary variable. If the ideal number of boys reported is greater than the ideal number of girls, then this measure has a value of one and implies that the parent has a son preference. This measure has a value of zero if the ideal number of sons is less than or equal to the ideal number of daughters.[10]

[9] NFHS reports the wealth quintiles of the surveyed households. Wealth indices are constructed from information on ownership of household assets (such as furniture and vehicles), dwelling characteristics (such as water source), home construction materials and whether a household member has a bank or post office account. These composite indices are then categorized by quintiles (relative to households in the survey round). Quintile 1 denotes the poorest households and quintile 5 denotes the wealthiest households.

[10] Consider for example, three mothers each of whom report their ideal number of children to be four. Suppose that the first mother wants three boys and one girl, the second mother wants two boys and two girls and the third mother wants one boy and three girls. Then only the first mother is designated to have a son preference.

A related measure has been used by Clark (2000); the ratio of ideal number of sons to the ideal number of children, where a higher ratio implies a greater preference for sons. This measure makes it possible to assess differing magnitudes of son preference. Due to a much smaller sample size (about 6 percent of the sample size in Clark (2000)) in this analysis, there is not sufficient variation that can be exploited to use such a measure. Instead, the binary measure of son preference used can be conceived as an aggregated version of Clark's measure where parents who would like more than 50 percent of their children to be boys are designated as those with a son preference.

Table 2.3: Distribution of Parental Preferences

		Father has son preference		
		No	Yes	Total
		(1)	(2)	(3)
Mother has son preference	No	2,318	932	3,250
		(71.32)	(28.68)	(100.00)
		[72.71]	[54.44]	[66.33]
	Yes	870	780	1,650
		(52.73)	(47.27)	(100.00)
		[27.29]	[45.56]	[33.67]
	Total	3,188	1,712	4,900
		(65.06)	(34.94)	(100.00)
		[100.00]	[100.00]	[100.00]

Notes: Son preference for either parent is calculated as a binary variable which equals one if the parent reports that their ideal number of boys is greater than their ideal number of girls and is zero otherwise. Figures in parenthesis and square brackets present the row and column percentages respectively.

Variation in the son preference of parents is reported in Table 2.3. Approximately 34 percent of mothers and 35 percent of fathers in the sample report having a preference for sons. Parental preferences match in 63 percent of the 4,900 households. Of those households, in 2,318 cases (47 percent) neither parent has a son preference while both parents have a son preference in 780 cases (16 percent). In the remaining 1,802 households (37 percent), preferences do not match and either the mother or the father has a son preference.

Appendix Table B.1 outlines some basic characteristics associated with son preference. Household characteristics include higher probability of falling in the lower wealth quintiles as well as greater number of children. Older age and lower educational attainment of both parents are found to be associated with son preference. It can also be seen that parents with a son preference desire a greater ideal number of children.

2.4 Measuring Female Autonomy

For purposes of this analysis, female autonomy is defined as "the ability of women to make choices/decisions within the household relative to their husbands" (Anderson and Eswaran 2009, p.179). The NFHS asked adult male and female household members questions on decision making on a number of household matters, namely, household purchases, own health care, visits to family or relatives, and spending of spousal earnings. Household purchases were categorized into large purchases and purchases made for daily needs of the household. The two types of purchases differ on the amount of money to be spent and whether the purchase is routine or not: daily purchases being more routine and requiring a relatively smaller amount of money to be spent than large purchases (Kishor and Subaiya 2005).

The measure of status of female autonomy used in this paper is based on responses to the decision making question on household purchase for daily needs, which is likely to be the most directly relevant for investments in child nutrition. Fathers were asked about who they think the decision making power should rest upon while mothers were asked about who actually takes the decision in the household. Specifically, the question posed to the father was "Who do you think *should have* the most say in making decisions on household purchases for daily needs?" while the mother was asked "Who do you think *has* the most say in making decisions on household purchases for daily needs?"

Table 2.4 reports parental responses to the decision making question. The father responds whether the decision should be taken by himself (1,137 households, 23 percent), jointly with his wife (1,975 households, 40 percent) or by his wife alone (1,788 households, 36.5 percent). The mother responds whether the actual decision is taken by her husband (1,268 households, 26 percent), jointly with her husband (1,472 households, 30 percent), by herself (1,456 households, 30 percent) or by others (for instance, mother-in-law) in the household (566 households, 11.5 percent).[11] These

[11] The mothers' responses do not add up to 100 percent due to 138 observations which have missing value.

response categories provide variation in the status of female autonomy with decision making power of the mother being the strongest when she takes (should take) the decision all by herself and weakest when the decision is taken (should be taken) solely by her husband. When the couple jointly takes a decision, female autonomy lies in between. Since identity and details on preferences of the decision maker are not available when the mother responds that "others" take the decision, observations for this category are excluded from the analysis based on the mother's response.[12]

Table 2.4: Decision Making: Variation in Parental Response

		Mothers' response					
		Father (1)	Both (2)	Mother (3)	Others (4)	Missing (5)	Total (6)
Fathers' response	Father	**358**	326	270	153	30	1,137
		(31.49)	(28.67)	(23.75)	(13.46)	(2.64)	(100.00)
		[28.23]	[22.15]	[18.54]	[27.03]	[21.74]	[23.20]
	Both	517	**662**	535	209	52	1,975
		(26.18)	(33.52)	(27.09)	(10.58)	(2.63)	(100.00)
		[40.77]	[44.97]	[36.74]	[36.93]	[37.68]	[40.31]
	Mother	393	484	**651**	204	56	1,788
		(21.98)	(27.07)	(36.41)	(11.41)	(3.13)	(100.00)
		[30.99]	[32.88]	[44.71]	[36.04]	[40.58]	[36.49]
	Total	1,268	1,472	1,456	566	138	4,900
		(25.88)	(30.04)	(29.71)	(11.55)	(2.82)	(100.00)
		[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]

Notes: This is a cross tabulation of mothers' and fathers' responses to the decision making question. Items in bold font reflect agreement in the parents' responses. Figures in parenthesis and square brackets present the row and column percentages respectively.

Two features are worth noting from the cross tabulation of parental responses presented in Table 2.4. First, agreement of responses by both spouses on identity of the decision maker is observed only in 1,671 (34 percent) households. In contrast, the frequency of agreement in spousal responses is much higher for decisions related to other household matters, for example, large household purchases (46 percent, statistics not reported). Second, in comparison to the fathers' report, mothers' reports are skewed to portray a greater involvement of fathers in deciding matters related to daily household needs. For example, among the 1,268 mothers who say that their husbands are the sole decision makers, spouses of 358 of these mothers agree with this report while the remaining 517 and 393 fathers think that it should be a joint decision or that only their wives

[12] As a check, regressions are also estimated for this category but the coefficients are not found to be statistically significant.

should be involved in decision making. There are two potential explanations that can account for this apparent difference in perceptions. One relates to the nature of the decision under analysis. When exploring the decisions relating to large household purchases (statistics not reported), both parents report a greater likelihood of the father being involved in decision making. This suggests that in matters which are considered more important and involve the outlay of a larger sum of money, fathers are less willing to entrust their wives with the power to make decisions than in the case of relatively routine matters. The second explanation is that in a patriarchal society such as India (as is evidenced by the majority (95 percent) of households in this sample being headed by a male member), established norms might make women less likely to perceive that she could take independent decisions that are not vetted by her spouse.

Appendix Tables B.2 and B.3 summarize household and parental characteristics separately by the fathers' and mothers' response to the decision making question. These descriptive statistics reveal characteristics that are associated with the greatest level of female autonomy (father or mother reporting that the mother should be (is) the sole decision maker). Household characteristics include fewer children and lower probability of being in the lowest (poorest) wealth quintile. Parental characteristics include high BMI of mother, greater likelihood of the mother being employed as well as older age and higher educational attainment of both parents. These accord well with the correlates of female bargaining power from previous literature and validates the separate measures of female autonomy based on the fathers' and mothers' reports that are used in this analysis.

2.5 Empirical Specification

This paper first examines whether gender gaps in child nutrition are evident in the presence of parental son preference and then tests if this relationship varies with the level of female autonomy.

To answer these questions, the following regression specification is estimated.

$$\begin{aligned} y_{ibs} &= \alpha_0 + \alpha_1 Male_{ibs} + \alpha_2 MotherSonPref_{is} + \alpha_3 FatherSonPref_{is} + \alpha_4 (Male_{ibs} \times \\ &\quad MotherSonPref_{is}) + \alpha_5 (Male_{ibs} \times FatherSonPref_{is}) + X_{is}\theta + \phi_b + \gamma_s + \epsilon_{ibs} \end{aligned} \quad (2.1)$$

where y is the weight-for-height z score of child i of birth order b residing in state s. $Male_{ibs}$ specifies the gender of the child. $MotherSonPref_{is}$ and $FatherSonPref_{is}$ are binary variables which indicate if the mother or the father has a son preference. X is a vector of controls and includes mother's BMI, age of mother at childbirth, reported ideal number of children, educational attainment, and dummies for work status of both parents, total number of children in the household, dummy for female household head, and dummies for wealth quintile and religion. ϕ_b and γ_s represent birth order and state fixed effects; these are included in all regressions to control for any birth order and state level heterogeneity. The regressions are estimated first for the full sample and then separately by who makes decisions in household purchases for daily needs, which are based on the fathers' and mothers' reports. The estimation method is ordinary least squares.

The basic idea of the specification equation is thus to compare the outcomes of children whose parents have a son preference to ones where they do not. The coefficients of interest are the interaction terms between gender of the child and son preference of parents. α_4 gives the difference in gender gap in nutrition when the mother has a son preference compared to when she does not. α_5 gives the analogue when the father has a son preference.

2.6 Results

2.6.1 Results Based on Parental Preferences

The starting point of this analysis is to examine whether gender gaps in child nutrition are observed when parents have a son preference compared to when they do not. The regression results from estimating equation (2.1) for the full sample are reported in Table 2.5. The coefficient on the *Male* dummy is statistically insignificant, which indicates the absence of a gender gap when neither parent has a son preference. The average weight-for-height z score of female children is found to be

0.12 standard deviations lower when the mother has a son preference compared to when she does not. Interestingly, this relation is not found when fathers have a son preference. The interaction term of the child's gender and the son preference of mother is positive, which indicates that a gender gap exists when mothers have a son preference. However, the estimate is not statistically significant.

Table 2.5: Results: Preferences and Child Nutrition

	Weight-for-height (1)
Male (= 1)	0.0090
	(0.040))
Mother has son preference (= 1)	-0.12**
	(0.049)
Father has son preference (= 1)	0.022
	(0.048)
Male * Mother has son preference	0.074
	(0.062)
Male * Father has son preference	-0.056
	(0.066)
N	6,897
R^2	0.091

Notes: This table presents the regression results for equation (2.1) for the full sample of children. The dependent variable is the weight-for-height z score of a child. All controls are included but are not reported. Excluded categories include birth order 1, wealth quintile 1, Hindu religion, working father and non-working mother. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis. *** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

This result naturally raises the question of why only maternal preferences matter. A potential explanation is that mothers are primarily responsible for feeding young children and therefore can act on their preferences. Altering the quantity or quality of food are examples of how they might manifest their preferences.

But is it true that the mother is always able to act upon her preferences? Or does her ability to do so vary with the level of autonomy she enjoys in the household? The next two subsections seek to answer these questions. A source of concern with such an analysis is the systematic under or over representation of parental preferences across different autonomy levels. However, from Appendix

Tables B.4 and B.5, this does not seem to be the case. Preferences are found to be distributed across the different autonomy structures (considering both the fathers' and the mothers' response) in approximately the same proportion as in the full sample.

2.6.2 Results Based on Fathers' Response

To explore if the level of female autonomy has a bearing on the relationship between son preference and child nutrition, regressions are estimated separately based on the fathers' report on who he thinks should make decisions in household purchases for daily needs. Table 2.6 reports the estimation results of equation (2.1). The coefficient estimates on the *Male* dummy in all three columns are found to be statistically insignificant, implying the absence of a gender gap when neither parent has a son preference. In column (3), when the father thinks the decision making power should rest on his wife (the mother), the average z score of female children is found to be 0.25 standard deviations lower when the mother has a son preference. The coefficient on the interaction term *Male*Mother has son preference* indicates that the average z score of male children is 0.19 standard deviations higher than female children when the mother has a son preference compared to when she does not. These results are not obtained in columns (1) and (2), where the father reports that he alone or both he and his wife should participate in household decision making.[13] In both these cases, there appear to be no relation between son preference of parents and child nutrition. As with the results for the full sample, reported in Table 2.5, the son preference of father plays no significant role. This is true no matter who the father thinks the decision maker should be.

These results indicate that mothers are only able to manifest their preferences when they have the sole power to make decisions on household purchases for daily needs but cannot do so when the father wields his influence. The son preference of fathers, on the other hand, does not matter even when he believes that he alone should be in charge of daily household purchases.

The cross tabulation of parental responses to the decision making question, presented in

[13] The coefficient on *Male*Mother has son preference*, however, is not found to significantly differ across the three groups.

Table 2.6: Results: Fathers' Response

	Decision Maker in HH		
	Father	Both	Mother
	(1)	(2)	(3)
Male (= 1)	-0.00096	0.0040	0.041
	(0.077)	(0.061)	(0.069)
Mother has son preference (= 1)	-0.14	0.018	-0.25***
	(0.094)	(0.075)	(0.082)
Father has son preference (= 1)	-0.029	0.12	-0.037
	(0.090)	(0.076)	(0.084)
Male * Mother has son preference	-0.00040	-0.0026	0.19*
	(0.13)	(0.099)	(0.11)
Male * Father has son preference	0.070	-0.070	-0.12
	(0.13)	(0.10)	(0.11)
N	1,585	2,792	2,520
R^2	0.131	0.099	0.098

Notes: This table presents the regression results for equation (2.1) where the sample is stratified by the fathers' response to the decision making question. The dependent variable is the weight-for-height z score of a child. All controls are included but are not reported. Excluded categories include birth order 1, wealth quintile 1, Hindu religion, working father and non-working mother. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.
*** p< 0.01, ** p< 0.05, * p< 0.1.

Table 2.4, attested to the low frequency of agreement in spousal responses as well as the greater likelihood of mothers reporting involvement of fathers in decisions related to household purchases for daily needs. In what follows, the analysis is repeated based on the mothers' response to the decision making question to examine if the difference in responses alters any of the above results.

2.6.3 Results Based on Mothers' Response

Table 2.7 reports estimation results of equation (2.1) based on the mothers' report. As before, regressions are estimated separately for households where the father, mother or both parents participate in decision making. Columns (1) and (3) reveal that when the father or the mother is the sole decision maker, there is no baseline gender gap or variation in this gap depending on whether the parents also have a son preference. However, results from column (2) indicate that the son preference of mothers are associated with a gender gap when both parents participate in the decision making process. The weight-for-height z score of the average female child is 0.11 standard deviations lower when her mother has a son preference, although the coefficient is statistically insignificant. The estimated coefficient on the interaction term *Male*Mother has son preference* is 0.26, which suggests that the average gap in z scores between male and female children is 0.26 standard deviations when the mother has a son preference compared to when she does not.[14]

No statistically significant association is found between the son preference of fathers and child nutrition outcomes. The result that it is only the preference of mothers that matter is consistent with the previously reported results. The difference is observed in the autonomy structure in which mothers are found to be able to manifest their preferences.

2.6.4 Discussion - Reconciling Results

Results from the above analyses confirm the existence of a significant association between maternal son preference and gender bias in short run indicators of child nutrition. However, some ambiguity is observed on the exact household decision making structure where mothers can act upon

[14] The coefficient on *Male*Mother has son preference* is found to significantly differ across the three groups.

Table 2.7: Results: Mothers' Response

	Decision Maker in HH		
	Father	Both	Mother
	(1)	(2)	(3)
Male (= 1)	-0.042	0.053	0.034
	(0.076)	(0.071)	(0.076)
Mother has son preference (= 1)	-0.070	-0.11	-0.12
	(0.087)	(0.093)	(0.094)
Father has son preference (= 1)	0.063	-0.033	0.032
	(0.086)	(0.087)	(0.090)
Male * Mother has son preference	-0.10	0.26**	0.014
	(0.12)	(0.12)	(0.12)
Male * Father has son preference	0.015	-0.083	-0.077
	(0.12)	(0.12)	(0.13)
N	1,806	2,089	2,018
R^2	0.102	0.117	0.125

Notes: This table presents the regression results for equation (2.1) where the sample is stratified by the mothers' response to the decision making question. The dependent variable is the weight-for-height z score of a child. All controls are included but are not reported. Excluded categories include birth order 1, wealth quintile 1, Hindu religion, working father and non-working mother. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.
*** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

their preferences. Based on the fathers' response, this association is observed when mothers are the sole decision makers while results based on the mothers' response suggest that this association exists when both parents are involved in making decisions.

One way to explain this apparent discrepancy is through the examination of the couples' responses to the decision making question, which is presented in Table 2.4. As discussed before, due to the routine nature of the decision and established gender roles in the society under analysis, mothers are found to report far greater involvement of fathers in deciding matters related to daily household needs. Therefore, it is not surprising that results based on the mothers' response are found in the "both" category as opposed to the "mother" category. Table 2.4 also indicates that parental responses to the decision making question match in 1,671 (34 percent) households. Results based on this subsample, where parental responses match, are presented in Appendix Table B.6. The results resemble those based on the fathers' response although the positive coefficient on *Male*Mother has son preference* in column (3) is statistically insignificant.

There is another reason to place a greater emphasis on the results based on the fathers' response. These responses are indicative of the degree of autonomy husbands are actually willing to grant to their wives (Chakraborty and De 2011). Consequently, the husband's perception likely presents a more accurate picture of female autonomy, especially in a patriarchal society such as India.

2.7 Interaction of Parental Preferences

The specification given by equation (2.1) examines the relationship between gender gaps in child nutrition and son preference of each parent independent of the other parent's preference. Table 2.3 presents evidence that parental responses match in 3,098 households (63 percent) and do not match in the remaining 1,802 households (37 percent). To analyze whether the matching of preferences matter, the following model with interaction of parental preferences is estimated.

$$\begin{aligned} y_{ibs} &= \beta_0 + \beta_1 Male_{ibs} + \beta_2 MotherSonPref_{is} + \beta_3 FatherSonPref_{is} + \beta_4 (Mother \\ &\quad SonPref_{is} \times FatherSonPref_{is}) + \beta_5 (Male_{ibs} \times MotherSonPref_{is}) + \beta_6 (Male_{ibs} \\ &\quad \times FatherSonPref_{is}) + \beta_7 (Male_{ibs} \times MotherSonPref_{is} \times FatherSonPref_{is}) \\ &\quad + X_{is}\theta + \phi_b + \gamma_s + \epsilon_{ibs} \end{aligned} \tag{2.2}$$

where y is the weight-for-height z score of child i of birth order b residing in state s. As before, $MotherSonPref_{is}$ and $FatherSonPref_{is}$ are binary variables which indicate if the mother or the father has a son preference. X includes the same controls as in equation (2.1). ϕ_b and γ_s represent birth order and state fixed effects.

β_2 gives the mean difference in the nutrition outcome of female children when only the mother has a son preference relative to the baseline case of neither parent having a son preference. β_3 gives the analogue when only the father has a son preference. β_5 (β_6) gives the difference in gender gap in nutrition when only the mother (father) has a son preference compared to neither parent having a son preference. The coefficient on the interaction of parental preferences, β_4, gives the differential influence on female outcomes of mothers having a son preference when fathers have a son preference relative to when they do not. The triple interaction term, β_7, gives the differential influence on the gender gap.

The discussion in the previous section alludes to reasons why the fathers' report might be a more accurate representation of female autonomy in the household. Therefore, regressions results for equation (2.2) are estimated based on the fathers's response to the decision making question. These results are reported in Table 2.8. Similar to Table 2.6, gender gaps are observed only in column (3), where fathers report that their wives should be the sole decision makers. The coefficient on *Mother has son preference*Father has son preference* is -0.44, which suggests that when fathers have a son preference, the z scores of female children are 0.44 standard deviations lower if mothers also have a son preference. The differential gender gap when both parents have a son preference is 0.48 standard deviations. Interestingly, the negative influence of mothers' son preference on girls

Table 2.8: Results: Interaction of Parental Preferences

	Decision Maker in HH		
	Father	Both	Mother
	(1)	(2)	(3)
Male (= 1)	-0.034	-0.0026	0.085
	(0.082)	(0.065)	(0.074)
Mother has son preference (= 1)	-0.21*	0.034	-0.084
	(0.11)	(0.097)	(0.10)
Father has son preference (= 1)	-0.091	0.14	0.11
	(0.11)	(0.092)	(0.10)
Mother has son preference * Father has son preference	0.17	-0.040	-0.44***
	(0.18)	(0.15)	(0.17)
Male * Mother has son preference	0.12	0.017	0.0087
	(0.17)	(0.13)	(0.13)
Male * Father has son preference	0.18	-0.051	-0.29**
	(0.17)	(0.13)	(0.14)
Male * Mother has son preference * Father has son preference	-0.30	-0.044	0.48**
	(0.25)	(0.20)	(0.23)
N	1,585	2,792	2,520
R^2	0.132	0.099	0.101

Notes: This table presents the regression results for equation (2.2) where the sample is stratified by the fathers' response to the decision making question. The dependent variable is the weight-for-height z score of a child. All controls are included but are not reported. Excluded categories include birth order 1, wealth quintile 1, Hindu religion, working father and non-working mother. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.

*** p< 0.01, ** p< 0.05, * p< 0.1.

is only to be found when fathers have a son preference but not when only the mother has a son preference.[15] The coefficient on *Male*Father has son preference* is -0.29, which implies that when only fathers have a son preference, female children fare better than male children. This suggests that mothers are able to protect female children against discrimination in nutrition investments if she has no son preference and greater autonomy in the household. As before, no independent association is found between child nutrition outcomes and father son preference.

2.8 Conclusion

Using separate reports from couples on their preference for sons and perceptions of status of female autonomy in their household, this paper examines how the relationship between parental son preference and gender gaps in child nutrition varies with the level of female autonomy. Using data from the $2005-06$ round of the NFHS, gender gaps in child nutrition are observed when mothers have a son preference and are also involved in household decision making. In contrast, no independent association is found between child nutrition outcomes and paternal preferences. Overall, these results suggest that explicitly accounting for parental preferences may be important when studying the dynamics of intra-household bargaining.

[15] The coefficient on *Male*Mother has son preference*Father has son preference* is found to significantly differ across the three groups.

Chapter 3

Women's Partner Choices and Gender Relations

3.1 Introduction

A number of marriage types coexist in India. "Arranged marriage" is the predominant form of marriage, where the arrangement is negotiated by the two families (Medora 2003).[1] With increasing urbanization, educational attainment, and exposure to modern ideas and influences, there has been a growing tendency for families to consult and seek input from the young adults themselves (Banerji, Martin, and Desai 2008). In some cases, families allow the potential partners to communicate for a brief period so as to help them "decide whether they are suited for each other and whether they like each other adequately to get married and spend the rest of their lives together" (Medora 2003, p.218). Familial approval continues to be important even in self-arranged marriages where individuals choose their own partners (Medora 2003).

The deep involvement of the family in arranged marriages implies that a great deal of emphasis is placed on common family interests and inter-generational unity resulting in social, religious and cultural similarities to form the basis of those matches (Medora 2003). Where individuals are themselves involved in the final decision about their spouse, matches are more likely to be based on personal relationship considerations (Banerji et al. 2008; Fox 1975). The first part of this paper seeks to test these notions and investigates if partner characteristics differ depending on the extent of a woman's say in the choice of her partner. This is, to my knowledge, the first paper to examine

[1] The perpetuation of this system has been attributed to the belief of many young Indian adults that they lack the appropriate judgment and wisdom to find their own mates. Consequently, they leave this task up to their parents who they believe to be the best suited for the task since they have raised them and know what is best for them (Jones 2010; Medora 2003).

nationwide assortative mating patterns based on the extent of family involvement in the choice of a woman's partner in India.[2] The decision about whom to marry influences a number of things, one of which is the bargaining power of women after marriage. Higher relative bargaining power of women in turn is associated with several favorable outcomes, for example, lower fertility levels and greater investments in child health (Duflo 2003; Eswaran 2002; Thomas 1994). The next part of this paper, therefore, explores the influence of the type of marriage arrangement on the decision making power of women.

There is relatively little research on marriage types, especially at the national level, primarily due to the lack of data.[3] There are some studies on marriage patterns in specific regions. For example, Banerjee et al. (2009) and Dugar et al. (2010) find that within-caste marriage is the norm for arranged marriages in West Bengal, a state in eastern India. Using data from rural regions in two states, Jejeebhoy and Halli (2005) have explored changes in marriage age, marriage-related decision making, spousal age and educational differences, and dowry practices across different cohorts of women.

The 2005 India Human Development Survey (IHDS) is the only nationally representative survey to provide information on women's involvement in the marriage and mate selection process. Therefore, any nationwide study of marriage patterns would entail the use of this dataset. The study by Banerji et al. (2008), for example, finds that increasing levels of education are associated with greater autonomy in partner choice as more families seek the consent of the woman in the choice of her partner. Additionally, they find that this trend towards autonomy is more pervasive among younger cohorts of women. Using the same dataset, Banerji and Vanneman (2009) also examine the relationship between marriage types and decision making power of women. They construct an index of female autonomy from survey responses to decision making questions and find that self-arranged marriages are the most empowering for women. My study differs primarily

[2] Fox (1975) examines differences in marital homogamy and marital behavior across marriage types in Turkey. His study found no difference in the extent of homogamy between love and arranged marriages, and little evidence of an independent impact of marriage type on marital behavior.

[3] Much of the economic literature on marriage in India has focused on dowry practices or the age at marriage (Desai and Andrist 2010; Rao 1993).

with the usage of a fixed effects model, inclusion of additional controls in the estimation equation, and stratifying the analysis by urban-rural location of household. Estimating a model with state and birth cohort fixed effects assists in controlling for unobserved state and cohort level heterogeneity while the inclusion of additional controls allows us to better isolate the independent relationship between marriage types and intra-household gender relations. Finally, the locational stratification is justified based on the considerable variation in marriage patterns across these areas, which likely stem from differential exposure to modern ideas and variation in educational composition.

Using data from the IHDS, the results from this analysis indicate that in arranged marriages, women are more likely to marry someone from the same caste and someone at least as educated as her. On the other hand, self-arranged marriages are more likely to match similarly aged individuals and individuals from different castes. In contrast to Banerji and Vanneman (2009), this study finds no strong evidence that women with the greatest autonomy in partner choice are the ones with the greatest autonomy in making household decisions and decisions regarding their children. Instead, bargaining power is found to be the highest among women involved in the choice of their spouse together with their parents. The explanation offered in this paper is that self-arranged marriages likely result in matches that are not approved by the parents and this lack of familial support leads to the low bargaining power of these women.

3.2 Data

The data come from the 2005 India Human Development Survey (IHDS), a nationally representative survey conducted in India.[4] The survey covered approximately 33,500 ever-married women who were asked questions on a variety of topics including education, mate selection, marital history, and gender relations. This dataset provides the unique opportunity to study women's involvement in marriage related decision making since it is the only nationally representative dataset to collect this information.

The sample is restricted to married Hindu women aged $20-49$ years, who are currently

[4] The IHDS is publicly available at `http://www.icpsr.umich.edu/icpsrweb/DSDR/studies/22626`.

living with their husbands, and who have complete data on the variables used in the analysis. Observations are further restricted to women who have been married only once and whose age of marriage is between 12 and 24 years.[5] The final sample size is 19,484 women.

Table 3.1 describes the sample characteristics of women and their spouses. The average woman in an urban household is 33.5 years old, has an educational attainment of 7 years and got married at the age of 18. The average urban spouse is 39 years old and has an educational attainment of 9 years. The IHDS collected information on the degree of proficiency in speaking English. Proficiency in English reflects elitist education associated with private schooling, which is positively correlated with an individual's exposure to modern ideas as well as high economic status of parents (Banerji et al. 2008; Rana et al. 2005). Out of the 6,707 women in urban households, 74 percent report having no ability to speak English, 21 percent report being somewhat fluent and 5 percent report that they can converse fluently in English. Among their spouses, 60 percent are not fluent, 30 percent are somewhat fluent and 10 percent are fluent in English. In rural households, the average woman is 33 years old and has an educational attainment of 3 years. The average age at marriage is 17 years. 92 percent of rural women do not speak English, 7 percent have limited English speaking ability and 1 percent is fluent. The analogous distribution of English speaking ability of their spouses are 82 percent, 16 percent and 2 percent. The average age and educational attainment of rural spouses are 38 years and 6 years respectively. Column (5) reports the t statistics of the difference in characteristics of women and men between urban and rural areas. All of these are found to be statistically significant, which provides the justification for separating the analysis by location of household.

Table 3.2 reports the age distribution of women in the sample. Out of the 6,707 women in urban households, 2,294 women (34 percent) are between the ages of $20-29$, 2,643 women (39

[5] Since marriage processes vary considerably across religions, a generalized discussion would not be possible. Therefore, the sample is restricted to Hindu households since the majority (81 percent) of the surveyed households belong to the Hindu community. Observations on women who are widowed, divorced, separated or have absent spouses are dropped since spousal information is either not collected or not complete for these women. This results in the exclusion of 1,596 women. The restriction on marriage age leads to the further exclusion of 1,845 observations. The rationale behind this exclusion is that the extent of involvement of women in the choice of their partner is significantly different when women are much younger or older at the time of marriage (Banerji et al. 2008).

Table 3.1: Descriptive Statistics

	Urban		Rural		t-stat
	Mean	S.D.	Mean	S.D.	on diff.
	(1)	(2)	(3)	(4)	(5)
Women					
Age	33.48	7.68	32.85	7.68	5.51
Age at marriage	18.22	2.76	17.03	2.58	29.83
Years of education	6.89	5.00	3.37	4.13	52.32
English speaking ability					
Not at all	0.74		0.92		-36.38
Little	0.21		0.07		29.42
Fluent	0.05		0.01		20.35
Men					
Age	38.95	8.39	37.89	8.48	8.38
Years of education	8.99	4.55	5.82	4.66	45.46
English speaking ability					
Not at all	0.60		0.82		-34.84
Little	0.30		0.16		23.59
Fluent	0.10		0.02		24.85
N	6,707		12,777		

percent) are between the ages of $30 - 39$, and 1,770 women (26 percent) are between the ages of $40 - 49$. In rural households, 4,586 women (36 percent), 5,181 women (41 percent) and 3,010 women (24 percent) are in their 20's, 30's and 40's respectively.

Table 3.2: Birth Cohorts of Women

	Urban		Rural	
	% of total	N	% of total	N
	(1)	(2)	(3)	(4)
Birth Year: 1976-1985 (Cohort: 20-29 years)	34%	2,294	36%	4,586
Birth Year: 1966-1975 (Cohort: 30-39 years)	39%	2,643	41%	5,181
Birth Year: 1956-1965 (Cohort: 40-49 years)	26%	1,770	24%	3,010
Total	100%	6,707	100%	12,777

3.2.1 Marriage Types

The primary explanatory variable is marriage type. Following on Banerji et al. (2008), marriages are categorized into four types based on the extent of a woman's say in the choice of her spouse. Ever-married women were asked two questions to elicit information on the mate selection process. The first question asked was "Who chose your husband?", to which women responded that the choice was either made by herself, together with her parents, only by her parents or only by "others".[6] If a woman responded that she chose her own husband, the marriage is labeled as "arranged by woman alone". If she responded that she chose her husband together with her parents, the marriage is labeled as "jointly arranged by woman and parents". Only where women responded that their spouses were chosen by parents or others alone, a second question was asked. These women were asked "Did you have any say in choosing him?" to which they responded "yes" or "no". If a woman's spouse was chosen by parents or others and she had a say in choosing him, then the marriage is labeled as "parent arranged with consent of woman". If a woman's response to the second question was "no", then the marriage is labeled as "parent arranged without consent

[6] The "others" category refers to cases where extended family members or individuals outside the family played a role in choosing the spouse (Banerji et al. 2008).

of woman". These four categories represent a range of marriage types starting from one in which women make all the decisions to one in which their parents make all the decisions and they have no say at all in the choice of their spouse.

Table 3.3 shows the distribution of marriage types. Among the 6,707 urban respondents, 325 women (5 percent) reported that they themselves chose their husband, 2,531 women (38 percent) reported that they chose their husband together with their parents, 1,965 women (29 percent) reported that their consent was sought when their parents arranged their marriage, and 1,886 women (28 percent) reported that their parents arranged their marriage without their consent. The number of rural respondents reporting the four marriage types are 503 (4 percent), 4,881 (38 percent), 2,517 (20 percent) and 4,876 (38 percent) respectively. The prevalence of three of the four marriage types are found to significantly differ between urban and rural areas. The distribution of marriage types also indicates that urban women are more likely to be involved in the choice of their spouse compared to their rural counterparts.

Table 3.3: Distribution of Marriage Types

	Urban		Rural		t-stat
	% of total	N	% of total	N	on diff.
	(1)	(2)	(3)	(4)	(5)
Type 1: Arranged by woman alone	5%	325	4%	503	2.99
Type 2: Jointly arranged by woman and parents	38%	2,531	38%	4,881	-0.63
Type 3: Parent arranged with consent of woman	29%	1,965	20%	2,517	15.21
Type 4: Parent arranged without consent of woman	28%	1,886	38%	4,876	-14.06
Total	100%	6,707	100%	12,777	

Appendix Table C.1 shows that the characteristics of women differ by the reported marriage type. These descriptive statistics reveal that on average, a woman whose marriage was arranged by her parents without her consent (Type 4) got married at a younger age, has a lower educational attainment and a greater likelihood of not being able to converse in English compared to women reporting other types of marriage. These patterns are observed among both urban and rural respondents.

3.2.2 Outcome Variables

There are five outcome variables used to examine the extent of assortative mating across the four marriage types. These include age difference between a woman and her husband, indicator for whether the husband grew up in the same village or town as the woman, indicator for whether the husband belongs to the same caste as the woman, indicator for whether the economic status of the husband's family is at least similar to the woman's family, and indicator for whether the husband is at least as educated as the woman. Table 3.4 reports the raw means of these variables. Age difference between couples is found to be the lowest in parent arranged marriages without the consent of woman. Women who arrange their own marriage are more likely to marry someone who grew up in the same village or town as her. The likelihood of a woman marrying someone at least as educated as her or marrying someone whose family is economically at least as well off as her family is higher when her parents are involved in the choice of her husband. Within-caste marriage appears to be the norm when parents are involved in arranging the marriage. Women who arrange their own marriage are less likely to choose someone from the same caste. The above mentioned patterns are observed in both urban and rural households.

Table 3.4: Means: Variables Used to Analyze Partner Choices

	Urban Households				Rural Households			
	Type 1 (1)	Type 2 (2)	Type 3 (3)	Type 4 (4)	Type 1 (5)	Type 2 (6)	Type 3 (7)	Type 4 (8)
Spousal age difference	5.46	5.52	5.84	5.02	5.16	5.14	5.77	4.55
Husband from same village /town (= 1)	0.38	0.13	0.19	0.09	0.23	0.10	0.15	0.07
Husband from same caste (= 1)	0.78	0.95	0.96	0.96	0.90	0.97	0.97	0.97
Husband's economic status at least similar to woman's family (= 1)	0.90	0.94	0.93	0.93	0.90	0.91	0.90	0.93
Husband at least as educated as woman (= 1)	0.77	0.82	0.81	0.89	0.82	0.89	0.83	0.92
N	325	2,531	1,965	1,886	503	4,881	2,517	4,876

Notes: This table reports the means of the variables used to examine differences in partner choices. The four marriage types are: (1) Arranged by woman alone, (2) Jointly arranged by woman and parents, (3) Parent arranged with consent of woman, and (4) Parent arranged without consent of woman.

Five variables are used to analyze the decision-making power of women across the different marriage types. These are derived from survey questions on who in the household has the most say in decisions pertaining to what to cook on a daily basis, whether to purchase an expensive item (such as refrigerator or television), how many children to have, what to do when a child falls sick, and whom children should marry. Women responded if they themselves, their husbands, a senior male member, a senior female member, or others were the primary decision makers. To explore the extent of the woman's autonomy in household decisions, binary variables are constructed which have a value of one if the woman has the most say and zero if her husband, a senior male member, senior female member or others have the most say.[7] Thus, the decision making power of women is examined both with respect to her husband and other elderly household members, for instance mother-in-law. Table 3.5 reports the raw means of these variables across the different marriage types. Not surprisingly, higher percentage of urban women report being the primary decision maker compared to their rural counterparts. Another pattern observed in both urban and rural households is that women in marriages arranged by parents without their consent have lower decision-making power than women whose marriages are self-arranged, jointly arranged with parents or arranged by parents with their consent.

Table 3.5: Means: Variables Used to Analyze Intra-Household Gender Relations

	Urban Households				Rural Households			
	Type 1 (1)	Type 2 (2)	Type 3 (3)	Type 4 (4)	Type 1 (5)	Type 2 (6)	Type 3 (7)	Type 4 (8)
Woman has most say in								
What to cook on daily basis (= 1)	0.82	0.79	0.80	0.78	0.73	0.73	0.77	0.71
Whether to purchase an expensive item (= 1)	0.15	0.08	0.12	0.08	0.09	0.08	0.07	0.04
How many children to have (= 1)	0.27	0.18	0.24	0.21	0.21	0.14	0.16	0.14
What to do if child falls sick (= 1)	0.40	0.28	0.41	0.27	0.29	0.26	0.29	0.18
Whom children should marry (= 1)	0.16	0.07	0.10	0.06	0.13	0.07	0.07	0.04
N	296	2,389	1,803	1,749	473	4,559	2,384	4,668

Notes: This table reports the means of the variables used to analyze differences in intra-household gender relations. The four marriage types are: (1) Arranged by woman alone, (2) Jointly arranged by woman and parents, (3) Parent arranged with consent of woman, and (4) Parent arranged without consent of woman.

[7] To examine the relation between gender relations and marriage types, Banerji and Vanneman (2009) used survey responses to the last four decisions to construct an index of female autonomy. The index ranges from zero to four, where a value of four indicates that the woman has the most say in all four decisions and a value of zero indicates that she is not the primary decision maker in any of those decisions.

3.3 Analysis of Assortative Mating Patterns

3.3.1 Empirical Strategy

This paper first examines whether assortative mating patterns differ across the four marriage types. The regression specification to identify differences in partner choices is given below.

$$y_{ics} = \alpha + \sum_{j=1}^{3} \beta_j MarriageType_{j,ics} + X_{ics}\theta + \phi_c + \gamma_s + \epsilon_{ics} \qquad (3.1)$$

where y is a characteristic of the husband of woman i of birth cohort c in state s, $MarriageType$ specifies the type of marriage reported by a woman, and X_{ics} is a vector of characteristics of women. ϕ_c and γ_s represent ten-year birth cohort and state fixed effects.[8] The regressions are estimated separately for urban and rural respondents.

The five dependent variables are (1) spousal age difference, (2) indicator for whether the husband grew up in the same village or town as the woman, (3) indicator for whether the husband belongs to the same caste as the woman, (4) indicator for whether the economic status of the husband's family is at least similar to the woman's family, and (5) indicator for whether the husband is at least as educated as the woman. Ordinary least squares is used for estimation when spousal age difference is analyzed. Since the other dependent variables are all binary, the logit model is employed.

Dummies for the three marriage types, arranged by woman alone, jointly arranged by woman and parents, and parent arranged with consent of woman are included in the estimation equation. The omitted category is parent arranged marriage without the consent of woman. The coefficients β_j trace out the average difference in partner characteristics between marriage type j and the omitted marriage category.

Appendix Table C.1 attests to differences in age of marriage, educational attainment and English speaking ability of women across the different marriage types. In general, these statistics reveal that less educated women and women who marry young are those who are less likely to

[8] Using 5-year birth cohorts instead of 10-year birth cohorts, I find remarkable similarity in the magnitude and significance levels of the estimated coefficients on marriage types. I have also estimated the regressions separately for women in their 20's, 30's and 40's and find that the results are broadly similar across the cohorts.

have a say in the choice of their spouse.[9] Given this information, it becomes necessary to control for the sorting of women with different characteristics into the different types of marriages so as to try and isolate the independent influence of type of marriage arrangement on partner choices. Therefore, X_{ics} includes characteristics of women such as age at marriage, educational attainment, and dummies for level of proficiency in speaking English.

Partner choices could also be dictated by the characteristics of a woman's parents, their marriage as well as the household she was raised in, particularly in arranged marriages. Unfortunately, this information is not available from the IHDS.[10] However, some of the controls included in the estimation equation could serve as proxies for the same. As mentioned before, proficiency in English speaking is associated with private schooling, which in turn is positively correlated with high economic status of parents (Rana et al. 2005). Again, due to the general patterns of migration in India, a woman's residence status (urban-rural location and state of residence) pre and post marriage are highly correlated.[11] Therefore, although the residence information was collected at the time of interview (post marriage), it could well serve to indicate household characteristics at the time of marriage.

3.3.2 Results

Table 3.6 presents the regression results from estimating equation (3.1) for urban households. Of primary interest are the coefficients on the three marriage types, which give the average difference in partner characteristics with respect to the omitted category, parent-arranged marriage without the consent of woman. The results from column (1) indicate that women who arrange their own marriage are more likely to marry someone who is closer to her age. The relevant point estimate is -0.50, which indicates that spousal age difference is lower by 6 months. However, no statistically

[9] Using data from Turkey, Fox (1975) found that "love matches" are more common than arranged marriages among women from urban backgrounds, among women who married at older ages, and among more educated women.

[10] An exception is the information collected for 424 married women (2 percent of total sample) who are currently living with their parents instead of with their in-laws.

[11] The 2001 Census estimates indicate that marriage is the pre-dominant reason of migration for women. Out of the total female migrants, 87 percent migrated to other places within the same state. Even within the same state, 78 percent of the migrations were between urban and other urban areas or rural and other rural areas (Census of India 2001).

significant difference in spousal age difference is found between the other types of marriages and the omitted marriage category. The negative coefficients on the cohort dummies indicate a rising trend towards finding similarly aged partners. Column (2) indicates that in all three marriage types, women are more likely to marry someone who grew up in the same town or village. The magnitude of the estimates suggest that this probability is highest for women arranging their own marriage. Column (3) indicates that when a marriage is arranged by the woman alone, she is 16 percentage points less likely to marry someone from the same caste. Put differently, this suggests that the probability of marrying someone from the same caste is higher in marriages where parents are involved in the choice of the spouse. This result is consistent with findings from Banerjee et al. (2009) and Dugar et al. (2010) who also find the strong prevalence of within-caste matches in arranged marriages. Column (4) indicates the absence of any statistically significant difference between the economic status of the woman's family and her husband's family across the different marriage types. Column (5) indicates that the probability of a woman finding a partner who is at least as educated as her is higher when the marriage is jointly arranged by the woman and her parents or when the marriage is arranged by the woman's parents with her consent. The negative coefficients on the cohort dummies suggest that the odds of marrying someone at least as educated have reduced for the younger cohorts. The coefficient on women's educational attainment is -0.029, which implies that educated women have a greater likelihood of marrying someone less educated than them. However, the positive coefficients on the English speaking indicators imply that educational hypogamy or marrying down with respect to education is less likely when women are proficient in English.

The results for rural households echo the results from urban households and are reported in Table 3.7. A difference is observed in the results for economic status, which is presented in column (4). Women in all three marriage types are found to be more likely to marry into poorer families in comparison to women in the excluded marriage category.

Table 3.6: Partner Choices in Urban Households

	Age difference (1)	Same village/town (2)	Same caste (3)	Better/same eco.status (4)	More/equally educated (5)
Arranged by woman alone	-0.50***	0.28***	-0.16***	-0.027	-0.0011
	(0.19)	(0.037)	(0.042)	(0.018)	(0.021)
Jointly arranged by woman and parents	0.083	0.060***	-0.0039	-0.0016	0.031**
	(0.097)	(0.017)	(0.011)	(0.010)	(0.013)
Parent arranged with consent of woman	0.15	0.094***	0.0062	-0.0072	0.032**
	(0.10)	(0.018)	(0.0093)	(0.011)	(0.013)
Cohort: 20 – 29 years	-0.43***	0.024**	-0.016**	-0.0010	-0.069***
	(0.094)	(0.011)	(0.0077)	(0.0079)	(0.013)
Cohort: 30 – 39 years	-0.26***	-0.0047	-0.0090	-0.00051	-0.035***
	(0.092)	(0.011)	(0.0066)	(0.0076)	(0.012)
Years of education	0.038***	0.00076	0.0011	0.0028***	-0.029***
	(0.0099)	(0.0012)	(0.00076)	(0.00089)	(0.0014)
English speaking ability: Little	0.12	0.017	0.012	-0.016	0.057***
	(0.11)	(0.014)	(0.0086)	(0.013)	(0.011)
English speaking ability: Fluent	-0.059	0.030	-0.0034	0.0097	0.12***
	(0.18)	(0.026)	(0.016)	(0.018)	(0.011)
Age at marriage	-0.15***	-0.0056***	-0.0017	0.0030**	0.0089***
	(0.016)	(0.0019)	(0.0011)	(0.0013)	(0.0020)
N	6,707	6,707	6,707	6,707	6,707

Notes: This table presents the regression results of equation (3.1). The excluded marriage category is parent arranged without consent of woman and women aged $40-49$ years form the excluded cohort category. State fixed effects are included throughout. OLS is the estimation technique in column (1). Logit regressions are estimated for the remaining variables and the average marginal effects are reported. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.
*** p< 0.01, ** p< 0.05, * p< 0.1.

Table 3.7: Partner Choices in Rural Households

	Age difference (1)	Same village/town (2)	Same caste (3)	Better/same eco.status (4)	More/equally educated (5)
Arranged by woman alone	-0.50***	0.10***	-0.047***	-0.039**	0.0084
	(0.15)	(0.021)	(0.018)	(0.018)	(0.012)
Jointly arranged by woman and parents	-0.065	0.017	0.0057	-0.030***	0.029***
	(0.068)	(0.011)	(0.0062)	(0.0098)	(0.0071)
Parent arranged with consent of woman	0.022	0.033***	0.0074	-0.028***	0.020***
	(0.088)	(0.012)	(0.0056)	(0.010)	(0.0072)
Cohort: 20 – 29 years	-0.74***	-0.0088	0.0031	-0.013*	-0.024***
	(0.067)	(0.0073)	(0.0047)	(0.0070)	(0.0083)
Cohort: 30 – 39 years	-0.49***	-0.012*	0.0029	-0.011	-0.013*
	(0.065)	(0.0067)	(0.0044)	(0.0066)	(0.0080)
Years of education	0.039***	-0.0022**	-0.00083*	0.00079	-0.028***
	(0.0080)	(0.00091)	(0.00048)	(0.00077)	(0.00080)
English speaking ability: Little	0.28**	0.019	0.012**	-0.0036	0.052***
	(0.12)	(0.014)	(0.0046)	(0.013)	(0.0064)
English speaking ability: Fluent	0.12	-0.00012	0.0096	0.036	0.087***
	(0.33)	(0.035)	(0.013)	(0.029)	(0.0082)
Age at marriage	-0.093***	-0.0044***	-0.00051	0.0022*	0.0070***
	(0.012)	(0.0013)	(0.00080)	(0.0011)	(0.0012)
N	12,777	12,777	12,777	12,777	12,777

Notes: This table presents the regression results of equation (3.1). The excluded marriage category is parent arranged without consent of woman and women aged 40 – 49 years form the excluded cohort category. State fixed effects are included throughout. OLS is the estimation technique in column (1). Logit regressions are estimated for the remaining variables and the average marginal effects are reported. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.
*** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

Overall, these results are consistent with the perception that in arranged marriages, that is when families are involved in the choice of a woman's partner, matches are based mainly on socioeconomic and educational similarities. This is indicated by the greater likelihood of a woman marrying someone from the same caste and someone at least as educated as her. On the other hand, in marriages arranged by the woman alone, matches are based on similarities in personal characteristics of the partners at the time of marriage as is evidenced by a smaller age difference. These marriages are also more likely to take place between individuals from the same town or village, which would be the most probable way to find one's own partner.

3.4 Analysis of Intra-Household Gender Relations

3.4.1 Empirical Strategy

Next, this paper examines the relationship between marriage types and intra-household gender relations. To conduct this analysis, the following regression specification is estimated.

$$z_{ics} = \alpha + \sum_{j=1}^{3} \beta_j MarriageType_{j,ics} + W_{ics}\pi + H_{ics}\psi + X'_{ics}\theta + \phi_c + \gamma_s + \epsilon_{ics} \qquad (3.2)$$

where z is an indicator for whether the woman i of birth cohort c in state s is the primary decision maker in decisions pertaining to (1) what to cook on a daily basis, (2) whether to purchase an expensive item, (3) how many children to have, (4) what to do when a child falls sick, and (5) whom children should marry. $MarriageType$ specifies the type of marriage reported by a woman, W_{ics} is a vector of characteristics of women, H_{ics} is a vector of characteristics of their husbands, and X'_{ics} is a vector of other covariates. ϕ_c and γ_s represent ten-year birth cohort and state fixed effects, and the regressions are estimated separately by urban-rural location of household.[12] Due to the binary nature of the dependent variables, the logit model is used for estimation.

As before, dummies for the three marriage types, arranged by woman alone, jointly arranged by woman and parents, and parent arranged with consent of woman are included in the estimation

[12] Using 5-year birth cohorts instead of 10-year birth cohorts, I find that the estimated coefficients on marriage types are remarkably similar in magnitude and significance levels. I have also estimated the regressions separately for women in their 20's, 30's and 40's and find that the results are broadly similar across the cohorts.

equation. The omitted category is parent arranged marriage without the consent of woman. Therefore, the coefficients β_j indicate if the decision making power of women differ between marriage type j and the omitted category.

The ability of women to make household decisions might depend on several other factors, which are included as controls in equation (3.2). The inclusion of these controls allows us to understand if the type of marriage arrangement influences intra-household gender relations independent of its correlation with these factors. W_{ics} includes educational attainment and dummies for level of proficiency in English, which are characteristics of women that might be correlated with the level of autonomy she enjoys in her household. Similarly, H_{ics} specifies husbands' educational attainment and level of proficiency in English. X'_{ics} includes other covariates such as years since marriage, spousal age difference, dummy for whether the woman lives with her parents or alone with her husband (this equals zero if she is living with her husband's parents), dummy for whether the economic status of the husband's family is at least equal to the woman's family, and a dummy for membership in a high caste.

3.4.2 Results

Table 3.8 reports the regression results of equation (3.2) for urban households. Again, the coefficients of interest are those on the three marriage types, which give the average difference in decision making power of women compared to the omitted marriage category, parent arranged without consent of woman. In three out of the five decisions, the estimates indicate no statistically significant difference in the decision making power of women between the three marriage types and the omitted marriage category. An exception is found in column (1), where the decision on what to cook is analyzed. The point estimates suggest that in marriages jointly arranged by woman and parents, and in parent arranged marriages with woman's consent, women are 5 percentage points and 4 percentage points less likely to be the primary decision maker compared to women in parent arranged marriages without their consent. The coefficient on self-arranged marriages also carries a negative sign, but it is not statistically significant. One way to interpret the negative coefficients is that it could imply the sharing of household duties and may actually be the sign of a more egalitarian marriage. In the decision regarding what to do with sick child (column (4)), women in parent arranged marriages with their consent are found to be about 8 percentage points more likely to be the primary decision maker than women in parent arranged marriages without their consent.

The estimation results for rural households are presented in Table 3.9. Column (1) shows that in self-arranged marriages and in marriages jointly arranged by a woman and her parents, women are 6 percentage points and 5 percentage points less likely to have the most say in the decision on what to cook on a daily basis. As discussed before, these negative coefficients likely indicate the sharing of household duties. Column (5) shows that women in these same marriage categories are 3 percentage points and 2 percentage points more likely to have a say in the decision on whom children should marry compared to women whose marriages have been arranged by their parents without their consent. The positive coefficients on all three marriage types in Columns (2) and (4) suggest that these women have a greater say in decisions on whether to buy an expensive item and what to do if a child falls sick. The coefficient on self arranged marriages, however, is not statistically significant.

Overall, the results suggest that women in parent arranged marriages with their consent and women in jointly arranged marriages are the ones with the greatest autonomy in making decisions. Paradoxically, no strong evidence is found that self-arranged marriages are the most empowering for women.[13] One way to explain this apparent discrepancy is by examining the partner choices in self-arranged marriages. Results from the previous section indicate that these marriages are more likely to take place between similarly aged individuals and individuals from different castes, both of which could result in these matches not being approved by the woman's parents and family. The absence of higher autonomy among these women likely stem from the lack of support from their own family.

[13] This is confirmed by individual tests of statistical significance between the coefficients on the three marriage types.

Table 3.8: Intra-Household Gender Relations in Urban Households

	Woman has most say in				
	What to cook	Purchase of expensive item	Number of children	What to do with sick child	Marriage of child
	(1)	(2)	(3)	(4)	(5)
Arranged by woman alone	-0.012	0.013	0.0066	0.058	0.035
	(0.035)	(0.030)	(0.034)	(0.038)	(0.033)
Jointly arranged by woman and parents	-0.054***	-0.0040	-0.021	-0.0032	0.0018
	(0.019)	(0.013)	(0.017)	(0.022)	(0.013)
Parent arranged with consent of woman	-0.037**	0.021	0.025	0.077***	0.017
	(0.018)	(0.013)	(0.016)	(0.021)	(0.012)
Cohort: $20-29$ years	0.038	-0.011	-0.0011	0.024	0.00021
	(0.027)	(0.021)	(0.028)	(0.034)	(0.020)
Cohort: $30-39$ years	0.059***	0.0075	0.00091	0.031	0.0066
	(0.018)	(0.014)	(0.017)	(0.020)	(0.012)
Years of education	0.00075	0.0029**	0.0050***	0.0044**	0.00040
	(0.0016)	(0.0012)	(0.0017)	(0.0020)	(0.0011)
Years of education of husband	-0.0025	-0.0047***	-0.0048***	-0.0080***	-0.0013
	(0.0018)	(0.0013)	(0.0018)	(0.0020)	(0.0011)
Spousal age difference	0.00046	0.00070	0.0012	-0.0024	0.00045
	(0.0018)	(0.0013)	(0.0018)	(0.0021)	(0.0011)
N	6,237	6,237	6,237	6,237	6,237

Notes: This table presents the regression results of equation (3.2). The excluded marriage category is parent arranged without consent of woman and women aged $40-49$ years form the excluded cohort category. Controls that are included but not reported include dummies for English speaking ability of woman and her husband, dummy for whether woman lives with her parents or alone with her husband, dummy for whether the economic status of the husband's family is at least equal to the woman's family, years since marriage, and dummy for membership in a high caste. State fixed effects are included throughout. Average marginal effects from logit regressions are reported. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.

*** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

Table 3.9: Intra-Household Gender Relations in Rural Households

	Woman has most say in				
	What to cook	Purchase of expensive item	Number of children	What to do with sick child	Marriage of child
	(1)	(2)	(3)	(4)	(5)
Arranged by woman alone	-0.058**	0.012	-0.012	0.026	0.031*
	(0.027)	(0.017)	(0.022)	(0.024)	(0.019)
Jointly arranged by woman and parents	-0.052***	0.031***	-0.0047	0.070***	0.017**
	(0.017)	(0.0095)	(0.013)	(0.016)	(0.0082)
Parent arranged with consent of woman	-0.00047	0.020**	0.0037	0.043**	0.013
	(0.017)	(0.0098)	(0.012)	(0.017)	(0.0091)
Cohort: 20 − 29 years	-0.00043	0.0030	0.015	0.024	-0.014
	(0.025)	(0.014)	(0.020)	(0.023)	(0.012)
Cohort: 30 − 39 years	0.035**	0.0086	0.0089	0.024*	-0.0056
	(0.016)	(0.0078)	(0.012)	(0.014)	(0.0076)
Years of education	-0.0016	0.0012	0.0020*	0.0046***	0.0014*
	(0.0014)	(0.00076)	(0.0012)	(0.0014)	(0.00075)
Years of education of husband	-0.0049***	-0.0013*	0.00031	-0.00082	-0.0016**
	(0.0013)	(0.00071)	(0.0011)	(0.0012)	(0.00072)
Spousal age difference	0.0031*	0.00025	0.0031**	0.0044***	0.00031
	(0.0017)	(0.00082)	(0.0012)	(0.0014)	(0.00084)
N	12,084	12,040	12,084	12,084	12,040

Notes: This table presents the regression results of equation (3.2). The excluded marriage category is parent arranged without consent of woman and women aged 40 − 49 years form the excluded cohort category. Controls that are included but not reported include dummies for English speaking ability of woman and her husband, dummy for whether woman lives with her parents or alone with her husband, dummy for whether the economic status of the husband's family is at least equal to the woman's family, years since marriage, and dummy for membership in a high caste. State fixed effects are included throughout. Average marginal effects from logit regressions are reported. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.
*** p< 0.01, ** p< 0.05, * p< 0.1.

3.5 Conclusion

This paper sets out to examine differences in partner choices across the different marriage types prevalent in India and is the first paper to do so. The marriage types are categorized based on the extent of a woman's say in the choice of her spouse. The results confirm the perception that in arranged marriages, that is when parents are involved in the choice of a woman's partner, the matches are based on socioeconomic and educational similarities. In these types of marriages, women are found to be more likely to marry someone from the same caste and someone at least as educated as her. In contrast, women who arrange their own marriages are more likely to marry someone who is closer to her age and someone from a different caste.

Next, this paper seeks to examine differences in the extent of women's autonomy in decision making across the different marriage types. This autonomy is explored along a range of household decisions and decisions regarding children. In contrast to Banerji and Vanneman (2009), decision making power is found to be the highest among women involved in the choice of their spouse together with their parents rather than among women in self-arranged marriages. A possible explanation of this result is that women in self-arranged marriages lack family support due to the matches not being approved by their families. This provides some suggestive evidence of the importance of parental approval in the determination of post marriage bargaining power of women.

Of course, a complete discussion of the marriage market would entail considering both sides of the market. Future research should look to examine partner choices and post marriage decision making power from the perspective of men.

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Appendix A

Chapter 1 Appendix

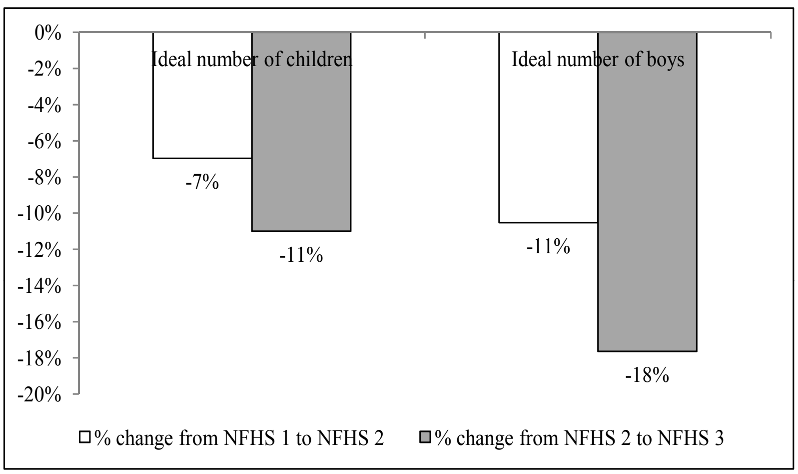

Figure A.1: This figure shows the percentage change in mean ideal number of children and mean ideal number of boys reported by all women in successive survey rounds. NFHS 1 was conducted in 1992 – 93, NFHS 2 was conducted in 1998 – 99 and NFHS 3 was conducted in 2005 – 06. Observations are restricted to women in rural households in wealth quintiles 1, 2 and 3.

Appendix B

Chapter 2 Appendix

Table B.1: Parental and Household Characteristics: Stratification by Parental Preferences

	Mother has son preference				Father has son preference			
	No		Yes		No		Yes	
	Mean (1)	S.D. (2)	Mean (3)	S.D. (4)	Mean (5)	S.D. (6)	Mean (7)	S.D. (8)
Mother Characteristics								
Age	27.05	5.65	27.49	5.82	26.72	5.51	28.10	5.97
Education	4.25	4.51	2.53	3.86	4.14	4.48	2.82	4.05
Worked in last year	0.41		0.42		0.41		0.41	
Ideal no. of children	2.61	1.02	3.10	0.87	2.63	0.94	3.04	1.05
Ideal no. of boys	1.27	0.51	2.13	0.53	1.45	0.61	1.77	0.69
Ideal no. of girls	1.33	0.55	0.97	0.45	1.18	0.52	1.27	0.58
BMI	19.75	2.86	19.51	2.74	19.75	2.91	19.52	2.65
Father Characteristics								
Age	32.30	6.52	32.08	6.66	31.83	6.47	32.97	6.66
Education	6.30	4.77	5.17	4.62	6.30	4.75	5.20	4.67
Worked in last year	0.97		0.96		0.97		0.97	
Ideal no. of children	2.67	1.01	2.92	1.03	2.55	0.99	3.12	0.97
Ideal no. of boys	1.49	0.68	1.73	0.73	1.24	0.49	2.18	0.63
Ideal no. of girls	1.18	0.56	1.19	0.56	1.31	0.54	0.94	0.51
Household Characteristics								
Wealth Quintile								
1	0.21		0.33		0.21		0.32	
2	0.27		0.29		0.28		0.28	
3	0.26		0.23		0.26		0.23	
4	0.19		0.12		0.18		0.13	
5	0.07		0.04		0.08		0.04	
Religion								
Hindu	0.72		0.75		0.74		0.71	
Muslim	0.10		0.12		0.09		0.12	
Christian	0.15		0.11		0.13		0.13	
Others	0.04		0.03		0.04		0.04	
Male household head	0.95		0.97		0.95		0.96	
Total no. of children	2.98	1.77	3.58	1.99	2.94	1.74	3.64	2.02
Number of households	3,250		1,650		3,188		1,712	

Table B.2: Parental and Household Characteristics: Stratification by Fathers' Response

	Decision Maker in HH					
	Father		Both		Mother	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
	(1)	(2)	(3)	(4)	(5)	(6)
Mother Characteristics						
Age	26.75	5.53	27.26	5.72	27.43	5.81
Education	3.07	4.08	3.69	4.39	4.04	4.50
Worked in last year	0.40		0.41		0.43	
Ideal no. of children	2.66	0.90	2.77	1.01	2.85	1.04
Ideal no. of boys	1.51	0.63	1.57	0.67	1.59	0.66
Ideal no. of girls	1.15	0.48	1.20	0.54	1.26	0.59
BMI	19.34	2.59	19.67	2.85	19.87	2.91
Father Characteristics						
Age	31.83	6.29	32.22	6.42	32.49	6.87
Education	5.24	4.63	6.09	4.79	6.15	4.75
Worked in last year	0.97		0.96		0.97	
Ideal no. of children	2.65	0.91	2.73	1.02	2.85	1.08
Ideal no. of boys	1.54	0.67	1.55	0.71	1.61	0.72
Ideal no. of girls	1.11	0.50	1.18	0.56	1.24	0.59
Household Characteristics						
Wealth Quintile						
1	0.31		0.24		0.22	
2	0.30		0.28		0.26	
3	0.22		0.24		0.28	
4	0.14		0.17		0.17	
5	0.04		0.07		0.07	
Religion						
Hindu	0.82		0.72		0.68	
Muslim	0.11		0.11		0.09	
Christian	0.05		0.13		0.19	
Others	0.02		0.04		0.04	
Male household head	0.96		0.95		0.95	
Total no. of children	3.17	1.89	3.25	1.90	3.12	1.82
Number of households	1,137		1,975		1,788	

Table B.3: Parental and Household Characteristics: Stratification by Mothers' Response

	Decision Maker in HH					
	Father		Both		Mother	
	Mean (1)	S.D. (2)	Mean (3)	S.D. (4)	Mean (5)	S.D. (6)
Mother Characteristics						
Age	27.31	5.71	27.68	5.72	28.38	5.64
Education	2.88	4.06	3.79	4.44	3.96	4.40
Worked in last year	0.40		0.40		0.46	
Ideal no. of children	2.66	0.91	2.84	1.02	2.94	1.11
Ideal no. of boys	1.53	0.64	1.59	0.65	1.63	0.70
Ideal no. of girls	1.13	0.49	1.26	0.58	1.31	0.61
BMI	19.29	2.67	19.70	2.85	19.99	2.97
Father Characteristics						
Age	32.22	6.35	33.04	6.54	33.51	6.48
Education	5.37	4.60	5.72	4.79	5.91	4.76
Worked in last year	0.97		0.97		0.97	
Ideal no. of children	2.64	0.95	2.82	1.05	2.93	1.14
Ideal no. of boys	1.51	0.67	1.61	0.72	1.66	0.76
Ideal no. of girls	1.13	0.50	1.21	0.58	1.27	0.63
Household Characteristics						
Wealth Quintile						
1	0.30		0.28		0.21	
2	0.29		0.28		0.28	
3	0.24		0.23		0.27	
4	0.12		0.16		0.18	
5	0.05		0.06		0.06	
Religion						
Hindu	0.80		0.71		0.64	
Muslim	0.13		0.09		0.09	
Christian	0.05		0.16		0.23	
Others	0.02		0.04		0.05	
Male household head	0.96		0.97		0.95	
Total no. of children	3.40	1.96	3.27	1.88	3.39	1.88
Number of households	1,268		1,472		1,456	

Table B.4: Distribution of Parental Preferences: Stratification by Fathers' Response

		Father has son preference		
		No	Yes	Total
		(1)	(2)	(3)
Panel A: Decision Maker, Father				
Mother has son preference	No	527	222	749
		(70.36)	(29.64)	(100.00)
		[72.89]	[53.62]	[65.88]
	Yes	196	192	388
		(50.52)	(49.48)	(100.00)
		[27.11]	[46.38]	[34.12]
	Total	723	414	1,137
		(63.59)	(36.41)	(100.00)
		[100.00]	[100.00]	[100.00]
Panel B: Decision Maker, Both				
Mother has son preference	No	938	359	1,297
		(72.32)	(27.68)	(100.00)
		[72.43]	[52.79]	[65.67]
	Yes	357	321	678
		(52.65)	(47.35)	(100.00)
		[27.57]	[47.21]	[34.33]
	Total	1,295	680	1,975
		(65.57)	(34.43)	(100.00)
		[100.00]	[100.00]	[100.00]
Panel C: Decision Maker, Mother				
Mother has son preference	No	853	351	1,204
		(70.85)	(29.15)	(100.00)
		[72.91]	[56.80]	[67.34]
	Yes	317	267	584
		(54.28)	(45.72)	(100.00)
		[27.09]	[43.20]	[32.66]
	Total	1,170	618	1,788
		(65.44)	(34.56)	(100.00)
		[100.00]	[100.00]	[100.00]

Notes: This table presents the distribution of son preference of parents where the sample is stratified by the fathers' response to the decision making question. Son preference for either parent is calculated as a binary variable which equals one if the parent reports that their ideal number of boys is greater than their ideal number of girls and is zero otherwise. Figures in parenthesis and square brackets present the row and column percentages respectively.

Table B.5: Distribution of Parental Preferences: Stratification by Mothers' Response

		Father has son preference		
		No	Yes	Total
		(1)	(2)	(3)
Panel A: Decision Maker, Father				
Mother has son preference	No	595	218	813
		(73.19)	(26.81)	(100.00)
		[71.26]	[50.35]	[64.12]
	Yes	240	215	455
		(52.75)	(47.25)	(100.00)
		[28.74]	[49.65]	[35.88]
	Total	835	433	1,268
		(65.85)	(34.15)	(100.00)
		[100.00]	[100.00]	[100.00]
Panel B: Decision Maker, Both				
Mother has son preference	No	669	304	973
		(68.76)	(31.24)	(100.00)
		[71.47]	[56.72]	[66.10]
	Yes	267	232	499
		(53.51)	(46.49)	(100.00)
		[28.53]	[43.28]	[33.90]
	Total	936	536	1,472
		(63.59)	(36.41)	(100.00)
		[100.00]	[100.00]	[100.00]
Panel C: Decision Maker, Mother				
Mother has son preference	No	716	289	1,005
		(71.24)	(28.76)	(100.00)
		[75.13]	[57.46]	[69.02]
	Yes	237	214	451
		(52.55)	(47.45)	(100.00)
		[24.87]	[42.54]	[30.98]
	Total	953	503	1,456
		(65.45)	(34.55)	(100.00)
		[100.00]	[100.00]	[100.00]

Notes: This table presents the distribution of son preference of parents where the sample is stratified by the mothers' response to the decision making question. Son preference for either parent is calculated as a binary variable which equals one if the parent reports that their ideal number of boys is greater than their ideal number of girls and is zero otherwise. Figures in parenthesis and square brackets present the row and column percentages respectively.

Table B.6: Results: Matching Response

	Decision Maker in HH		
	Father	Both	Mother
	(1)	(2)	(3)
Male (= 1)	-0.067	-0.0027	0.076
	(0.15)	(0.10)	(0.12)
Mother has son preference (= 1)	0.092	0.023	-0.34**
	(0.14)	(0.14)	(0.15)
Father has son preference (= 1)	-0.16	-0.066	-0.14
	(0.15)	(0.13)	(0.14)
Male * Mother has son preference	-0.036	0.20	0.21
	(0.21)	(0.18)	(0.20)
Male * Father has son preference	0.0086	-0.0058	-0.15
	(0.22)	(0.17)	(0.20)
N	502	949	918
R^2	0.179	0.144	0.134

Notes: This table presents the regression results for equation (2.1) based on the subsample where parental responses to the decision making question match. The dependent variable is the weight-for-height z score of a child. All controls are included but are not reported. Excluded categories include birth order 1, wealth quintile 1, Hindu religion, working father and non-working mother. Robust standard errors clustered at the primary sampling unit level are reported in parenthesis.
*** p< 0.01, ** p< 0.05, * p< 0.1.

Appendix C

Chapter 3 Appendix

Table C.1: Characteristics of Women by Marriage Type

	Type 1		Type 2		Type 3		Type 4	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Urban								
Age at marriage	18.95	2.87	18.55	2.70	18.65	2.73	17.19	2.58
Years of education	7.86	4.77	7.55	5.00	7.89	4.78	4.78	4.64
English speaking ability								
Not at all	0.71		0.71		0.67		0.86	
Little	0.23		0.22		0.27		0.13	
Fluent	0.06		0.07		0.06		0.01	
N	325		2,531		1,965		1,886	
Panel B: Rural								
Age at marriage	17.66	2.67	17.29	2.58	17.67	2.62	16.37	2.41
Years of education	4.34	4.58	3.48	4.18	4.91	4.43	2.38	3.56
English speaking ability								
Not at all	0.89		0.93		0.87		0.95	
Little	0.10		0.07		0.12		0.04	
Fluent	0.01		0.01		0.01		0.00	
N	503		4,881		2,517		4,876	

Notes: The four marriage types are: (1) Arranged by woman alone, (2) Jointly arranged by woman and parents, (3) Parent arranged with consent of woman, and (4) Parent arranged without consent of woman.