Can Incentives Increase Preference for Daughters?

Evidence from a Cash Transfer Scheme in Haryana, India

By Chand Tulal Mazumdar

Chand Tulal Mazumdar completed her Master of Public Policy from Georgetown University in 2012 and finished her thesis under the guidance of Thomas Wei, PhD. She is currently a Research Associate at the Abdul Latif Jameel Poverty Action Lab (J-PAL), where she works on a project that uses randomized evaluation to assess the impact of a performance-based incentive scheme on tuberculosis health workers in Northern India.

ABSTRACT

The gender imbalance caused by a skewed female-to-male sex ratio remains a persistent problem in India despite rapid economic development in recent times. The low child sex ratio results from both excess female infant mortality—due to malnutrition and neglect—and from sex-selective abortions, the roots of which lie in a strong cultural preference for sons over daughters. Although the government banned prenatal sex determination techniques in 1994, many feel that the policy has been ineffective due to inadequate enforcement. Apart from the ban, the government introduced other schemes and campaigns at both national and state levels that focused on changing parental perception and behavior toward daughters. Using two rounds of District Level Household Survey (DLHS) data, this study assesses the impact of Haryana's *Ladli* scheme—a conditional cash transfer scheme that provides incentive to parents for having a second daughter—on the likelihood of having daughters using a difference-in-differences approach with Punjab as a comparison state. The findings suggest that while the likelihood of having a daughter increased in Haryana compared with Punjab in the post-policy period, the effect is not statistically significant. However, restricting the sample to border districts in Haryana and Punjab shows some significant results.

I. INTRODUCTION

The human sex ratio is defined as the number of females to every 1000 males in a population. Low human sex ratios in the Indian population have been documented since the first Indian census in 1871(Kanitkar 1991). While earlier low ratios were attributed to pre-industrial factors such as low levels of education and healthcare provision that reinforced cultural and behavioral bias, persistently low ratios suggest that the problem may not disappear with economic development. Even though the 2011 Indian census showed an encouraging trend in the sex ratio, which increased seven points from the 2001 level to 940—the highest since 1971—it remains low compared to the estimated global average of 984. In addition, the bias remains stark in the child sex ratio—the number of females to every 1000 males in the 0-6 age group—which has declined to an all-time low of 914 (Government of India 2011).

According to demographers, both the natural sex ratio at birth and the population sex ratio are "remarkably consistent" across human populations in the absence of manipulation. The natural sex ratio at birth is 934–952 female births for every 1,000 male births. The slight excess of male births is balanced out in the population sex ratio as males have higher mortality rates than females. Thus, the population sex ratio is estimated to be 979–1,003 females for every 1,000 males (Hesketh & Xing 2006). In practice, both types of sex ratios vary widely across regions and countries (Table 1).

While revisiting the concept of "missing women" he introduced in 1990, Sen (2003) states that the total number of missing women has grown globally during the past decade, primarily due to an absolute growth in population. However, he adds that "another more important and radical change" has occurred during this period: while female disadvantage in mortality has been reduced drastically, this has been counterbalanced by natal disadvantage through prenatal sex detection and selective abortion (Sen 2003). In India, the low child sex ratio has resulted from both excess female infant mortality due to malnutrition and neglect, and sex-selective abortions, the roots of which lie in strong cultural preferences for

Table 1. Population Sex Ratio in 10 Most Populous Countries

Country	2001	2011
World	**986**	**984**
China	944	926
India	933	940
US	1,029	1,025
Indonesia	1,004	988
Brazil	1,025	1,042
Pakistan	938	943
Russia	1,140	1,167
Bangladesh	958	978
Japan	1,041	1,055
Nigeria	1,016	987

Source: Office of the Registrar General & Census Commissioner, Government of India (2011).

Table 2. Population and Child Sex Ratio in India, and Haryana and Punjab States

	Total Population		Child Population (0-6)	
	2001	2011	2001	2011
India	933	940	927	914
Haryana	861	877	819	830
Punjab	876	893	798	846

Source: Office of the Registrar General & Census Commissioner, Government of India (2011).

sons (Jha et al. 2006; Arnold, Kishor, and Roy 2002; Jha et al. 2011). Similar observations have been documented in East Asian countries (Ebenstein 2007; Lin and Luoh 2008; Chunn and Das Gupta 2009), while male-biased sex ratios have been found among children of Asian immigrants in the US, Canada and, Norway (Almond and Edlund 2008; Almond, Edlund, and Milligan 2009; Singh et al. 2010).

Assumptions that discrimination against girls would diminish with economic development and female education have proven simplistic (Löfstedt, Shusheng, and Johansson 2004). For example, in South Korea sex ratios kept declining until a few years ago despite rapid development in industrialization, education, and urbanization, including women's participation in the formal labor force. Even though South Korea was included in the OECD countries by the mid-1990s, gender imbalance rose sharply during this period (Chung and Das Gupta 2007). This pattern is also evident in the Indian context, where the decline has continued despite rising living standards and higher levels of human development. In fact, the gender imbalance is more pronounced in wealthier states like Punjab and Haryana, and in urban areas where people have better access to prenatal tests to determine fetus sex (Table 2) (Haub and Sharma 2006; Subramanian and Selvaraj 2009).

Apart from widely documented non-economic factors, there are several hypotheses that sex selection occurs for economic reasons and is based on parents' intertemporal allocation decisions to optimize the family utility function. According to economic models of choice, parents tend to invest in the child with greatest potential returns, and this rationale can be extended to the unequal sex ratio in India. In developing countries, the gender gap in returns is due to both labor market forces and cultural practices where parents have to pay a dowry for their daughter's marriage. These daughters then move out of the family, while sons stay within the household with their wives. Thus,

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parents are more likely to receive the full return of investing in sons than in daughters under resource constraints (Rosenzweig and Schultz 1982; Strauss and Thomas 1995).

Studies have found that the sex outcome of the first pregnancy in India is close to the natural rate as parents do not selectively abort their first pregnancy as they feel they can try again to have a son. However, as family size in India has fallen substantially, it seems that selective abortion of girls is increasingly being used for second- or higher-order births to ensure at least one boy in the household, given a firstborn girl. On the other hand, it has been found that there is no significant decline in second-order birth sex ratio if the first-born was a boy (Jha et al. 2011; Ebenstein 2007).

The impact of the falling ratio is important as it not only contributes to the deteriorating status of women in society, but also adds to increasing crime and violence (Edlund et al. 2007; Hudson and Boer 2002), affects psychological wellbeing (Zhou et al. 2011), and creates long-run socio-demographic imbalances. The reduced number of women may push women into traditional family roles at the expense of education, training, and employment (Guilmato 2007). This deficit is already being felt in Punjab and Haryana, where young men have difficulties in finding brides and are increasingly resorting to unusual solutions, such as marrying across other caste groups, importing brides from other regions, or trafficking (Jagran Post Bureau 2011).

Though India legalized abortion in 1971, ultrasound technology did not become widely available until the mid-1980s, after which sex ratios at birth began to fall significantly below expected norms. Recognizing this trend, the Indian government passed the Pre-Conception and Pre-Natal Diagnostic Techniques (PNDT) (Prohibition of Sex Selection) Act in 1994, outlawing prenatal sex determination on January 1, 1996. However, the sex ratio has continued to decline, leading many to believe that the ban has been practically ineffective due to inadequate enforcement and insufficient punitive measures (Guilmato 2007). Even though stricter measures are being taken to enforce the ban nationwide, the Indian Planning Commission recently acknowledged that the government has failed to implement the ban. The Commission is now looking at alternate policy options, including giving incentives to families and health workers for the safe delivery of babies and adoption of female fetuses (Dhar 2011).

In addition to the national legislation, several schemes and campaigns exist at the state level to try to change parental perception and behavior toward daughters. The first such scheme was launched by Tamil Nadu in 1992, and similar schemes were implemented

Table 3. Salient Features of Haryana's *Ladli* Scheme

Objectives	To combat female feticide, increase number of girls in families, improve sex ratio, and raise status of the girl child in society.
Eligibility	All state residents are eligible if they have a second girl child born on or after August 20, 2005. Parents should ensure proper immunization and enroll both sisters in school. Parents receiving benefits from any other schemes are also eligible.
Incentives	Government will invest a cash incentive of Indian Rupees (INR) 5,000 (~US$100) per year for a period of 5 years or until the scheme is extended, in designated investment bonds (*Kisan Vikas Patra*), with an interest rate of approximately 8.29 percent, in the name of the second girl child and the mother. The accumulated amount will be given when the girl child turns 18. The incentive will expire if either girl gets married before she reaches the age of 18.
Beneficiaries	86,820 beneficiaries as of December 2009 since implementation in August 2005 (The Hindu 2010).

by Haryana in 2005, Madhya Pradesh in 2006, and Delhi in 2008. These schemes have tailored eligibility criteria and incentives to achieve a variety of development objectives, including improvement in educational attainment and health indicators, so that parents perceive greater benefits from having daughters, thereby reducing female feticide and improving the child sex ratio.

While there have been several empirical studies on the child sex ratio—its impacts, causes, and consequences—there are relatively few studies to assess the impact of legislation or policy interventions on improving the ratio. A recent study assesses the impact of the legal ban (PNDT Act) on sex-selective abortions (Nandi and Deolalikar 2011), and finds that contrary to general perception of the law being virtually ineffective, the act had a significantly positive impact on the child sex ratio. The study's authors estimate that in the absence of the Act, the gender imbalance would have further increased by 13-20 percentage points, or an additional 51,000 female fetuses would have been aborted. Another study measures the impact of a financial incentive program—*Apni Beti Apna Dhan* cash transfer scheme implemented in Haryana in 1994—on the child sex ratio and finds that it had a positive impact on both the number of daughters born and parental investment in daughters' health and education (Sinha and Yoong 2009).

This study contributes to this limited literature by estimating the impact of Haryana's *Ladli* scheme (Table 3), a conditional cash transfer (CCT) program, on the likelihood of mothers having daughters by using data from two rounds of the India District Level Household Survey (DLHS). This study also adds to the broader literature of evaluating CCT schemes in India, which are being advocated within

multiple sectors and at multiple levels for alleviating poverty and achieving the United Nations Millennium Development Goals.[1]

II. DATA

This study uses figures from two rounds of the DLHS data, which are primarily designed to collect information on reproductive and child health at the district level in India. These surveys are conducted by the International Institute for Population Sciences (IIPS) of Mumbai with funding from India's Ministry of Health and Family Welfare[2] and consist of health interviews covering family planning, maternal and child health, reproductive health of ever-married women, and use of maternal and child healthcare services.

The third round of DLHS (DLHS-3) was conducted in 611 districts from late 2007 to late 2008 and sampled 720,320 households (1,000, 1,200, or 1,500 from each district) using multistage stratified sampling with probability proportional to size using the 2001 census data. From these households, 643,944 currently married and ever-married women, aged 15-49 years, were interviewed. DLHS-3 covered the period two to three years after Haryana's *Ladli* scheme was implemented.

The second round of DLHS (DLHS-2) was conducted between 2002 and 2004 in 593 districts and sampled 620,107 households (about 1,000 in each district) using the random sampling method outlined for DLHS-3. From these households, 507,622 currently married women, aged 15-44 years, were interviewed. DLHS-2 covered the period before the Haryana *Ladli* scheme was implemented in August 2005. While all ever-married women were interviewed for DLHS-3, only currently married women were interviewed for DLHS-2. Thus, for the purpose of this study, I use data for only currently married women.

Household interviews were conducted to gather information about the women's age, educational attainment, birth history, birth order, fertility preference, and child sex preference. The outcome of the most recent pregnancy (live birth, stillbirth, or spontaneous or induced abortion) and the survival of the child in the case of a live birth were also recorded. All rounds of DLHS data include a separate household interview that gathered information about demographic composition of households and socioeconomic characteristics, including asset ownership.

III. EMPIRICAL STRATEGY

To estimate the effects of the *Ladli* scheme on the likelihood of having a second daughter in Haryana, I pool the second and third rounds of DLHS

[1] Based on recommendations by the subgroup for girl child development created during the 11th five-year plan, the Government of India has implemented a pilot CCT scheme for families with girl children, Dhanalakshmi, on a pilot basis in 11 blocks in 7 states since 2008-09.
[2] DLHS-3 was also funded by United Nations Population Fund (UNFPA) and United Nations Children's Fund (UNICEF).

data with Haryana as the treatment group. I use Punjab as the control group because it is economically, demographically, and geographically similar to Haryana. Thus, the strategy for estimating the impact of the program on the likelihood of having a second daughter is difference-in-differences (DID):

$$DID = (\overline{Haryana}^{post} - \overline{Punjab}^{post}) - (\overline{Haryana}^{pre} - \overline{Punjab}^{pre})$$

where *post* and *pre* index individuals in the post-policy and pre-policy periods, and *Haryana* and *Punjab* indicate the average likelihood of having a second daughter for Haryana and Punjab, respectively. Thus, my identifying assumption is that the change in the likelihood of having a second daughter in Haryana between the pre- and post-policy periods would have been the same as the change in Punjab during the same period, if the policy had not been implemented.

The DID approach can be implemented with linear regressions to allow for controlling for other variables:

$$girl_i = \beta_0 + \beta_1 * Haryana_i + \beta_2 * Post2005_i + \beta_3 * (Haryana * Post2005)_i + X_i`\gamma + \varepsilon_i$$

where *i* indexes the individual eligible woman, and ε is the error term. *Girl* is a dummy variable indicating if the eligible woman had a daughter during a certain time period (described below). *Post2005* indicates post-policy period, and *X* represents individual-specific covariates such as age, education, husband's education, residence type, and standard of living. *Haryana* is a dummy indicating if the eligible woman lives in the treatment state (Haryana) or the control state (Punjab). β_1 and β_2 estimate the differences in the likelihood of having a daughter between the treatment-control groups and pre- and post-policy period groups, respectively. The coefficient of the interaction term, *Haryana*Post*2005, is the DID estimator (β_3), which indicates whether the change in likelihood of having a daughter between the pre- and post-policy periods is higher in the treatment group as compared to the control group. Thus, a positive estimate for β_3 indicates a relative increase in the likelihood of having a second daughter—suggesting that the *Ladli* program was effective—while a negative estimate for β_3 indicates otherwise. Since the dependent variable is a dummy variable, I run the linear probability model (LPM) to estimate the coefficients.

The sample of eligible women for the study consists of currently married women aged 15-44 years. I drop women older than 44 years in DLHS-3 (2007-08) for consistency, as DLHS-2 (2002-04) only interviews women up to 44 years. Then, I divide the data into two sub-samples (Full and Restricted). The Full sample includes all eligible women who had either one daughter or no daughter before 2002 for the pre-policy dataset (cut-off period: 2001) and before 2006 for the post-policy dataset (cut-off period: 2005). The Restricted sample

contains only those eligible women who had exactly one daughter before the cut-off periods mentioned above. Thus, the outcome of interest (*girl)* is a dummy variable indicating whether a woman in the sample had at least one daughter after the cut-off period. The reason I include first daughters as well is because even though there is no incentive for having the first daughter, some women with no daughters may aim to have two daughters eventually to get the incentive. But with only three years of data since 2005 (which is the year when the program was enacted), they may just have had one of the two daughters by 2008, so having the first daughter still might indicate that the incentive is working.

I also run the regression specifications separately for the whole of Haryana and Punjab states and for the border districts alone, as the latter may be more comparable. Based on the latest state borders, I consider seven districts for Haryana: Sirsa, Fatehbad, Jind, Kaithal, Kurukshetra, Ambala, and Panchkula, and six districts for Punjab: Muktsar, Bhatinda, Mansa, Sangrur, Patiala, and Mohali.

IV. DESCRIPTIVE FINDINGS

Full States

Table 4 provides the summary statistics: there are 13,736 observations for Haryana and 11,784 observations for Punjab for the Full sample in the pre-policy period (2004), while there are 14,173 observations for Haryana and 14,067 observations for Punjab in the post-policy period (2008). The Restricted sample includes 6,230 women for Haryana and 5,746 women for Punjab in the pre-policy period, and 6,079 women for Haryana and 6,338 for Punjab in the post-policy period. While the mean of most of the variables of interest seem to have relatively similar magnitudes,

Figure 1. Summary Statistics of Dependent Variable (Full States)

Figure 1A

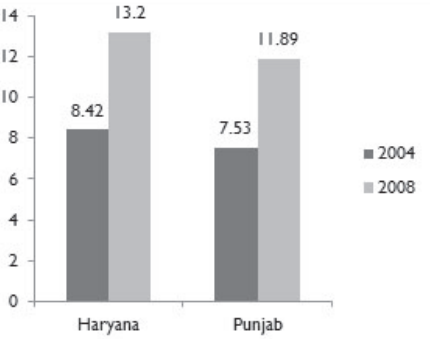
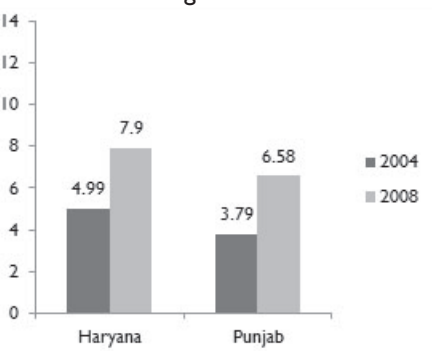


Figure 1B



Note: Figure 1A represents the Full sample that includes all women who had zero or one daughter before 2002 and 2006. Figure 1B represents the Restricted sample that includes all women who had exactly one daughter before 2002 and 2006. Each bar gives the percentage of eligible women in that particular year that had at least one daughter after the cut off periods in the pre- and post-policy periods (2001 for pre-policy and 2005 for post-policy period).

Table 4. Sample Summary Statistics (Full States)

	2004				2008			
	Full Sample		Restricted Sample		Full Sample		Restricted Sample	
	Haryana	Punjab	Haryana	Punjab	Haryana	Punjab	Haryana	Punjab
Observations	13,736	11,784	6,230	5,746	14,173	14,067	6,079	6,338
Age	28.085	30.132	30.823	32.465	28.717	30.31	31.944	33.065
Education	5.66	6.385	5.058	6.022	6.037	7.054	5.289	6.439
Husband's Education	8.333	7.607	7.963	7.456	8.491	8.11	8.046	7.737
Urban	0.302	0.316*	0.321	0.326^	0.253	0.29	0.265	0.294
Standard of living index								
- Middle	0.433	0.368	0.419	0.363	0.489	0.342	0.495	0.356
- Richest	0.432	0.556	0.437	0.562	0.451	0.644	0.442	0.631
Total sons	1.248	1.233^	1.383	1.319	1.204	1.141	1.378	1.247
Total children	1.789	1.799^	2.435	2.358	1.771	1.716	2.461	2.315

Notes: Full sample includes all women who had zero or one daughter before 2002 and 2006. The Restricted sample includes all women who had exactly one daughter before 2002 and 2006. Age is measured in number of years; education and husband's education are measured in number of years of schooling; region of residence is urban or rural; standard of living index is richest, middle, or poorest; total number of children, sons and daughters include total number of surviving children, sons, and daughters. T-tests of differences in mean between Haryana and Punjab were calculated for each variable in pre- (2004) and post- (2008) policy periods for both Full and Restricted samples. * = significant at 10% level ($p<0.05$).
** = significant at 5% level ($p<0.01$). ^ = not significant. All t-test scores are significant at the 1% level unless indicated otherwise.

formal testing of means shows that the differences in means between the states were statistically significant for all variables, except for *urban* and *total children* for the Full sample in 2004. I control for these variables in the regressions because of these differences.

Figures 1A and 1B show the percentage of women who had at least one daughter after the cut-off in pre- and post-policy periods, for the Full and Restricted samples of the whole states. For both Punjab and Haryana, this percentage of women was higher in the post-policy period relative to the pre-policy period. Additionally, the unconditional DID estimates, at 0.42 percentage points for the Full sample and 0.12 percentage points for the Restricted sample, show that the increase in Haryana (Full sample: from 8.42 to 13.2 percent; Restricted sample: from 4.99 to 7.9 percent) was more than that in Punjab (Full sample: from 7.53 to 11.89 percent; Restricted sample: from 3.79 to 6.58). However, none of the estimates are statistically significant as will be seen from the regression results in the next section.

Border Districts

Table 5 provides the summary statistics for the border districts: for the Full sample in pre-policy period (2004), there are 5,039 observations for Haryana and 4,574 observations for Punjab, while there are 4,838 observations for Haryana and 4,511 observations for Punjab in the post-policy period (2008). The Restricted sample includes 2,321 women for Haryana and 2,137 women for Punjab

Table 5. Sample Summary Statistics (Border Districts)

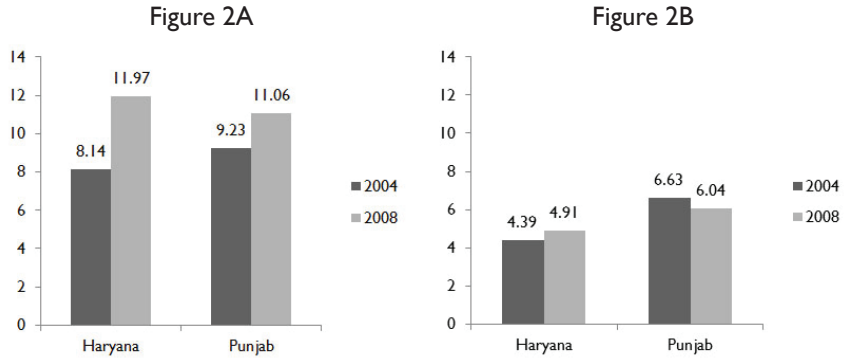
	2004				2008			
	Full Sample		Restricted Sample		Full Sample		Restricted Sample	
	Haryana	Punjab	Haryana	Punjab	Haryana	Punjab	Haryana	Punjab
Observations	5,039	4,574	2,321	2,137	4,838	4,511	2,083	1,969
Age	28.706	29.608	31.192	32.084	29.435	29.900**	32.62	32.756^
Education	5.137	5.632	4.598	5.302	5.869	6.461	5.176	5.837
Husband's Education	7.54	7.084	7.081	7.001^	7.98	7.794^	7.554	7.365^
Urban	0.275	0.303**	0.296	0.313^	0.24	0.291	0.254	0.293**
Standard of living index								
- Middle	0.421	0.379	0.42	0.371	0.482	0.372	0.479	0.394
- Richest	0.45	0.534	0.444	0.549	0.473	0.611	0.472	0.59
Total sons	1.246	1.211^	1.358	1.297*	1.175	1.113	1.31	1.224
Total children	1.791	1.774^	2.404	2.347*	1.73	1.665**	2.379	2.287

Notes: Full sample includes all women who had zero or one daughter before 2002 and 2006. The Restricted sample includes all women who had exactly one daughter before 2002 and 2006. Age is measured in number of years; education and husband's education is measured in number of years of schooling; region of residence is urban or rural; standard of living index is richest, middle, or poorest; total number of children, sons, and daughters include total number of surviving children, sons and daughters. T-tests of differences in mean between Haryana and Punjab were calculated for each variable in pre- (2004) and post- (2008) policy periods for both the Full and Restricted sample. * = significant at 10% level ($p<0.05$). ** = significant at 5% level ($p<0.01$). ^ = not significant. All t-test scores are significant at the 1% level unless indicated otherwise.

in the pre-policy period, and 2,083 women for Haryana and 1,969 for Punjab in the post-policy period. Similar to the full states, formal testing of means shows that the differences in means between the border districts are statistically significant for several variables. However, as expected, the districts appear to be more similar between the two states in terms of women's *age* for the Restricted sample in 2008, *husband's education* in almost all years and samples, *urban* areas in the Restricted samples of the pre-policy period, and *total boys* and *total children* in Full sample of the pre-policy period. Again, I control for these variables in the regressions because of these differences.

Figures 2A and 2B show the percentage of women who had at least one daughter after the cut-off in pre- and post-policy periods for the Full and Restricted samples of the border districts, respectively. In both Punjab and Haryana, this percentage of women went up in the post-policy period relative to the pre-policy period. Additionally, the unconditional DID estimates, at 2 percentage points for the Full sample and 1.11 percentage points for the Restricted sample, show that the increase in Haryana (Full sample: from 8.14 to 11.97 percent; Restricted sample: from 4.39 to 4.91 percent) was greater when compared to Punjab (Full sample: from 9.23 to 11.06 percent; Restricted sample: from 6.63 to 6.04 percent). The estimate for the Full sample is statistically significant in this case, as we will see from the regression results in the next section.

Figure 2. Summary Statistics of Dependent Variable (Border Districts)



Notes: Figure 2A represents the Full sample that includes all women who had zero or one daughter before 2002 and 2006. Figure 2B represents the Restricted sample that includes all women who had exactly one daughter before 2002 and 2006. Each bar gives the proportion of eligible women in that particular year that had at least one daughter after the cut-off periods in the pre- and post-policy periods (2001 for pre-policy and 2005 for post-policy period).

V. REGRESSION RESULTS

Table 6 presents the regression results of the key outcome of interest (*girl*) if women from the Full and Restricted samples had at least one daughter after the cut-off period for the full states and the border districts alone. While all the coefficients have been detailed in the tables, the parameter of interest in each equation is the interaction term, *Haryana*Post*2005. This parameter measures the increase in likelihood of having at least one daughter or a second daughter for Haryana residents after the policy was implemented compared to Punjab. The LPM estimates are presented with the full set of controls including age, education, husband's education, standard of living index (richest, middle, and poorest), and region of residence (urban and rural).

Full States

For the full states, the LPM DID estimate of the Full sample shows that after the implementation of the policy, the likelihood of having at least a daughter in Haryana increased by 0.8 percentage points more between the pre- and post-policy periods compared with the change during the same period in Punjab; however, the estimate is not statistically significant. For the Restricted sample, the estimate shows that the likelihood of having a second daughter increased by 0.5 percentage points more between the pre- and post-policy periods compared with the change in Punjab during the same period, but the effect is not statistically significant.

Border Districts

In comparison, the LPM DID estimate for the border districts shows that for the Full sample, the likelihood of having at least one daughter increased by almost 2.3 percentage points more between the pre- and post-policy periods in Haryana compared with the change during the same period in Punjab, and the estimate is statistically

Table 6. LPM DID Estimates (Full States & Border Districts)

Dependent Variable: Women had at least one daughter after the cut-off (2001 and 2005)

	Full States		Border Districts	
	Full Sample	Restricted Sample	Full Sample	Restricted Sample
Haryana	-0.013***	-0.007	-0.021***	-0.015*
	(0.003)	(0.004)	(0.006)	(0.006)
Post2005	0.047***	0.037***	0.022***	0.020**
	(0.004)	(0.004)	(0.006)	(0.007)
Haryana Post2005* (DID coefficient)	0.008	0.005	0.023**	0.018
	(0.005)	(0.006)	(0.008)	(0.010)
Type of residence:				
- *Urban*	0.009**	0.015***	0.016**	0.014*
	(0.003)	(0.004)	(0.005)	(0.006)
Standard of living index:				
- *Middle*	0.002	-0.017*	0.014	-0.005
	(0.006)	(0.007)	(0.009)	(0.012)
- *Richest*	-0.012*	-0.035***	-0.008	-0.022
	(0.006)	(0.008)	(0.010)	(0.012)
R-squared	0.069	0.068	0.07	0.064

Notes: Full sample includes all women who had zero or one daughter before 2002 and 2006. The Restricted sample includes all women who had exactly one daughter before 2002 and 2006. For Full States: n = 53,760 for Full sample and n = 24,393 for Restricted sample. For Border Districts: n = 18,962 for Full sample and n = 8,510 for Restricted sample. For all specifications, the dependent variable is a dummy variable, girl, which takes the value of 1 if the woman in the sample had at least one daughter after the cut-off (2001 for pre-policy and 2005 for post-policy period) and 0 if not. The right-hand-side variables are a dummy for Haryana, post-policy period (2008), a Haryana post-interaction term, and covariates (age, education, husband's education, standard of living index, and region of residence). Age is measured in number of years; education and husband's education are measured in number of years of schooling; region of residence is urban or rural; standard of living index is richest, middle, or poorest. * = significant at 10% level ($p<0.05$). ** = significant at 5% level ($p<0.01$). *** = significant at 1% level ($p<0.001$).

significant at the 5 percent level. For the Restricted sample, the estimate shows that the likelihood of having a second daughter increased by 1.8 percent more between the pre- and post-policy periods in Haryana compared with the change in Punjab during the same period, but is not statistically significant.

Heterogeneity

Table 7 shows the DID estimates for various subgroups—urban, rural, richest, middle and poorest, both for the full states and border districts, and also for the Full and Restricted samples. For the full states, the results did not produce any statistically significant insights for most categories from the Full sample. However, the border districts show a significant increase in the likelihood of having a daughter in both the rural category and the richest category by more than two percentage points each.

VI. ROBUSTNESS CHECKS

Since the estimates for the full states do not produce any significant results,

Table 7. LPM DID Estimates, by category (Full States & Border Districts)

Dependent Variable: Women who had at least one daughter after the cut-off (2001 and 2005)

	Full States		Border Districts	
	Full Sample	Restricted Sample	Full Sample	Restricted Sample
Urban	0.012	-0.005	0.029	0.02
	(0.009)	(0.010)	(0.016)	(0.017)
Rural	0.006	0.010	0.021*	0.016
	(0.006)	(0.007)	(0.010)	(0.012)
Richest	0.005	-0.003	0.024*	0.016
	(0.007)	(0.007)	(0.011)	(0.011)
Middle	-0.005	-0.011	0.002	-0.009
	(0.008)	(0.010)	(0.014)	(0.017)
Poorest	0.028	0.078	0.047	0.114
	(0.032)	(0.043)	(0.051)	(0.066)

Notes: The table shows the DID estimates, or the interaction terms, from each of the categories–urban, rural, richest, middle, and poorest. The Full sample includes all women who had zero or one daughter before 2002 and 2006. For all specifications, the dependent variable is a dummy variable, girl, which takes the value of 1 if the woman in the sample had at least one daughter after the cut-off (2001 for pre-policy and 2005 for post-policy period) and 0 if not. The right-hand-side variables are a dummy for Haryana, post-policy period (2008), a Haryana post-interaction term, and covariates (age, education, husband's education, standard of living index, and region of residence). Age is measured in number of years; education and husband's education are measured in number of years of schooling; region of residence is urban or rural; standard of living index is richest, middle, or poorest. * = significant at 10% level ($p<0.05$). ** = significant at 5% level ($p<0.01$). *** = significant at 1% level ($p<0.001$).

I run robustness checks only for the border districts. To show that the parallel assumption of the DID method holds, I use the first round of the DLHS survey conducted in 1998-99 to ascertain that the trends in the dependent variables for the treatment and control states were not divergent prior to the baseline. For that purpose, I simulate the same empirical strategy for DLHS-1 and DLHS-2, and divide the data into two subsamples. The Full sample was divided into a pre-policy dataset that includes all eligible women who had either one daughter or no daughter before 1997 (cut-off period: 1996) and a post-policy dataset that includes all eligible women who had either one or no daughter before 2002 (cut-off period: 2001). The Restricted sample contains only those eligible women who had exactly one daughter before the cut-off periods as mentioned. The measures of the dependent variable, *girl,* remain the same. The DLHS-1 data is comparable to the DLHS-2 and DLHS-3 waves, with the only difference being that the standard of living index was not available for DLHS-1. As such, the type of house—*kachha* (mud house), *semipucca* (mix of mud, brick and cement), and *pucca* (brick and cement)—was used as the proxy variable.

The regression results in Table 8 show there is no significant effect in the likelihood of having a daughter in Haryana compared with the change in Punjab before the baseline period.

Apart from validating the parallel assumption trend to establish the robustness of my identification strategy,

"... the improved sex ratio may not be attributable to the *Ladli* scheme. However, there are some positive results for the border parts of the state."

one of the major factors to account for is that Punjab also implemented a program called *Balri Rakhshak Yojana* in 2005-06 to improve the sex ratio in the state. However, its eligibility criteria were much more stringent than Haryana's program, and as of 2008-09 it had only 212 beneficiaries since its launch (Government of Punjab 2009). In comparison, the Haryana *Ladli* scheme had nearly 50,000 beneficiaries in 2007-08 alone, during which it spent 119 percent of the amount budgeted for the fiscal year (Government of Haryana 2007-08), and had a total of 86,820 beneficiaries as of December 2009 (The Hindu 2010).

VII. DISCUSSION

Results from the 2011 census brought both good and bad news for Haryana—the state reported the best sex ratio figures in the last 110 years, yet it continues to rank the lowest among all 28 states (IANS 2011). According to the Haryana government, the *Ladli* scheme has turned around the state's sex ratio (Mahajan 2011). In 2010, the state government also decided to continue the available benefits of the scheme for another five years (The Hindu 2010). The results from this study suggest that the improved sex ratio may not be attributable to the *Ladli* scheme. However, there are some positive results for the border parts of the state. This is encouraging, as the identification assumption used for the study may be more likely to hold true for the border districts. These findings also raise the possibility that the *Ladli* scheme may not have affected all parts of Haryana uniformly.

It would be more plausible to attribute a positive impact to the policy if the Restricted sample—which constitutes the primary target group of the policy—had yielded significant results. Significant results for the Full sample that included women with both zero and one daughter at baseline, but not for the Restricted sample that included women with exactly one daughter at baseline, may imply that the number of first-born daughters (for women with zero daughters) went up significantly in the border districts of Haryana compared to Punjab. While this is an encouraging outcome because it indicates an increase in the overall likelihood of having a daughter, the data does not clearly reflect the impact of the policy as it is currently designed. However since the DLHS-3 data only covers a very brief period after the policy was implemented, it is possible that although there is no direct incentive to have the first daughter, some women with no daughters may aim to eventually have two daughters to get the incentive. Thus, data for women who had only one of the two daughters by 2008 might still indicate that the incentive is working. Nonetheless, empirical evidence suggests that parents do not usually abort their first daughter, but the incidence of such sex-selective abortion increases with two or more pregnancies, as noted in the

Table 8. LPM DID Estimates (Border Districts)

Dependent Variable: Women who had at least one daughter after the cut-off (1996 and 2001)		
	Full Sample	Restricted Sample
Haryana	-0.027***	-0.016
	(0.008)	(0.009)
Post2000	-0.078***	-0.049***
	(0.009)	(0.011)
*Haryana * Post2000* (DID coefficient)	0.008	0.003
	(0.010)	(0.011)
Type of residence:		
- *Urban*	0.004	0.024**
	(0.006)	(0.007)
House type:		
- *Semipucca*	0.013	0.010
	(0.007)	(0.009)
- *Pucca*	0.004	-0.004
	(0.008)	(0.010)
R-squared	0.061	0.065

Notes: Full sample includes all women who had zero or one daughter before 1997 and 2002. The Restricted sample includes all women who had exactly one daughter before 1997 and 2002. n = 18,063 for both regressions with Full sample and n = 8,358 for both regressions with Restricted sample. For all specifications, the dependent variable is a dummy variable, girl, which takes the value of 1 if the woman in the sample had at least one daughter after the cut-off (1996 to simulate pre policy and 2001 to simulate post policy period) and 0 if not. The right-hand-side variables are a dummy for Haryana, post-policy period (2000), a Haryana post-interaction term, and covariates (age, education, husband's education, type of house as a proxy for standard of living index, and region of residence). Age is measured in number of years; education and husband's education are measured in number of years of schooling; region of residence is urban or rural; house type is kachha (mud house), semipucca (mix of mud, brick, and cement), and pucca (brick and cement). * = significant at 10% level ($p<0.05$). ** = significant at 5% level ($p<0.01$). *** = significant at 1% level ($p<0.001$).

Introduction (Jha et al. 2011; Ebenstein 2007).

Thus, it is evident that, while there appears to be some improvement in the relative likelihood of having daughters in the post-policy period in the border districts, it is difficult to determine whether they can be directly attributed to the policy. Additionally, as mentioned earlier, the incentive amount at the current rate is only a fraction of the average total cost of raising a child, which may be one of the primary reasons the policy did not have the desired impact. Also, the insignificant results across the full state of Haryana raise some questions about policy implementation and overall effectiveness.

VIII. POLICY IMPLICATIONS

Based on these results, it can be argued that incentive schemes may have some positive effects on parents' views about

having daughters and improve the skewed sex ratio, albeit at a gradual pace. Such direct transfers can be particularly beneficial for impoverished families as it may help them invest in the education of their daughters, wherein the tussle is always about prioritization of limited resources for the son. However, the most important policy implication here is the substantial empirical evidence that shows that even though son preference may be prevalent across the society, it is mostly the educated and well-off who have access to sex-selective techniques. Thus, incentives targeting only the poorest families may overlook the need to reinforce positive perceptions about daughters. That being said, it is true that such incentives, along with targeted awareness campaigns, can help the most impoverished section of society by equalizing the benefits of having sons versus daughters.

Secondly, with the declining fertility rate and the promotion of a two-child policy across the country, the criteria of tying the incentive to the second daughter, irrespective of the number of sons, may not be the most desirable solution. For example, unless some families have a strong preference for daughters, they are unlikely to have daughters if they already have two or more sons. In this case, the scheme may merely attract people who already have a preference for daughters.

"... it can be argued that incentive schemes may have some positive effects on parents' views about having daughters and improve the skewed sex ratio, albeit at a gradual pace."

Thirdly, since one of the objectives of the policy is to "raise the status of the girl child in society," it does not necessarily make sense for the incentive to be restricted to only the second daughter; ideally, incentives should be extended to all daughters. But as this option requires a higher budget and outlay, it could be a solution implemented by the federal government, either alone or in combination with the state governments. Also, considering the rapid increase in per capita income of the state[3] and the nation, and the fact that the incentive amount at its current level constitutes only 3.57 percent of the total cost of raising a child, the Haryana state government could consider doubling the incentive from INR 5,000 to INR 10,000 in line with Delhi's successful *Ladli* Scheme (Sekher 2010).

Finally, because the third round of DLHS data covered the period soon after the *Ladli* scheme was introduced, the effects observed in this study might be different from the current sex-ratio levels. To evaluate the longer-term effects of the program, further assessments need to be done using data from more periods of the DLHS and, ideally, also using other available datasets, including administrative data (SRS) and other health surveys, such as

[3] Since 2005-06, the per capita income in Haryana rose to Rs. 56,922 (~US$1,122) in 2007-08, was Rs. 94,680 (~US$1,868) in 2010-11, and was estimated to reach Rs. 109,227 (~US$ 2,155) in 2011-12 (Economic Survey of Haryana 2010-2011).

the Demographic and Health Surveys (DHS). It would also be beneficial to have survey data that asked respondents whether the incentive had any effect on their decision to have or not have a second daughter. Most importantly, when assessing longer-term impacts, it is not sufficient to judge the success or failure of the program based upon its impact on the number of female births. Instead, one must look at the overall development and social status of female children in society. If there is reason to believe that more girls were born but suffered lifelong neglect and discrimination, the final outcome of the policy might be not be considered successful, whereas an increase in actual fondness for daughters, even if generated among fewer parents, might be a more successful outcome for society.

In conclusion, while the skewed sex ratio tarnishes the economic growth story of a modern India, there are reasons to believe that the right policymaking process and targeted interventions can aim to reverse such bias. In this process, the important thing to remember is that while short-term policy measures can bring about a change in the immediate outcomes, policymakers should focus on the long-term outcomes—the true development of the girl child and her later life outcomes—as that will be the primary contributing force to hasten the normative transformation in society.

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